A Contractor's Guide To Induction Loop Systems (AFILS)

The induction loop systems this document refers to are more properly termed AFILS, which stands for Audio Frequency Induction Loop Systems.

AFILS are mostly used to assist those with hearing difficulties, but may also be used for other limited area broadcasting systems, such as museum guides, talkback systems and surveillance.

An AFILS consists of the following parts:

A source, which could be a microphone, a television, a public address system or a combination of audio sources.

A signal cable from the source to the amplifier

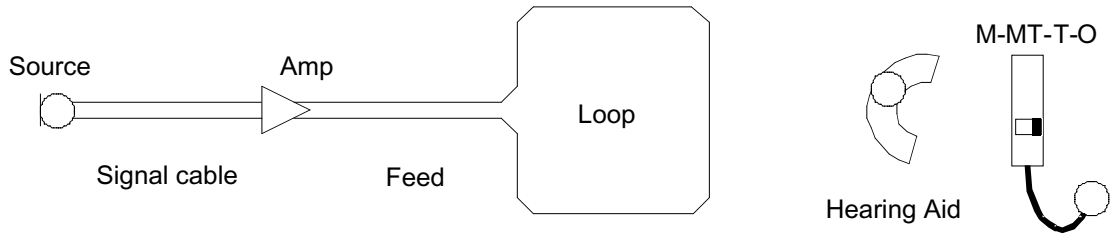
An amplifier, to amplify the signal

A feed cable from the amplifier to the loop

An insulated loop cable (single core) to radiate the signal

One or more receiver (s), typically a hearing aid with a special coil, called a telecoil, to receive the signal and convert it into sound

The hearing aid will have the following switch positions, Off, Telecoil, Microphone & Telecoil and Microphone



How does an AFILS Work?

An AFILS does not use radio frequencies; it operates at audio frequencies.

The signal from an audio source is fed into the induction loop amplifier, which amplifies the signal in the same way as any other audio amplifier. The amplified signal, instead of going to a loudspeaker, is fed to a closed loop of cable that is normally placed around the perimeter of the room to be covered.

The current flowing through the loop generates a magnetic field at audio frequency that radiates in the space around the loop cable. (This is the same as happens with a loudspeaker, except that in a loudspeaker the coil is fixed to the cone of the speaker, and moves in response to the signal.) Any lines of magnetic flux that pass through the coil in a receiver, such as a hearing aid, will generate a current in that coil that is then converted back to audio and fed into the listener s ear.

The combination of loop and telecoil is a very inefficient transformer, where the loop is the primary and the telecoil is the secondary.

What is special about PDA induction loop amplifiers?

Modern induction loop amplifiers have two main differences from amplifiers designed to drive loudspeakers.

1 Signal processing.

People with hearing difficulties need assistance with the intelligibility of sounds.

Intelligibility comes from a combination of audibility (loud enough) and clarity (clear enough).

The goal of most conventional amplifiers is high fidelity, which means as near as possible to the original sound, but is not necessarily the most intelligible.

Any good amplifier will give clarity but the difference between quiet and loud passages means that, if it is turned up enough to hear quiet sounds, it will be too loud on the loud sounds.

The solution to this is to compress the dynamic range (the difference between the quiet and loud passages) of the signal.

An everyday example of this is to listen to classical music on the motorway.

The signal has to be loud enough to be heard against the background noise (This is called the signal to noise ratio).

Radio Three does not use compression, so it is difficult to hear quiet passages against the noise in the car.

Classic FM does use compression and amplifies quiet passages relatively more than loud passages.

The result is that the quiet passages can be heard, but the loud passages will not be too loud.

Modern induction loop amplifiers employ similar compression techniques to reduce dynamic range and improve the intelligibility of the signal.

2 Current mode amplification

Normal amplifiers, which are designed to drive loudspeakers, operate in voltage mode. That is to say, the voltage varies in line with the source signal.

However, induction loop amplifiers are required to produce a strong magnetic field and magnetic fields are proportional only to the current flowing in a wire and not to the voltage.

Therefore, PDA induction loop amplifiers are designed to vary the current in line with the source, leading to the most efficient conversion of the signal into a magnetic field.

Can I use an ordinary amplifier?

Apart from the lack of compression, normal voltage-mode amplifiers can, in theory be used but they are far from ideal.

If a voltage-mode amplifier is used in a loop application, several turns of wire are needed to generate an adequate magnetic field. Calculating the exact number of turns is complicated, and they should be kept as few as possible.

Induction loops are ideally made up of a single turn of wire in order to minimise the impedance (frequency dependant resistance) of the loop, which rises with the frequency of sound. Each extra turn will result in unnecessary loss of signal, and will reduce the intelligibility, leading to a muddy sound.

PDA induction loop amplifiers are designed to drive into loops with d.c. resistance in the range 0.2 to 2.0 Ohms, ideally 1.0 Ohm, and to not distort or overheat.

Voltage mode amplifiers are unlikely to be able to operate safely into less than 2.0 Ohms.

When is an assisted hearing system required?

Building regulations call for an assisted hearing system for *public* and *staff* in meeting rooms and reception areas over 100m^2 and at glazed ticket offices.

Typical examples are ticket windows in stations and theatres. The implication is that all ticket windows should be covered, but the rules do not make this clear.

Meeting rooms includes places of entertainment and anywhere were discussions take place.

Reception areas are areas where announcements are made, such as doctors waiting rooms.

The disability discrimination act says a service provider (this can be anyone, from a theatre to a village hall) should make reasonable provision to ensure that his service is available equally to disabled people. This includes helping people with hearing problems.

This expands the requirements of the building regulations to cover all cases where sound has to be transmitted to people, and could include public bars and even juke boxes! The deciding factor here is reasonableness .

Methods of assisted hearing

There are three possible methods for assisting with hearing difficulty.

Radio

Radio is not used in the UK, as it is not licensable. Also, transmissions can carry for very long distances and radio requires special receivers that have to be provided with new earpieces, collected after use, and maintained.

Infrared

Infrared is line of sight only, which can be an advantage as coverage is easy to predict, but it also requires special receivers. The management of the facility have to make receivers available, ensure they are returned, repair them, provide new earpieces (hygiene), and fit batteries, which can be a considerable headache.

Induction Loop

Induction loop telecoils are fitted as standard in National Health hearing aids (and are an inexpensive option on most private aids) and so are available to most people without any management involvement.

Many modern hearing aids do not just amplify all frequencies equally; they are tailored to the user s hearing problem and amplify different bands by different amounts. This gives maximum intelligibility, so the user has the best chance of understanding what is said.

Are there any disadvantages with AFILS?

The magnetic field is affected by metal in the building structure. In particular, it is affected by large sheets of metal (solid or perforated) in the horizontal plane, such as metal suspended ceilings (Acoustic tiles in a metal frame are not a problem). This can result in the magnetic field being absorbed, giving uneven coverage or even resulting in dead spots.

The magnetic field radiates outside the loop and can spread into areas intended for coverage by adjacent loops, or give a problem of security. Modifying the loop design can often control this.

The British Standard on AFILS, BS 7594 : 1993 acknowledges these issues and suggests that a trial loop be run wherever possible and the layout adjusted to suit. Where this cannot be done, the standard says that areas of good coverage and poor coverage should be indicated with signs so that users can go to areas where the system will work acceptably.

Some buildings have an underlying 50Hz hum present, especially old properties where live and neutral wiring takes separate routes, resulting in a loop. However, most hearing aids are designed to reject such low frequencies, and so this is not normally a practical problem.

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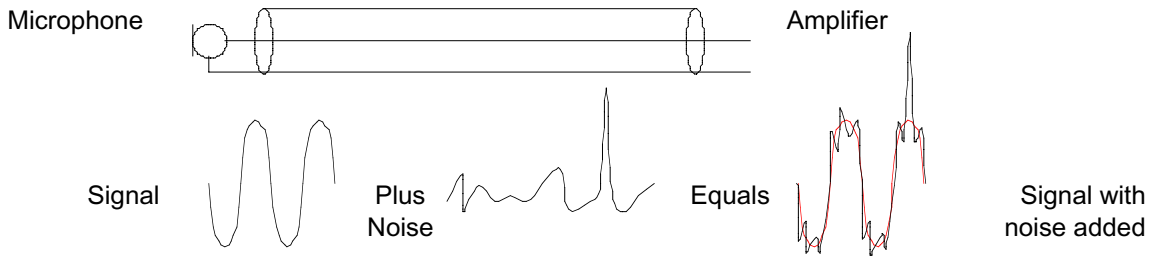
How do I specify the parts of an induction loop system?

Following is some audio information that may not be familiar to everyone.

Unbalanced and balanced signal lines

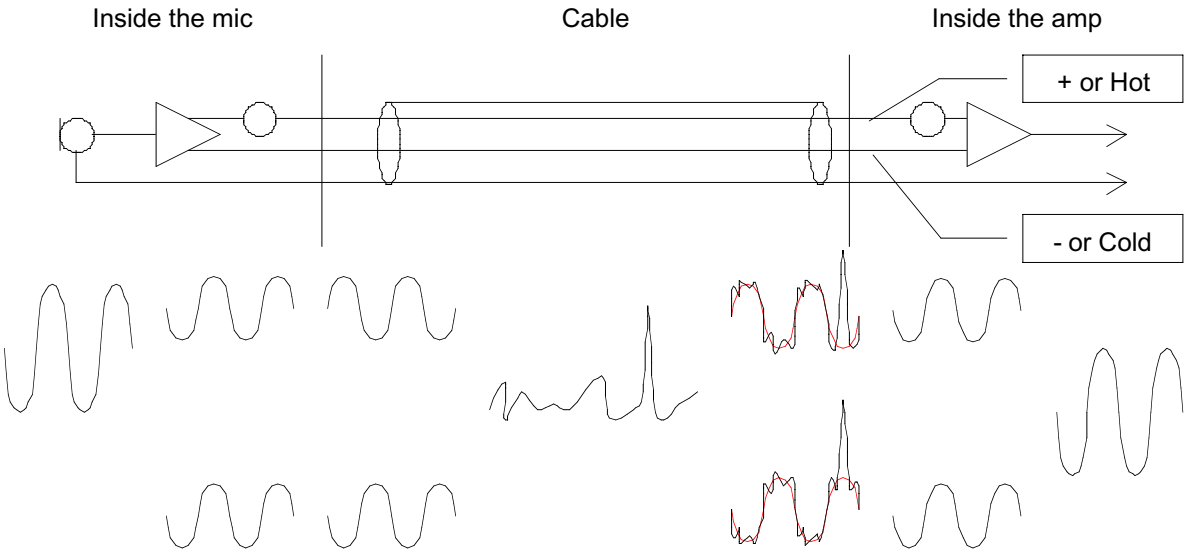
Low-level signals such as from microphones, especially if the cable is more than a metre or so long, are liable to interference, resulting in hum and/or cracking noises. These affect intelligibility and so are to be avoided.

The signal coming out of a microphone capsule is unbalanced as opposed to balanced. A typical unbalanced system is shown below.



The microphone cable, despite being screened, acts as an aerial and picks up electrical noise very easily. This noise can be a low hum, such as from the electrical mains, or loud cracks, such as those caused by sparking light switches.

This problem is much reduced by changing the signal to a balanced line as shown below.



Signal from mic. Split signal. Invert one line, pass down balanced line, interference on both lines. Invert one line back, inter ference cancels out, add both signals together, pass into amplifier.

The signal from the microphone capsule is split into two equal signals, but at half the amplitude. One of these signals is then inverted, so that it is exactly opposite to the other signal. The two signals are then passed along two wires and any interference is picked up equally in both wires. At the amplifier, the inverted signal is inverted back again. The two signals complete with interference are then re-combined and the interference, which now cancels out, disappears.

Balanced line signals are labelled + (for positive phase) or HOT and — (for negative phase) or COLD . In this case + and — refer to an a. c. voltage rather than d. c.

This system is very effective and allows cables to be run long distances. However, due to component tolerances, it is not perfect and some interference will be picked up, especially if cables are very long or are too near to a source of noise.

The maximum signal cable distance also depends on the voltage of the signal and on voltage drop and relative impedances of the source and input of the amplifier.

Phantom voltage or phantom power

Phantom power is a very low current d.c. voltage that is superimposed on the microphone line at the input to the amplifier. It is used to provide the biasing and amplification voltage that is required by certain kinds of microphone, such as electret or condenser microphones.

Dynamic (moving coil) microphones do not require phantom power, and will not usually be affected by its presence. However, we do not recommend dynamic microphones be used with AFILS as they can pick up the magnetic field from the loop, resulting in feedback.

If the microphone line is unbalanced, positive phantom power will be applied to the signal line and the screen will be negative.

If the microphone is balanced, positive phantom power will be applied to both signal lines equally and the screen will be negative.

The phantom voltage varies depending on the amplifier.

On the PDA 101, it is 2.5 Volts, which is suitable for powering low cost unbalanced condenser microphones, such as those used on PCs.

On the PDA 200/800 it is 15 Volts and on the PDA 500/1000 it is 50 Volts. The voltage is not usually important, as most professional microphones will work with a phantom in the range 9 to 52 volts.

Note that some electret microphones have a battery compartment. These mics should not be used with PDA induction loop amplifiers for two reasons.

a) *The amplifier will charge the battery, which might explode, and*

b) *If the phantom power is defeated, the battery will eventually run flat. This will stop the AFILS working but will probably not be noticed by the management.*

Line and microphone level

Generally, input signals fall into two bands , mic level and line level.

Line level is normally in the range 300 milliVolts to 2 Volts, but if not specified, it is assumed to be 775 milliVolts rms. A line level audio source normally comes from equipment containing a pre-amplification stage, such as a CD player, TV audio output, Radio tuner etc.

Mic level can be as little as 300 microVolts for an electret microphone up to tens of milliVolts for a dynamic microphone.

Because of the wide range of voltages that can be presented to audio equipment, an input is usually either mic or line, or has two switchable levels, mic and line, plus a control to adjust the levels to suit the wide variation.

Input connectors

PDA 101

The PDA 101 has two unbalanced 3.5mm jack socket inputs. Each can be switched to mic or line level and fine adjustment is provided.

PDA 200 and 800

The PDA 200 and 800 each have two balanced 5-pin 180… DIN socket inputs. Each can be connected to a mic or line level source (not both at once) and fine adjustment is provided.

PDA 500 and 1000

The PDA 500 and 1000 each have one balanced mic and one balanced line 3-pin XLR socket and fine adjustment is provided. The line level input can be supplied as a second mic level input to special order if required.

Microphones

Dynamic (moving coil) or electret (condenser) microphones

Dynamic microphones have a moving diaphragm that generates a voltage in a coil. These types of microphones are robust and can be quite inexpensive, but they tend to pick up the magnetic field from the loop amplifier, resulting in feedback.

This is similar to the whistling feedback you get when a microphone is in front of a loudspeaker.

Electret microphones have a diaphragm that moves in a voltage field, varying the voltage across the line. These are not susceptible to magnetic feedback.

We only recommend electret microphones.

What kind of amplifier and microphone should be used?

Many designs of microphone are available for specific applications and they can cost anything from a few pounds to several *thousands* of pounds. Only reasonably priced microphones are required for loop amplifiers.

Ticket counters

Use the PDA101C, which comes complete with a PDA100M self-adhesive electret microphone on a one metre unbalanced lead. This cable will pick up interference if it is extended and so it is generally only suitable for use on ticket counters or as a direct pick-up from a TV loudspeaker.

Fix the mic to the front edge of the counter, bearing in mind that clothing should not rub up against it, as this will be transmitted.

In order to minimise the risk of eavesdropping, it is normal to fit induction loop systems at every other counter position.

If the PDA100M is not suitable, use an Audio Technica PRO47 gooseneck mic fitted to one side on the desktop.

The ideal location for the loop pad is horizontally just under the counter top.

If the counter is very high, such as in a bookmaker s, experiment with fitting the loop lower.

Domestic use, bedrooms in nursing homes

The loop has two typical applications. Relaying TV sound and conversations with visitors.

For TV sound only, use the PDA101S and plug into the TV.

For conversation only, use the PDA100M mic supplied.

If TV and conversation are required at the same time, position the microphone near to the loudspeaker and the room s occupants, say on the front, top or bottom of the set.

Nursing Home Lounges

The loop has two typical applications. Relaying TV sound and entertainment / announcements.

For TV sound, use a SCART lead connected to one input.

For a fixed microphone, fit an OM2 to the ceiling (fits in 25mm single gang electrical back box) over where the speaker normally stands.

For a handheld microphone, use an Audio Technica MB4000 handheld microphone.

For overall sound pickup, use 2 off OM2 on the ceiling about a third of the way from each end of the room.

Churches

Apart from the smallest halls, churches generally need microphones at different positions such as the pulpit, the altar, the choir, etc. Installing, cabling and mixing these microphones is relatively expensive and specialised.

For most installations, especially if there is no specification, the ideal solution is a radio microphone.

The most effective radio mics are UHF diversity systems, which have two aerials and two receivers to give the best chance of the signal being received, even when pillars etc. obstruct it.

Radio microphones are normally provided as lapel mics or handheld.

We suggest the Sennheiser EW122 (lapel mic) or the EW165 (handheld mic) four channel systems.

If more complex microphone systems are required, a multi-channel mixing desk will be required, such as the Spirit RW5354 (4 balanced mic, 2 stereo inputs) or the RW5445 (6 balanced mic, 2 stereo inputs).

Note on Church Loops

If the whole church is covered with a simple loop then overspill will be heard outside. A sign can be put at the exit telling users to turn the hearing aid back to mic as they leave the building.

If a mixing desk is to be fitted, it is possible for magnetic interference to occur at the input connectors. This can be minimised by running a 1 x 1 meter notch in the loop where the desk will fit.

Microphone Cables

Good quality microphone cable should be used. Suitable cables are available from RS components.

For example, stock number 361-557 is a 100-metre reel of PVC insulated cable with good screening and flexibility.

If there is a high risk of electrical interference, stock number 236-9068 is a 100-metre reel of PVC insulated star-quad microphone cable with increased noise rejection.

Can you run microphone cables next to loop cables?

No. If you run cables closer that 600 mm for more than a metre or so, the interference will be so strong that feedback will occur despite the use of balanced lines.

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Loop cables

There is nothing electrically special about loop cables and they can be single or multi-strand. However, the cross-section should be chosen so the loop is as near to one ohm as possible (0.5 to 1.5 ohms) and robust insulation is recommended to minimise the chance of shorting the cable to earth (which could damage the output of the amplifier).

What kind of loop cable should be used?

We recommend tri-rated switchgear cable, which is available from RS components.

Cross section area	Stock number	Outside diameter
0.5 mm	364-253	2.6 mm
0.75 mm	364-326	2.9 mm
1.0 mm	364-398	3.1 mm
1.5 mm	364-461	3.4 mm
2.5 mm	364-534	3.8 mm
4.0 mm	364-607	4.4 mm
6.0 mm	364-657	5.1 mm

What cross section of loop cable should be used?

The PDA 101 should be used with 0.5mm^2 cable or a TxBI loop pad.

For all other amplifiers, assume the loop is rectangular (ignore small deviations, such as chimney breasts and approximate circular loops to squares), and measure the length, L and width, W and work out the area, A using A= L x W.

Then look up the area in the following table and select one that will cover the area.

AMPLIFIER	MAX AREA m^2
PDA 200	120
PDA 500	250
PDA 800	400
PDA 1000	550

Then work out the perimeter, P using the equation P = 2(L+W+F) where F is the length of the feed cable from the loop to the amplifier and select the nearest cable diameter from the following table.

	PERIMETER, metres		
CABLE CSA, mm^2	*MINIMUM*	IDEAL	*MAXIMUM*
0.50	*14*	28	*42*
0.75	*21*	42	*63*
1.00	*28*	56	*83*
1.50	*42*	83	*125*
2.50	*68*	135	*203*
4.00	*109*	217	*326*
6.00	*156*	313	*269*

For example, for a loop 11 metres x 7 metres with a 3 metre feed, A = 11 x 13 = 143 m^2, so the PDA 800 is suitable.

The perimeter P = 2x(11+13+3) = 2 x 27 = 54 metres, which is between 42 and 56 metres, so either 0.75 mm^2 or 1.00 mm^2 cable may be used and 1.5 mm^2 will work OK.

What if the amplifier is a long way from the loop?

Loop amplifiers are best sited adjacent to the loop, as the feed cable will generate a magnetic field that may interfere with other areas.

However, if a long feed cable cannot be avoided, the resistance of the feed should be as low as possible and the cable should be twisted to reduce magnetic radiation.

The following chart gives the maximum feed cable length (0.5 Ohms) for twin cable and for star-quad cable. Star-quad configuration uses a twisted four-core cable, such as three-phase plus neutral mains cable with opposite conductors shorted together. This results in much lower magnetic radiation than for twisted twin cable.

	MAXIMUM FEED LENGTH	
CABLE CSA, mm^2	TWIN CABLE	STAR QUAD
0.50	14	28
0.75	21	42
1.00	28	56
1.50	42	83
2.50	68	135
4.00	109	217
6.00	156	313

Where should the loop cable be run?

In most installations, the loop cable should be run around the perimeter of the room. However, as the field is present outside the loop, it may be run on the floor (cable buried in plastic conduit or flat cable under carpet) or in the ceiling.

Do I need to run a trial loop?

If at all possible this is recommended by BS7594, as it is the only sure way of telling exactly how the loop will perform, especially in the presence of large amounts of metal.
The cable can be stuck in place temporarily with gaffa tape and a simple performance test carried out.

On new-build projects this cannot be done and if you are in doubt, we suggest sending dimensioned sketches showing any adjacent loops to your supplier for advice.

If loops have to be placed next to each other so close that overspill cannot be avoided, such as in bedrooms, it may be necessary to advise the client that adjacent loops cannot be used at the same time.

How do I run a loop in a suspended ceiling?

If the ceiling has a metal grid and non-metallic ceiling tiles, simply tie-wrap the loop cable to the support wires a couple of centimetres above the tiles.

If the tiles are metallic, the field strength will be affected, even if they are perforated, and especially if they are electrically cross-bonded. It may be possible to partially overcome this by turning up the current drive of the amplifier, please check with your supplier.

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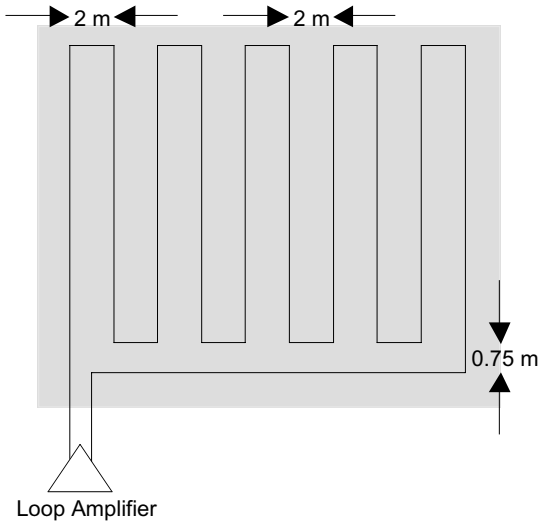
Special loop patterns have been mentioned, what are they?

The most common pattern is the electric grill shape. This uses the fact that lines of magnetic flux cannot cross each other to squash the field in the vertical and horizontal planes.

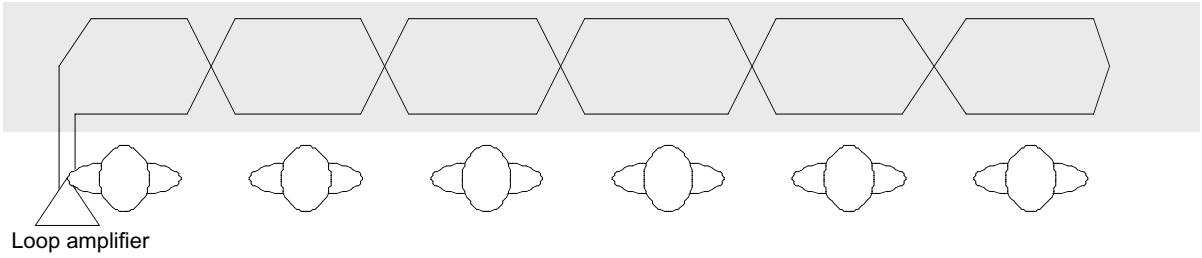


The gap between the prongs of the pattern is about 2 metres because this reduces the overspill (left - right in the diagram) to about six metres but allows the field to spread upwards enough to give good coverage at head height. The up - down overspill as shown in the diagram will be slightly more than the left — right spill but will still be a lot less than for a simple rectangular pattern.

The downside of this pattern is that a dead area will exist immediately above each cable, but this compromise is usually not noticeable.

The area of the loop is the overall length x the overall width, but the perimeter is total length of the cable. This means that a larger cross section cable may be required than for a rectangular loop.

Another pattern is ideal for fixed tables, such as in council chambers.



This pattern restricts the loop to the immediate vicinity of the table and, depending on the layout, there should be little or no overspill outside the room.

The area of the loop is the overall length x the width, ignoring the shape of the pattern.

The perimeter is the actual cable length and this may result in a larger cable diameter being required than for a rectangular loop.

At what height should the loop cable be run?

Loop cable is normally run at floor or ceiling height - 2.5 to 3 metres from the floor so that it is within a couple of metres of the listener s head when he is standing or sitting. If the loop has to placed higher, the field strength will reduce and the dead spots immediately over and under the cable will get wider.

The cable can be run on the wall around ear height and this will give the strongest possible field. However, if the loop cable is run at ear height and a listener approaches the loop cable, the signal will be uncomfortably strong near to the loop.

In the region directly above or below the loop cable, the signal will drop to zero. This is because there is little or no vertical component of the magnetic field in this region (about 15… each way).

Does the loop system have to cover the whole room?

Not necessarily, for instance in a bowling alley, it will only need to cover the top of the lanes and in a church it will only have to cover the pews, although it might also have to cover the choir.

Can the loop cable be run in conduit?

Plastic conduit is fine. Metallic conduit should not be used.

Can I buy flat cable for installation under a carpet?

Yes, we supply three sizes, each 66 metres long. They have cross sections of 0.5 mm^2, 1.0mm^2, and 1.5mm^2.

You will also need protective tape to hold the cable down and reduce the chances of damage.

What happens at doors and windows?

The loop cable can pass vertically up and down either side. However, this wastes some power and so care should be taken if the amplifier is only just capable of covering the area. As a rule of thumb we suggest allowing 20% extra power in the amplifier if vertical runs are needed.

How much overspill will there be?

As a rule of thumb, in a standard loop, the signal from the loop can still be heard up to three times the loop width away. This means that adjacent loops that are used at the same time for different purposes will definitely overspill into each other s areas.

Will the signal overspill vertically?

Yes, a loop placed at ceiling height will give excellent coverage in the room above and a loop placed it floor level will cover the room below.

Placing the downstairs loop in the floor and the upstairs loop in the ceiling will reduce the problem but if the loops are large the overspill may still be unacceptable so please ask for advice.

If vertically or horizontally adjacent rooms are to be covered, send dimensioned drawings, showing the relative position of each room to your supplier for advice.

If the area to be covered is bigger than can be covered by a single amplifier, what should I do?

Consult your supplier for advice. One method is to run two cables and two amplifiers in parallel; another is to lay special patterns of cable adjacent to each other.

Will special patterns result in dead areas?

The receiving coil in a hearing aid only responds to the vertical component of the magnetic field round the loop cable. Immediately above the loop there is no vertical component so there will be a dead patch. However, unless the loop is a long way above or below the listener, this area will be very narrow and it is often an acceptable compromise in return for reduced overspill.

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The client is demanding coverage that cannot be achieved. What do I do?

Refer to BS BS7594. This says that some installations will be a compromise and that dead patches may be unavoidable.

How can overspill be prevented?

The British Standard suggests several technically complex solutions that are reasonably effective, but are rarely employed due to high cost. In many cases overspill can be reduced nearly as effectively, and for much less cost by laying the loop in an electric grill pattern where each leg of the cable is about 2 metres from its neighbour.

This method cannot be used in small rooms, where we suggest a 2 metre square loop in the centre of the room.

Listeners can hear hum when the loop system is operating and the client will not pay, what can I do?

Turn the amplifier off completely and test for noise using a hearing aid or an RxTI tester. The noise will still be present. This proves it cannot be due to the loop amplifier.

We recommend this be tested for before installation.

Will the AFILS interfere with other equipment such as guitar pickups, mixing desks etc?

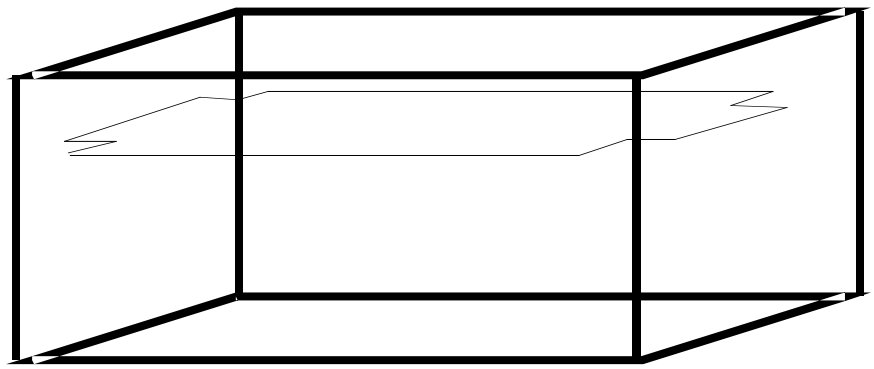
Yes. If an electric guitar is within an induction loop it will definitely pick up the magnetic field and cause feedback. Some guitar pickups are less sensitive (humbuckers).

If a mixing desk is to be installed, then make a one metre notch in the loop where the mixer is to be installed. This will limit the field in the immediate areas and reduce feedback substantially

Large amounts of metal can cause problems, please clarify

Structural steel can absorb the magnetic field and eddy currents can be set up, turning the magnetic field into heat. This is what would happen in a transformer core if insulated laminations were not used to reduce the currents.

Generally, keep the loop about a metre from large uprights; it is perfectly OK to put a notch in the loop (see below).



If there is a steel-reinforcing grid in the floor, either put the loop in the ceiling or, if it must go in the floor, install the loop in plastic conduit as far above the grid as possible. The drive current may have to be turned up to overcome the effects of the metal, so choose the largest conductor size possible to suit the area.

Do not run the loop cable closer than 1 metre from large pieces of metal such as girders.

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What happens if the loop gets damaged?

A simple break can be repaired provided it can be found. All that matters is that the join is low resistance and allows the required current to flow (3 A peak on the PDA 101, 17 A peak on the PDA 1000).

If the loop cable is shorted to earth, fir instance, by drilling through it and touching a reinforcing grid, the amplifier output stage will be damaged. This cannot be protected against.

And Finally

Which loop amplifier should be used?

For ticket counters and reception desks, use the PDA101C kit.

For areas up to 50m^2 (absolute maximum), use the PDA101L.

For direct connection to a TV via a SCART connector in areas up to 50m^2 (absolute maximum), use the PDA101S.

NEVER connect to any internal circuits in a TV as very high voltages can be present, even on loudspeakers, and you may be killed, or at least destroy the TV.

For areas up to 120m^2, use the PDA 200

For rooms up to 400m^2, use the PDA 800

For professional rack mount installations in rooms up to 250m^2, use the PDA 500

For professional rack-mount installations in rooms up to 550m^2, se the PDA1000

How do I connect a PDA 200 or 800 to a SCART socket?

Use a PDA2-8S lead.

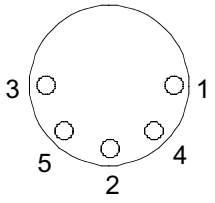
Can you rack mount the PDA 200 and 800?

No, they were designed as freestanding units. In any case rack mounting of loop amps is usually to be avoided due to the length of feed cable required.

What are the input connections on the PDA 200 and 800?

The PDA 200 and 800 are identical apart from output power. They have two 5-pin 180… DIN socket inputs and each input has a balanced microphone or balanced line level input, but *NOT* both at once.

Looking at the solder side of the pins



Balanced mic: 1 = +, Hot; 2 = Screen; 3 = -, Cold

Balanced line: 4 = +, Hot; 2 = Screen; 5 = -, Cold

Unbalanced mic: 1 = Signal; 2 = Screen; Link 2 to 3

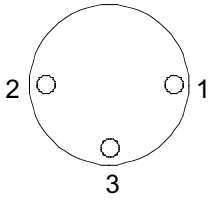
Unbalanced line: 4 = Signal; 2 = Screen; Link 2 to 5

A Contractor's Guide To Induction Loop Systems (AFILS)

What are the input connections on the PDA 500 and 1000?

The PDA 500 and 1000 have two 3-pin XLR socket inputs, one input can have a balanced microphone and the other can have balanced line level input. No microphone is supplied as applications vary widely.

Looking at the solder side of the pins



Each input is either mic or line

Balanced mic or line: 1 = Screen; 2 = +, Hot; 3 = -, Cold

Unbalanced mic or line: 1 = Screen, 2 = Signal; Link 1 to 3

The PDA 500 is 1U tall (1.75 inches) and the PDA 1000 is 2U tall (3.5 inches) and they are otherwise identical apart from some display features and output power.

Can you have two mic inputs on the PDA 500 and 1000?

Yes, please specify two mic inputs when ordering.

What regulations call for AFILS?

Building regulations and the disability discrimination act.

What standards apply to AFILS?

BS7594 — Code pf practice for audio frequency induction loop systems, 1993

Should induction loops be integrated with voice alarms?

According to BS7594, yes; but there is no reference in BS5839 Part 8 —voice alarm systems.