

# Loop Wire Selection Guide

## BEST PRACTICES FOR LOOP WIRE SELECTION

There are many suppliers and many types of wire suitable for Induction Loop Systems (ILS). Experienced ILS installers will have their preferred supplier and keep spools of various types at hand.

Amplifiers have a load recommendation, which specifies a DC resistance (or AC impedance) range it can tolerate. For example, if an amplifier has a load recommendation of 0.5 to 1.5  $\Omega$ , the DC resistance of the wire should not be less than 0.5  $\Omega$  and it should not exceed 1.5  $\Omega$ . For example, 1000 ft of 12 gauge multi strand single conductor wire is approximately 1.5  $\Omega$ . See our cable spec sheet for more cable specs.

A single loop (or run) of wire is generally adequate for most small loop installations. Depending upon the coverage area, it may be required to run two or more loops to get the desired coverage. Phased arrays (interwoven loops) can also be considered. Each additional loop can potentially provide as much as *twice* the power, but it will also *decrease* the high frequency performance in the system.

Before selecting the wire type to be used, a room blueprint should be reviewed, or at least a sketch with dimensions of where the desired loop will be installed. This information can then be used, with the following **Wire Resistance Chart**, to determine what type of wire can be used and if the proposed length fits into the load range/recommendation of the amplifier. If the installation requires longer wire, then a larger gauge wire (smaller number) could be considered to meet the resistance specification.

### Wire Resistance Chart

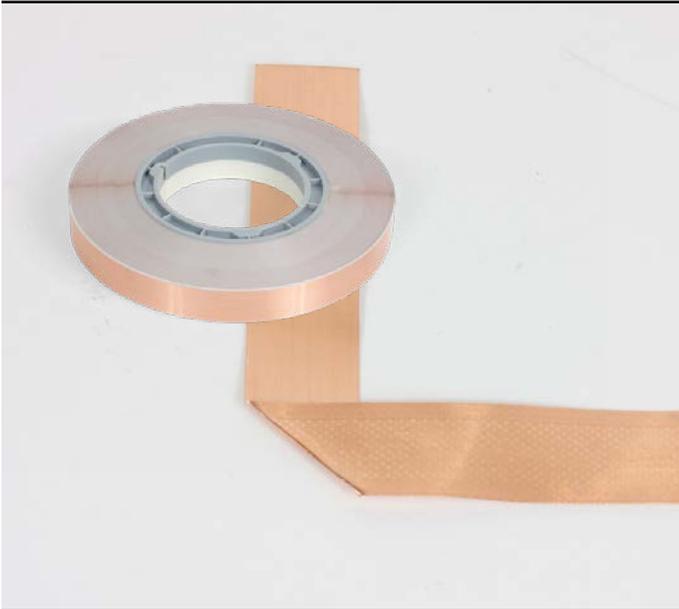
To select the proper wire for the loop(s), refer to the following chart. Wire resistance of each loop needs to be 0.5 - 1.5  $\Omega$  as required by the amplifier.

Wire type	AWG (CSA)	DC $\Omega$ 1000 ft (305 m)	Max length Approx ft (m)	Min length Approx ft (m)
Single conductor	18 (0.82 mm <sup>2</sup> )	6.5	231 (70 m)	77 (23 m)
	16 (1.3 mm <sup>2</sup> )	4.3	349 (106 m)	116 (35 m)
	14 (1.9 mm <sup>2</sup> )	2.8	535 (163 m)	179 (55 m)
	12 (3.3 mm <sup>2</sup> )	1.9	790 (240 m)	263 (80 m)
Flat 3/4" copper	~14 (1.9 mm <sup>2</sup> )	2.4	725 (221 m) *	208 (64 m) **

\* Flat copper wire is more efficient than single conductor stranded wire at audio frequencies. This allows the maximum length to be greater than the length calculated using the DC resistance. \*\* In order to present a minimum resistance of 0.5  $\Omega$  to the amplifier, the DC resistance must be used.

## Wire Types

The following wire types are typically used for loop installations. The wire type to be used depends on the application. In some installations, such as under carpet, flat copper wire generally works best. For other applications, such as a small room perimeter loop, stranded wire may be adequate.



### FLAT COPPER WIRE

Flat Copper Wire (or ribbon cable) from Williams AV is offered in 3/4" width and is equivalent to 14 gauge wire. Because flat wire has less Inductance, 10 – 20% increase in length may be utilized and still be within the load requirement. Flat wire can be installed under carpet or glued to the wall. See our installation videos for examples of flat wire installation. When laying on a concrete floor, be sure the concrete is sealed before laying the flat wire as the Alkaline in the concrete will eat into the wire. Flat wire can be secured using double sided tape, glue or flat wire tape.

Williams AV Part Numbers:

**PLW 300** (300 ft spool),

**PLW 500** (500 ft spool)



### FLAT WIRE TAPE

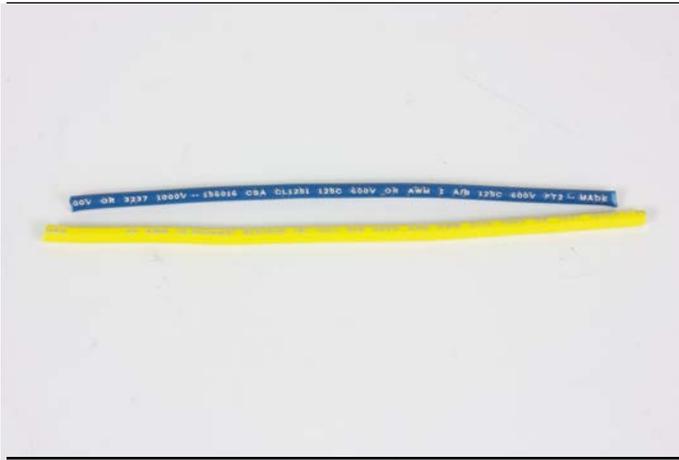
Flat wire tape from Williams AV is used to secure and protect flat copper wire when installing a loop under carpet, wood floors or tile. The flat wire tape is applied over flat copper wire.

Williams AV Part Number: **FWT 001** (2" W x 165 ft Roll)



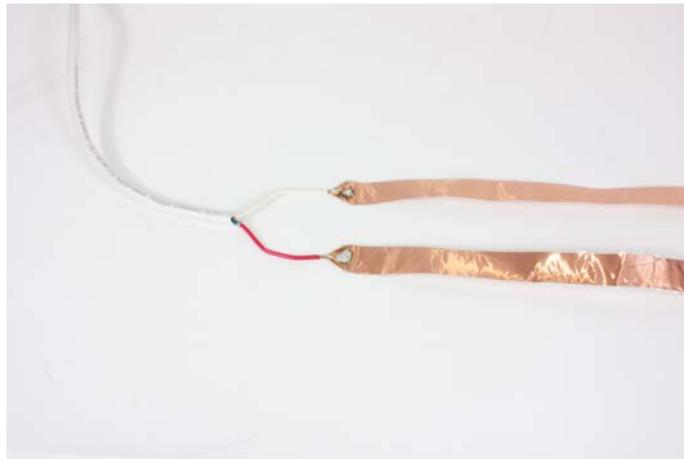
### MULTI-STRAND SINGLE CONDUCTOR

Multi-Strand Single Conductor wire can be easily sourced from many wire distributors. This can be found in various gauges and colors dependent upon the system needs.



## DIRECT BURIAL CABLE

Direct Burial Cable (DBC) is required when burying cable in concrete, bitumen or soil. This type of wire will resist the heat effect of curing as well as the caustic effect of over time. DBC should be used even when scoring and laying into dry concrete because of the alkaline effect from the concrete over time.



## LEAD WIRE

Lead wire is the wire connecting the amplifier to the loop wire. Sometimes this lead wire is just an extension of the loop wire and this lead should be twisted from the amplifier to the loop to prevent the lead wire from creating additional EMI areas and cancellation.

The resistance of the lead wire is also part of the wire load applied to the amplifier, so keep the lead length as short as possible.

Pictured is an example of Williams AV flat copper wire terminated with lead wire for connection of the loop to the amplifier. The wire used here is multi-strand multi-conductor wire (see "star wire" below) that is twisted inside the insulation jacket.



## OTHER WIRE TYPES

Two conductor speaker wire can be utilized for a standard single loop install. For a Phased Array loop configuration, four conductor star wire can be used. This Star Wire has four color coded wires tightly twisted together and sheathed. This can be soldered to flat wire or single strand at the loop.

**WILLIAMS AV**

info@williamsav.com / www.williamsav.com

800-843-3544 / INTL: +1-952-943-2252

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