203: Electrical installations technology  
**Handout 24: Earth loop impedance**

**Learning outcome**

The learner will:

1. know requirements of earthing systems.

**Assessment criteria**

The learner can:

4.5 identify **component parts** of an earth loop impedance path.

**Range**

**Component parts**: Zs, Ze, R1, R2, main earthing terminal (MET), supplier’s earth return path.

**Earth loop impedance**

If a fault of negligible resistance occurs between line and earth then an earth fault current will flow. The magnitude of current that flows will depend upon the resistance or impedance of the earth fault path. This fault path is shown below for a TN‑S system:

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| 01 Earth loop impedance TN-S.png |

The loop comprises the following parts, starting at the point of the fault:

* circuit protective conductor
* the main earthing terminal (MET) and earthing conductor
* for TN‑S systems, the supply earth
* the path through the earthed neutral point of the supply transformer
* the source line winding
* the line conductor from the source to the point of the fault.

The impedance of this fault path, ie the ‘earth fault loop impedance’, is denoted by the symbol Zs and is measured in ohms (Ω).

The fault path is broken into two parts:

* the external impedance (Ze) comprises combined resistances/impedances of the fault path on regional supply company’s (REC) side of the supply intake
* the combined resistance of the consumers’ line conductor (R1) and the consumers’ cpc conductor (R2). This combined resistance is referred to as (R1 + R2).

Both of these value combined is the earth loop impedance (Zs) and is measured in ohms (Ω).

The previous diagram showed the earth loop impedance path for a TN‑S system; the following two diagrams show the earth loop impedance path for a TN‑C‑S system and TT system, respectively:

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| **TN‑C‑S system** |
| 02 Earth loop impedance TN-C-S.png |
| **TT system** |
| 03 Earth loop impedance TT.png |