# How to achieve the best read range with hands free equipment

Overview

Very few sites have a clear open space around the entrance to be controlled and so several factors need to be considered before mounting the hands free interface and reader to their best effect.

Radio signals do not always behave as you might expect. A mobile phone that displays a full signal on one part of the site will loose signal completely only a few hundred yards away. There are many reasons for this including the proximity of buildings, walls and even trees or bushes.
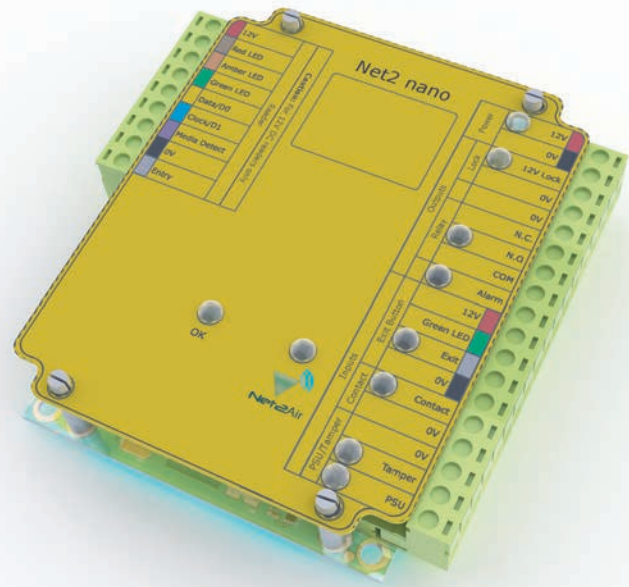
Problem areas

To achieve the best read range possible, you first need to determine where the potential problems are and plan to avoid them. Every source of interference will progressively reduce the range that you can achieve.

Metal objects (storage bins, fencing, vehicles, etc) are the most troublesome to the high frequency signal as they will disrupt any electrical field. Radio signals also have a physical component that will cause them to bounce off solid objects (e.g. brick walls, glass, trees, etc.) and reduce the final signal read at the interface.

This will be a particular problem where the object comes between the interface and the user.
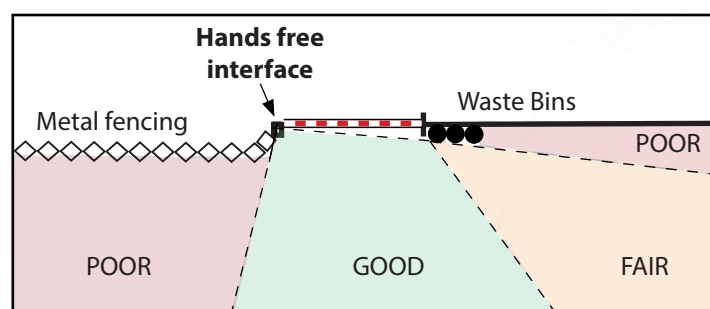
In the above diagram, we have a metal fence alongside the entrance. This will shield the interface from any user approaching from the left.

The waste bins to the right of the entrance will also have an effect on range by deflecting the signal in the 'Fair' area and shielding the signal from a user in the 'Poor' area.

You can see that we could fill the following pages with dozens of examples, but that would still not give a guarantee of the perfect location. Many of the items, vehicles, bins, etc, may be moved around the site on a daily basis.

You must assess if surrounding objects will have an effect based on their material and position and then mount the interface in its optimum position.

Reader position

In most cases the transmitting P series reader will not be a factor. It is normally mounted in full view, away from ground or roof overhang and at the same height as the user. It also runs at a relatively low 125 kHz and carries less data than the 2.4 GHz signal required for interface communication.

Problems will occur if the user is in or near a vehicle that blocks or disrupts communication with the reader. For example, metallised tints on glass will have a major impact on the range achieved.

A second P series reader can be used as a second 'wake up' transmitter; perhaps one on each side of a wide road to give better coverage. Readers should not be positioned so that their active fields overlap and conflict (e.g. P200 separation should be 2 x 2.5 m)

Set up the system as normal with a single reader. Once this is working, power down the interface, remove this reader and connect the second one to the interface to allow it to upgrade its firmware. You can now wire both readers to the interface in parallel 'colour for colour'.

Where two P series readers are mounted within range of each other (e.g. Car and lorry traffic) only one should be upgraded to be the HF transmitter. Install one reader as normal and complete its firmware upgrade process. Power down the system and wire the second reader to the interface in parallel with the data cable from the ACU. (Labelled Net2 Control Unit)   The ACU will then receive data from the hands free interface or the second P series reader.

Interface position

Hands free tokens are designed to operate in any orientation and so will try to communicate with an interface as soon as they come into range of a reader.

The orientation of the interface will be a factor as the aerial forms part of the circuit board itself.

The best guide for positioning is 'Line of Sight' - If you can clearly see the interface position from the intended users line of approach, this should be fine. There is often a compromise to be made in formal areas as the user will often ask that the interface be hidden above the ceiling. Again, the material of tiles, supports and light fittings will have an effect.
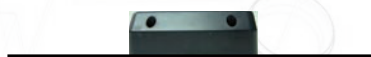
| Fig 1 | Fig 2 | Fig 3 |

Best results are obtained when the interface is directly facing the user - as shown in Fig 1.

In Fig 2, the interface is shown, as it would be when placed in a ceiling void. Users would therefore approach the interface 'edge on' until they were standing directly below the interface.

In Fig 3, the interface is 'side on' to the user as may be found when approaching a door along a corridor. Again the range will be reduced until they are standing in front of the door.

Both the above examples may be acceptable when used at internal doors but should be avoided externally where maximum range is normally a requirement.

Long range reader - 5 metres

The long range reader contains both an interface and a boosted P series transmitter. When used at a vehicle barrier, the 'line of approach' is predictable. The unit can therefore be located so that is pointing directly at the user / vehicle with a clear 5 metres of range.

Keycard operation - push button initiated

The same limitations apply to this feature as previously discussed for normal hands free operation. Again, only a clear line of sight with no surrounding reflective/absorbing/intervening objects will achieve the maximum range.

The extended range is often used in main entrance or car park areas. There will be additional factors to consider - for example, the approach is often bounded by chain link fencing, sometimes on both sides. The curve of the drive around buildings, containers, etc, also stops clear 'line of sight' (see diagram below)

By using more than one hands free interface (HFI) you can increase the range and coverage.
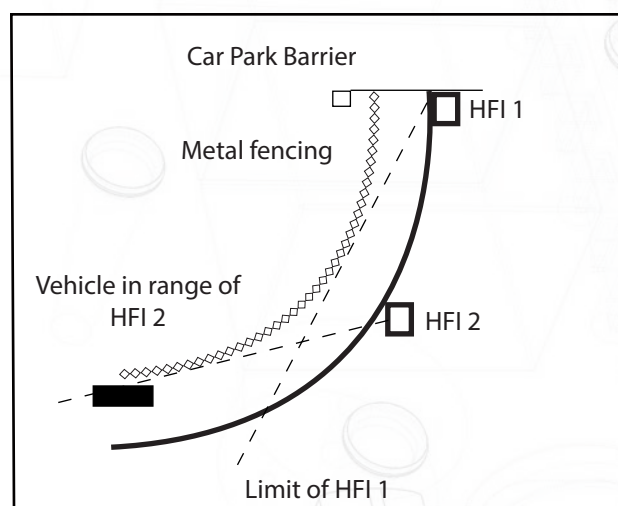
Connecting one ACU port to several interfaces wired in parallel allows them to be positioned along an approaching driveway. The total ACU reader port load should not exceed 500 mA.

(A single P series reader will need to be connected temporarily to each interface when a new keycard needs to be initialised - See keycard instructions Ins-30037 or Ins-30038)

The keycard selects just one interface to communicate with and therefore will only create one event per button press when used with Net2. There are two buttons on the card so two groups (In / Out) can be created to stop the wrong group responding.

Further detailed information can be found in the following documents:

AN1082 - Hands Free - How does it work? < http://paxton.info/815 >
Ins-30027 - Hands free interface. < http://paxton.info/550 >
Ins-30037 - Hands free keycard for Net2. < http://paxton.info/773 >
Ins-30038 - Hands free keycard for Switch2. < http://paxton.info/811 >
Ins-30060 - Long Range reader. < http://paxton.info/866 >