

## Application Note AN-SPX5

### Simplex Solution

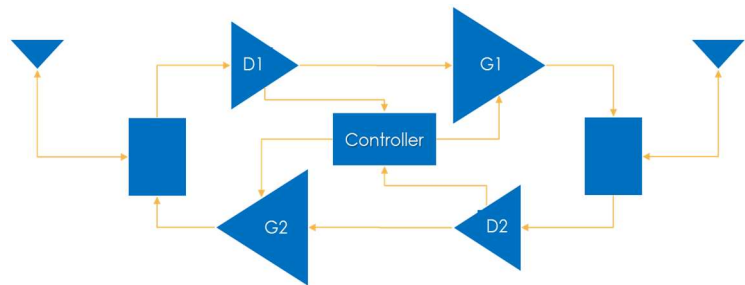
*Simplex channels are handled with ease with a Safe-Com Wireless switched BDA.*

In-building simplex radio coverage is always a challenge as it uses only one frequency – as opposed to the duplexed frequency pairs that make duplexed BDA coverage enhancement readily feasible. Simplex requires a more complex architecture to handle the common TX and RX frequency. Conventional BDA amplification is not possible in the simplex case as this will create a condition that would lead to oscillation. Safe-Com Wireless offers a clean solution that is compact and can be integrated with other duplexed channels in a multi-band system while assuring lowest cost installation with a single Service side DAS.

The block diagram shown below depicts the Safe-Com Wireless simplex architecture. The left side is the donor and is mounted outside the building. The right side is the service antenna that is comprised of a network of antennas, RF cable and splitters installed inside a building.

Both paths – uplink and downlink – are Class A amplifiers which pass only the simplex frequency. When deployed, only one of the paths is enabled at a time. When the downlink path is enabled, the controller guarantees that the uplink path is disabled by design. Meaning, for example, when path G1 is ON, path G2 is OFF. Both detectors D1 and D2 are on and always listening.

Both paths are initially squelched but monitoring any incoming traffic. When a first-responder keys up inside the building, D2 sees the signal and reports to the controller. The controller checks to see that the downlink path is not opened and passing signal. If its not then the downlink path is muted at multiple points to create



very high isolation, and the uplink path is opened for the signal to pass thru amplified. This happens in micro-seconds so it is transparent to the user. The isolation between paths is very high as it does not rely on a single switch but a multiple stages being muted. This methodology guarantees that only one path will be enabled at any one time and assures that the simplex BDA will never go into oscillation. When the in-building radio is keyed off, the BDA reverts back to its default mode: both paths are squelched and waiting for a signal from either direction. All simplex channels operate independently, and this technology can be combined with other conventional duplex channels and other multiple bands all in one BDA. Note that a single Service side DAS is utilized rather than split UL and DL's.

## Scenarios

The typical scenario is one where an indoor space does not receive simplex radio transmissions emanating from the outdoors. One example is a site commanders mobile radio on the firetruck transmitting from the street. If that radio cannot penetrate the deeper recesses of the building, the Safe-Com Wireless simplex solution would utilize an antenna on the outdoors near the location of the commanders mobile and a service antenna located in the indoor coverage area. The outdoor antenna can either be a dedicated simplex antenna receiving donor signal from the street (this would require a separate simplex port on the BDA) , or a donor antenna pointing to the distant donor tower in the cases that the simplex donor signal is derived from the a central dispatch location.

A second scenario is one where the simplex coverage is linked between two indoor locations. One example is a campus environment where the AHJ wants simplex key-ups in the basement of one building to be received in a second building. Then the two endpoints of the Safe-Com's Simplex BDA would be located in those two disparate areas – providing seamless simplex coverage between them.

These two scenarios are typical, but many variants exist. Call to discuss your application.

Conclusion: SAFE-Com 1000 Series has a unique simplex solution that works and has capability for your everyday and most demanding LMR and public safety applications. Call us at 855-SAFE-025 (723-3025) to solve your current RF challenges today.