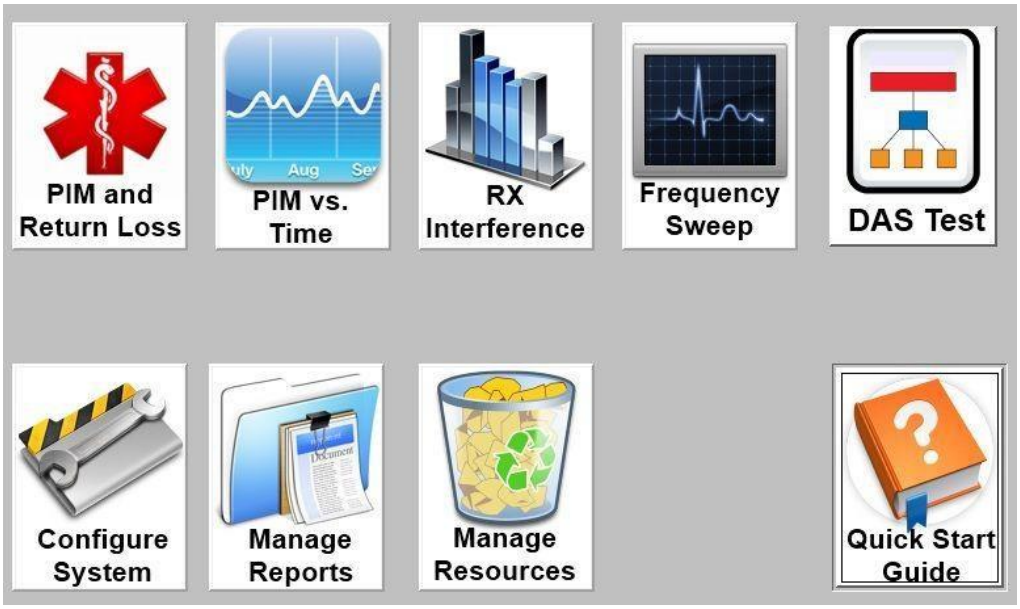
PIMPro: The Perfect Companion for In-Building (DAS) Installations

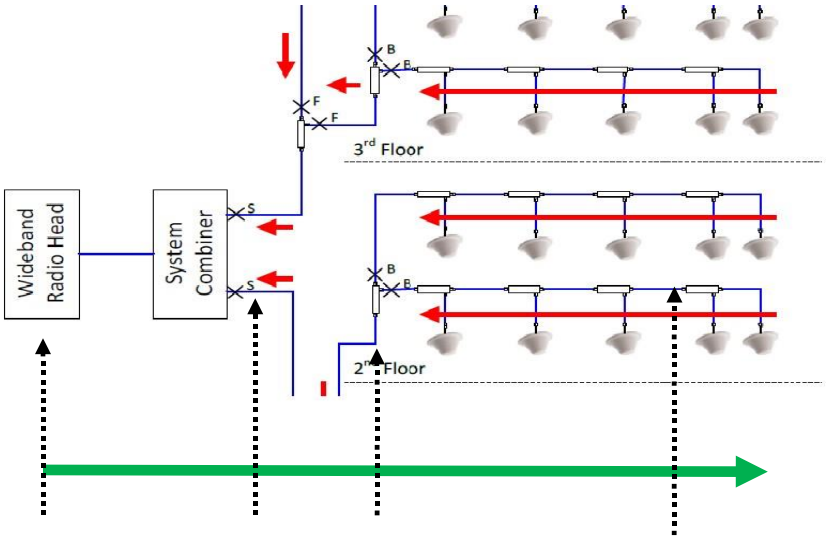
The next wave of PIM testing requirements demands a lateral view of PIM issues in DAS networks. Although the need for improved PIM performance is as important as it is in macro sites, new challenges arise from the antenna's environment, adding a new dimension of test understanding. Special attention on external interference signals is now imperative.

The PIM Pro is releasing additional special functionality to aid the measurement, diagnosis and analysis of PIM and interference in DAS installations. This includes the ability to use the PIM PRO unit as a Test Transmitter (single settable CW tone) for proving the DAS design, configuration and installation.



1) Installation Quality Assessment:

Whether in a Passive or Active DAS setup, installation workmanship of field cables, connectors, components and antennas is the key to superior PIM performance. Connector cleanliness and the use of silver plated N-connectors is strongly encouraged to achieve this goal. Although the head-end radios transmit 40 and 20 W signals, where DIN connector use is a must, N-type connectors are typically used at antennas located further away from the head-end, as the further tributaries operate at much lower power levels due to the attenuation caused by cable losses and signal splitting. These distant tributaries can sometimes have power as little as 20 dBm (100 mW).



2) Test Power levels:

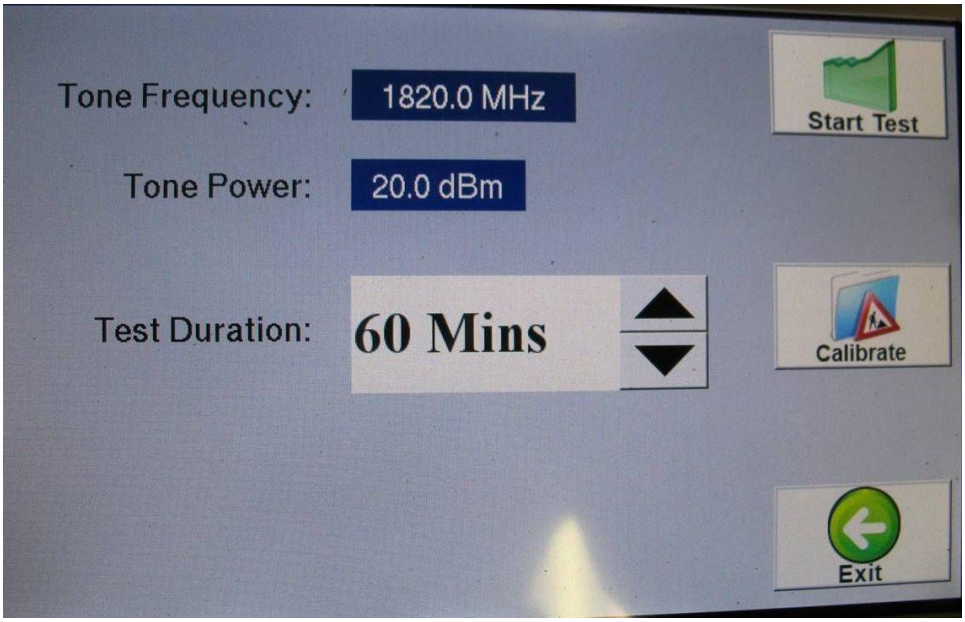
In order to isolate a test point, one must calculate a loss budget in order to test at the "real world" power level at the given test connection in the RF path.
CCI's PIMPro allows for power setting anywhere from 46 dBm to 20 dBm (40W to 100 mW) per signal tone. Down to 17 dBm (50 mW) for models 700 and 850.

3) Connected Path Loss

PIMPro allows for an accurate insertion loss assessment by injecting a (single tone) signal at the head-end and with the use of a field power meter or a spectrum analyzer a technician can connect directly at the antenna port and measure the insertion loss to that point. This aids the installation evaluation, verifying the design, and enabling accurate insertion loss information to be recorded for the different legs of the system.

4) Off-Air Path loss and propagation characteristics.

With the PIMPro still in a single tone DAS test mode and using test mobile, or an omni antenna on a battery operated Spectrum analyzer, one can perform a walk-around test near the DAS antenna to evaluate off-air signal propagation characteristics. Note that such tests are done at low power levels as there is no need for high power testing. The PIMPro single tone DAS feature allows the user to set power levels between 20 and 27 dBm, with test durations up to 4 hours.



5) External Interference issues

As in macro network sites, in-building DAS installations give a whole new meaning to the intrusion of external interferers in wireless networks. Although these interfering signals are construed as PIM energy creating similar undesired distortion in the network's uplink, they are in fact generated from metal objects near the antenna (metal reinforcement in concrete, heating ducts, air conditioning units, etc..) and detected by the antenna's ability to receive off air (300 Ω impedance). Such interferers desensitize a radio's receiver hence reducing coverage. It is thus important to try to install antennas and orient them in such a way as to minimize such interference.
For contractors, this is often the most difficult part of their installation, and can become a fine tuning exercise which requires time, patience, experience and a team effort.
The PIM PRO can be used as an interference measurement device, measuring the intefererence levels coming through the network on the Uplink. This is done in Rx only mode, all transmitters off.

Summary

For DAS installations PIMPro PIM analyzers have the following standard features:

- **Ability to generate single tone tests in the Radio's downlink to test path losses and off air performance characteristics.**
- **Simultaneously measure Real Time PIM and Return Loss**
- **Dynamic PIM testing**
- **External Signal Interference (done with PIMPro amplifiers in off mode)**