

IBEC BPL – How It Is Connected at Your Electric Cooperative

A number of people have asked for more detail on what the pieces of IBEC BPL equipment (BRUs & CAUs) are, where they are located on the power lines, and what they do, to make the Weekly Status Updates more informative. To assist, IBEC offers this brief description and a Diagram of how the BPL Network is connected at your Co-op. Please refer to the Diagram for more information.

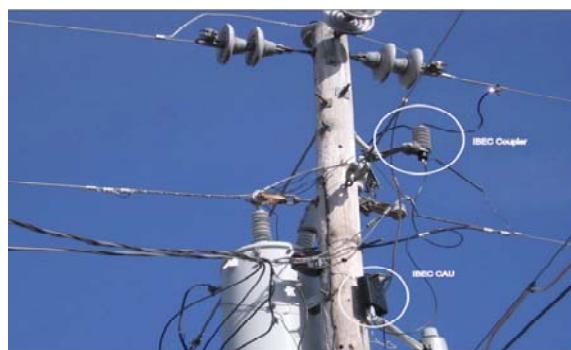
Perhaps the first question is, “What is a T-1 line, and why should I care?” T-1 (which is an old telephone system term for “Transmission Carrier Level 1”) lines are the high-speed telephone lines used to bring information from the broadband Internet to the BPL system. These lines, which have about 1.5 million bits per second of data-carrying capability, are provided by the telephone companies (in this case, Verizon) to the locations where the BPL system is to be connected to the power lines (Point 1 or 2 on the Diagram). This location is typically a power system substation, such as Martins Store, although the connections can be made at other locations along the power lines as needed.

Once the T-1 lines are terminated and tested at those locations by Verizon, IBEC connects those T-1 lines to its own routers and then, using optical fiber, connects those routers to its own BPL network equipment, thus eliminating any electrical path between the telephone network and the BPL network. IBEC’s BPL equipment then converts the light signal to a radio-frequency signal, safely couples that signal onto the power lines, and connects Co-op members to the broadband Internet via the BRUs and CAUs it deploys on the power lines. IBEC calls this coupling process “signal injection,” and the “injection points” referred to in the Weekly Updates are the spots where this coupling takes place. Examples of injection points are Afton 1, Afton 2, Woodsmill 1, and so on. From there, the broadband BPL signal travels down the power system circuit to Co-op members.

How do the BRUs and CAUs make this work? Referring to Point 2 on the Diagram, labeled Power Substation, the radio-frequency signal is injected via a BPL coupler onto the power line. The BPL coupler is a device that looks a lot like a lightning arrestor; in fact, it *is* a lightning arrestor with some additional capabilities that make it ideal for connecting the broadband radio-frequency signal onto and off of the Medium voltage (MV) power distribution lines that pass up and down the streets to our homes and businesses.



IBEC BPL Coupler



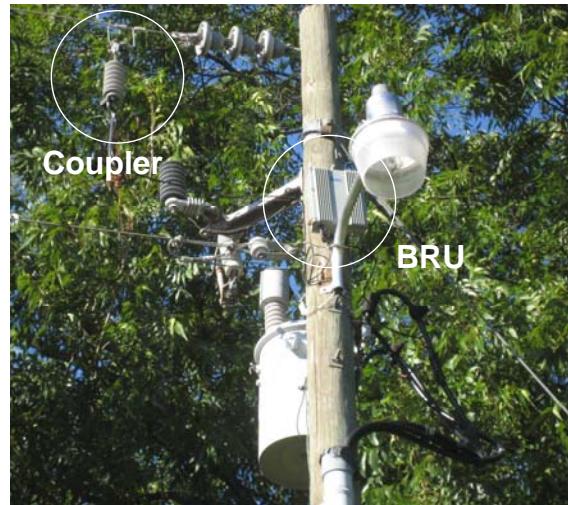
BPL Coupler Connecting Signal from the Power Line to a CAU

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As the BPL signal travels down the power line, it weakens and also picks up electronic noise from the power lines and utility equipment as well as noise from the atmosphere and nearby interference sources. To make sure the BPL signal remains strong, IBEC takes the signal off the power line about every half mile using a BPL coupler and uses a device called a BPL Regenerator Unit (BRU), to remove the noise and boost the signal back up to full strength, then recouples the signal through a BPL coupler back onto the power line. Through this process, the BPL signal remains strong and is able to travel many miles down the power lines between the Injection Point and your home. This is depicted as Point 3 on the Diagram. You may have noticed these BRUs (gray metal boxes) hanging on poles near the power lines about every half mile or so in your area.



BPL Regenerator Unit (BRU)



BRU Connected Via Coupler to the Power Line

Once the BPL signal reaches a point on the power line where a BPL customer is located, a BPL coupler is again used to take the BPL signal off the power line and connect that signal to a Customer Access Unit (CAU), a black box that is typically mounted on the power pole adjacent to the power transformer. This happens at Point 4 in the Diagram. The CAU serves as the intelligent connection device between a nearby BRU on the power line and the BPL Modem located inside your home or business. The CAU boosts the BPL signal and removes noise, then routes the BPL signal around your transformer, attaching to a bolt on the customer side of that transformer. From there, the BPL signal travels over the power wire running from the transformer to your power meter, which is usually mounted on the side of your home or office. The BPL signal then passes through your power meter and your circuit breaker or fuse box into the internal wiring of your home or office, making every power outlet in the building a broadband Internet port ready for connection to your personal computer.

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IBEC has found through experiment that some home power outlets work better than others, depending largely on the wiring inside your building, so sometimes repeaters are used to boost the signal inside, but this is not normally required. You simply plug your BPL modem into any power outlet in your house, connect it to your computer via the provided Ethernet cable, and your broadband Internet connection is made. This is shown as Point 5 of the Diagram, and it completes the connection between your computer and the broadband Internet. Some members will route their BPL signal to a wireless router instead of directly to a computer, so that multiple computers in their home can share the broadband Internet signal; others simply connect the BPL modem directly to their computer.

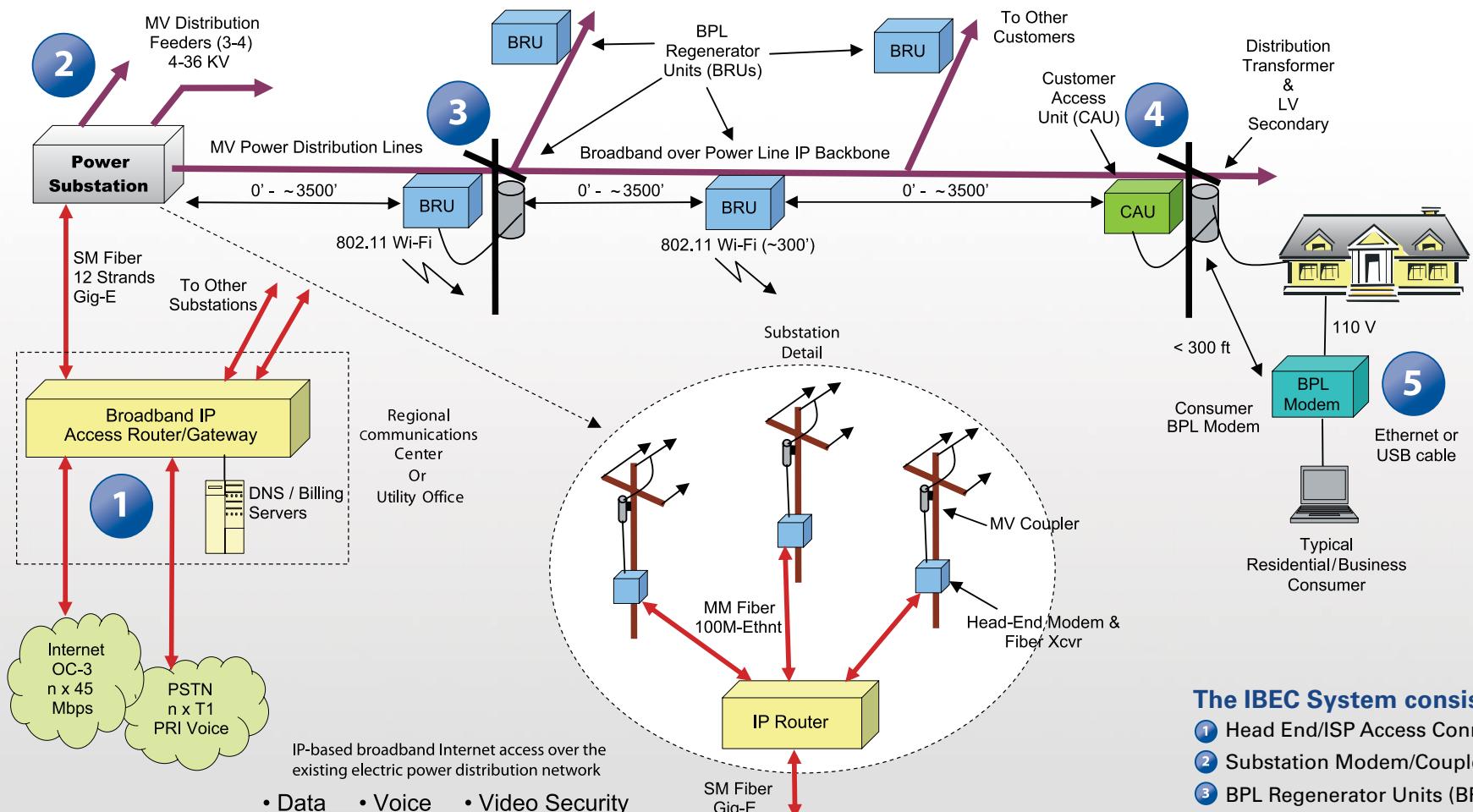


In summary, please remember that the first step in the BPL system network build-out is to have Verizon install the T-1 lines and IBEC (with their installation contractor, Davis H. Elliot) build out the BPL backbone network consisting of BRUs and some CAUs along the electric power grid. During this phase, IBEC crews check for system reliability, seek out and address noise problems, and stabilize the system at acceptable data rates. Once the BPL network is working properly, other CAUs are deployed along the network where pre-signed customers reside, and IBEC contacts those customers to begin the set-up process with their BPL modems, so their BPL service can begin. As this process continues, new customers sign up, and CAUs are installed (and BPL modems shipped to customers), so that service can be added for those new customers.

Hopefully this demystifies the IBEC BPL Network and equipment and clarifies how the BRUs and CAUs connect together on the power lines to create the high-speed BPL network that delivers broadband services to Co-op members.

IBEC continues to solicit your feedback. Our Customer Service Department is available to help you 24 hours a day at 1.888.IBEC-BPL (1.888.423.2275) or via email at service@ibec.net. You can also monitor progress and new IBEC developments online by visiting IBEC's web sites - www.ibec.net and www.bpl.coop. Thanks again for your continuing support, and please feel free to let us know how we can assist you.

IBEC Broadband over Power Line (BPL) Network Diagram



The IBEC System consists of:

- ① Head End/ISP Access Connection
 - ② Substation Modem/Couplers
 - ③ BPL Regenerator Units (BRU)
 - ④ Customer Access Units (CAU)
 - ⑤ BPL Modems