



Plan™
powerline network technology

Ref. : 260-01-23-04

260-01-23-04



General

In general, power lines incorporate bad environmental conditions for any communication target features such as unstable impedance, kinds of impulse and white noise can almost eliminate any communication effort.

Despite all these, the considerable economic advantage in reducing installation costs has pushed companies forward in looking for solution, like Power Line Carrier (P.L.C) technology, to overcome these difficulties.

Online communication with the meters is the key for the new standards of Smart Grid performance.

The **Spot™** implements an advance two-way powerline (PLC) platform, in combination with a Spread Spectrum Direct Sequence (SS) modulation, and an intelligent dynamic mesh network for data routing peer- to- peer NTR end nodes.

This technology ensures that each transmission reaches any other node in the network through a multitude of paths. This method overcomes dead spots, reaches all the floors within buildings, and connects thousands of nodes per network.

The powerline network is automatically self-configured without any manual intervention, and features natural self-adapting behavior to ensure links stability in the grid environment for best communication coverage.

The poweline link conform to FCC, ARIB and CENELEC standard bands with a robust baud rate of 2.5-10Kbps.

In the case of water or gas meters where power infrastructure is limited, the **Zimra™** system is applicable, based on a wireless ZigBee mesh network platform in the 2.4GHz band.

Specification and performance

Physical layer (PHY)

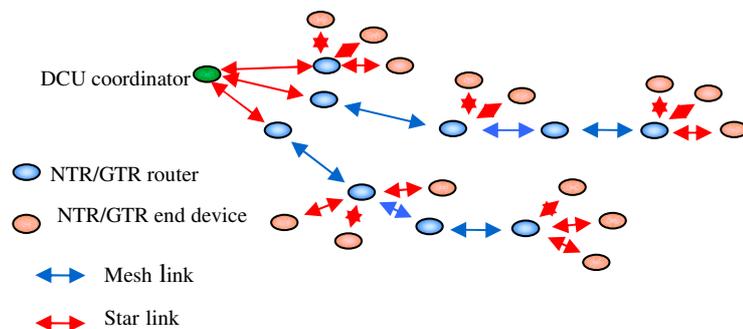
- DCSK (Differential Code Shift Keying) modulation provides extremely high communication reliability
- High immunity to signal fading, various noise characteristics, impedance modulation and phase/frequency distortion
- High in-phase and cross-phase reliability
- Forward short-block soft decoding error correction mechanism and CRC-16
- Complies with worldwide regulation requirements (FCC, ARIB, EN50065-1-CENELEC)
- Multiple transport modes:
 - FCC and ARIB bands maximum bit rate: 1.25Kbps - 7.5Kbps
 - CENELEC bands maximum bit rate: 1.25Kbps - 2.5 Kbps

Data link layer (DLL)

- Up to 1023 nodes/network (A node may function as a multichannel interface)
- Acknowledged (ACK) and Unacknowledged (UnAck) data transmission services
- Re-transmission mechanism
- CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)
- Adaptive back-off algorithm based on IEEE802.11 and optimized for the power line medium

Network layer

- Up to 1023 nodes per network
- Dynamic range > 95 dB.
- Power transmission up to 125dBi into load of 1Ω
- Each NTR end node acts as intelligent repeater
- No limitation on number of hops
- Distance range between nodes 100 - 400 m
- Plug and play network configuration with fast search scenario
- Remote PLC analyzer with link map status
- Log file for unstable nodes.
- On line search scenario for direct access mode.
- An optional chipset solution supporting the three layers with a simple serial host interfaces for ant transparent protocol application.



Mesh network topology

Overall network performance

Communication performance can be evaluated for large installation quantities over 30,000 meters as shown on the next table, while for low sites tests less 6 nodes, performance results may act as in column no' 2

Table-1 – Powerline communication performance

Seq. no'	Function	response time	1.Availability for 90% of node sites	2. Availability for 10% of node sites
1.	Network configuration parameters upload.	Up to 6 hours	100%	80%
2.	Data reading of all meters	Up to 2 hours * note 2	100%	80%
3.	On line data reading, parameter upload and control for a specific meter.	Up to 3 Min. * note 2 at day time (6 ⁰⁰ -18 ⁰⁰)	100%	60%
		Up to 5 Min. * note 2 at any time of day/night	100%	70%

Notes:

1. All performance is applied for a feeder transformer which is recognize as a node network with:
 - a. Minimum of 15% NTR devices of total meter quantities of a feeder transformer or no less of 15 units which ever is greater
 - b. Maximum of 1023 NTR devices per feeder
2. Sequence performance 2, 3 is achieved after 72 hours of network stability from the configuration upload.