



Digital Power Line Carrier

DPLC10



DPLC10 uses the high-voltage line between transformer substations as a communication path for the telephony and tele-control. This technology, which has been tried and tested over decades and adapted to the latest standards, has two main application areas: as a communications link between substations where a fiber-optic connection does not exist or would not be economically viable, and as a backup system for transmitting protection signals parallel to an installed fiber-optic link.

Overview

- SSB and Quadrature Amplitude Modulation (QAM). User programmable on site
- Extended carrier frequency range up to 1000 kHz, duplicating the useful frequency band
- Integrated versatile multiplexer for voice and data
- G.723 & AMBE voice compression solution that provides exceptional voice quality at rates as low as 6.3/5.3 or 2.4 kbps.
- Integrate a 24x24 voice switch matrix without blocking.
- VF telephone user interfaces: 4-wire EM, FXS and FXO.
- Narrowband data transmission: The narrowband modems (M9603) support the transmission of unformatted (asynchronous or synchronous transparent) data with speeds up to 1200 bps.
- Operation under low signal to noise ratio: supporting 1 voice channel (2.4K bps) plus 3 data channel (600 bps) when the signal to noise power ratio is down to 15 dB

Feature Points

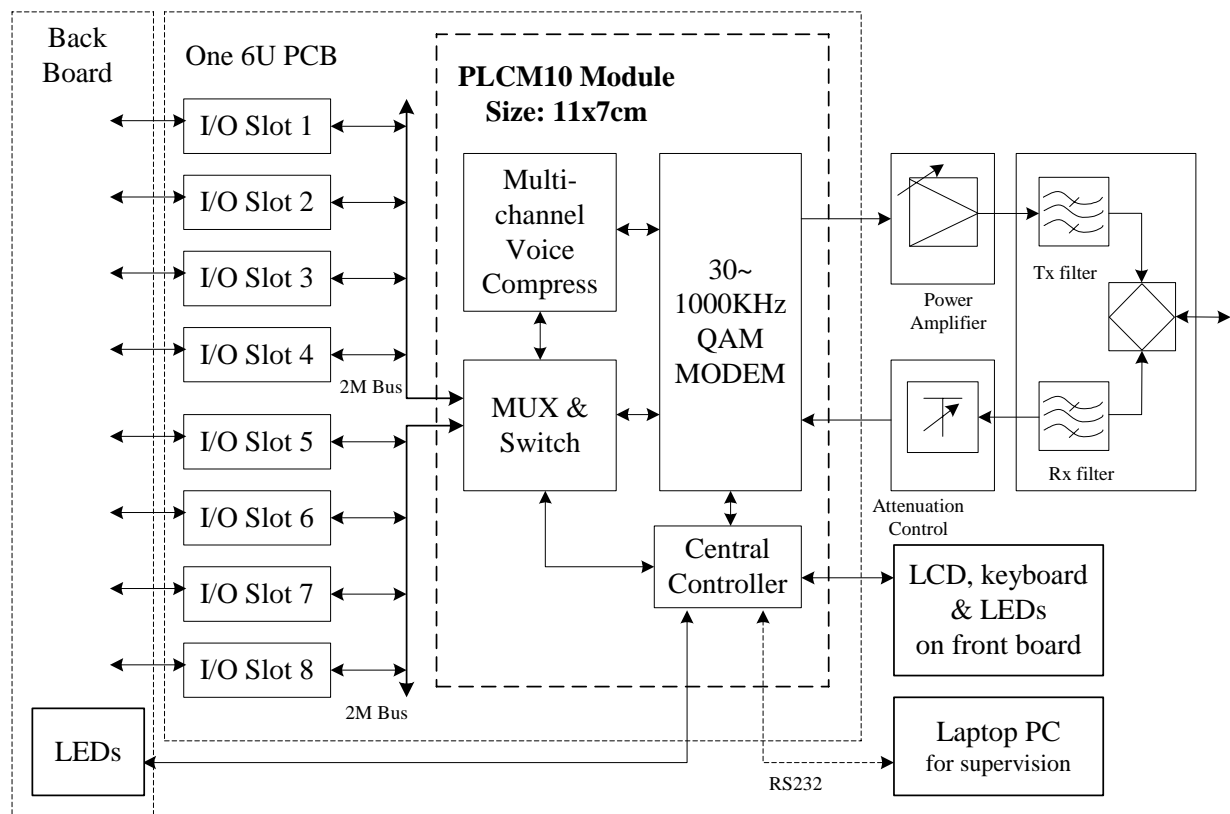
The conflict between transmission capacity and security

A basic distinction is made between analog (aPLC) and digital (dPLC) systems. Newer digital systems allow more efficient use of the frequency band, however, traditional analog PLC systems offer more advantages than the most of dPLC in cases where transmission conditions are worse (low signal / noise ratio, for example). Since PLC service for power supply utilities, it is emphasis to keep transmission security for some important data in cases where transmission conditions are worse. In

order to reduce the conflict between transmission capacity and security, Real-time Dynamic speed adaptation (DSA) is used by DPLC10, which allows to real-time adjusting the data rate according to the transmission requesting, at same time, no data transmission interruption or data error happens during adjusting.

The structure for high integration, flexibility, and anti- interference.

DPLC10 integrates all functions except interface on a central module, PLCM10, which size is only 7x11cm. Therefore, the structure of DPLC10 is much more simple and reliable than the traditional PLCs. The connections between PLCM10 and outer interface slots are two serial buses only. Each slot is in common use for all types of VF and data interfaces (all interface modules are same size), which offers a high degree of flexibility for user's requirement. In addition, PLCM10 software can be upgraded by supervision system, the new interface will be easily expanded in the future. These features protect the investments that users have made.



Each I/O slot is in common use for the following interface modules.

- 4EM: Voice Frequency 4 wire/EM. 1 channel per slot
- FXS: Voice Frequency FXS interface. 2 channels per slot
- FXO: Voice Frequency FXO interface. 2 channel per slot
- FSK /RS232: Narrow band FSK modem or RS232 interface. 1 channel per slot
- Alarm: System alarm module. 1 channel.

DPLC10 incorporates extra measures to provide high availability and protection against electromagnetic interference and damage due to over voltage stress. All of VF and data interfaces are electrically isolated, hence providing additional protection against over-voltages, ground potential rise and ground loops beyond standard requirements in the harsh substation environment.

Easy to operate – the DPLC10 management system

DPLC10 supports two Human Machine Interfaces for supervision and equipment settings. One is a LCD and a small key board on the front panel. Another is graphical user interface (GUI) based on Microsoft PC. .

The DPLC10 module features a very user-friendly Human Machine Interface software utility. It provides the following extended facilities and characteristics:

- Collection of operational status information from the statuses of all terminals in a network.
- Setting of the operating frequencies and transmission bandwidth of the link. Setting of the modulation type and mode of operation.
- Setting of the included switch & user ports for voice.
- Setting of data communication and narrow band Modem with respect to levels, data speed and transmission protocols.
- Generation of signals for tuning and testing of the transmit and receive filters

In addition, the PLCM10 module software could be upgraded through supervision port for feature upgrade in the future.

DPLC10 features built-in test functions for automatic link equalization with both graphical and numeric presentation, which in most instances eliminate the need of costly external test equipment such as spectrum analyzer.

Technical data

System

HF transmission	
Modulation	QAM modulation with single-sideband transmission, single stage frequency conversion
HF frequency range	40 – 1000 kHz
HF bandwidth	4kHz
Dynamic adjustment to changes in the line conditions	
Output power	40-W amplifier: max. + 46 dBm PEP Software adjustable 10 – 40 W 80-W amplifier: max. + 49 dBm PEP Software adjustable 20 – 80 W
Output impedance	75 ohms unbalanced
Spurious emission	≥ 60 dB/ ≥ 70 dB @ 1BN /2BN from the transmit frequency band
Receiver sensitivity	- 40 dBm (minimum receive level can differ according to the operating mode)
Receiver selectivity	≥ 65 dB/ ≥ 75 dB @1BN /2BN from the frequency band limits
Automatic gain control	50 dB dynamic range (AGC range can vary according to mode)
Automatic frequency control AFC	VF frequency variation between transmitter and receiver ≈ 0 Hz
Alarm output	

Number of alarm outputs	6
Contact type	Relay changeover contacts
Switching voltage	max. 220 V DC
Switched current	max. 2 A DC
Maintenance interfaces	
Element Manager	RS232 115.2 kbps
Ambient conditions	
Operation	0 °C to + 55 °C
Storage and transport	– 40 °C to + 70 °C
Relative humidity	5 to 95 %
Power supply	Input voltage 48 V DC Power consumption: max. 25 W(Not include PowerAmp.)

Voice interface

Voice compression channels	
Number of channels	up to 5
Voice compression rate	2.4kbps as per AMBE 5.3 kbps as per G.723.1 6.3 kbps as per G.723.1

Voice switch between PLC VF channels & phone interface	
switching matrix	24x24 without blocking or concentration.
Signaling	DTMF
Line echo canceller	Selectable

VF telephone interface, 4-wire, EM module	
Number of channels	up to 8 (1 channel per module)
Impedance input / output	600 ohms balanced
Input level	– 17 dBm to + 1 dBm
Output level	– 7 dBm to + 14 dBm
“M” wire in	Optocoupler (24 V DC < V _{in} < 72 V DC, I _{max} = 20 mA)
“E” wire out	Optocoupler (48V/max. 50 mA)

VF telephone interface FXS (2-wire)	
Number of channels	up to 16 (2 channels per module)
Impedance	600 ohms
Feeding current	48 V / max. 40 mA
Loop resistance	≤ 1500 ohms
Ringing current	90 V _{pp} / 20, 25, 50, 60 Hz selectable
Input level	– 17 dBm to + 4 dBm
Output level	– 17 dBm to + 1 dBm

VF telephone interface FXO (2-wire)	
Number of channels	up to 16 (2 channels per module)

Impedance	600 ohms
Ringing detection	20~130Vrms, 17~60 Hz
Loop resistance	< 560 ohms
Loop current max	70 mA
Input level	- 17 dBm to 3 dBm
Output level	- 17 dBm to 0 dB

Data interface

Narrowband data module	
Number of Modems	up to 8 (1 channel per module)
Nominal data rate	50, 100, 300, 600, 1200bps(asynchronous or synchronous transparent)
Port type	VF FSK (Frequency Shift Keying)Modem or RS232
Center frequencies	400~3600Hz user-programmable in steps of 1 Hz