PLCC SYSTEM

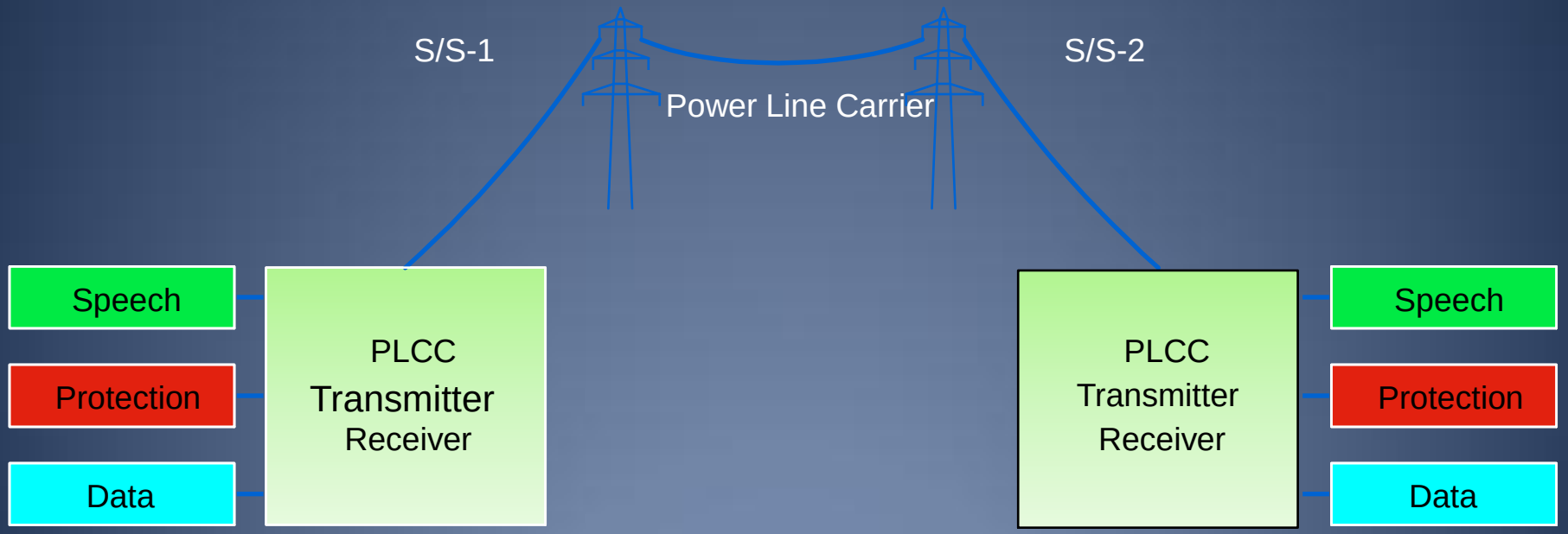
PLCC –Power Line Carrier Communication

- POWER LINE CARRIER COMMUNICATION (PLCC) is the technology which is used to communicate between electric EHV substations through existing electrical conductors.

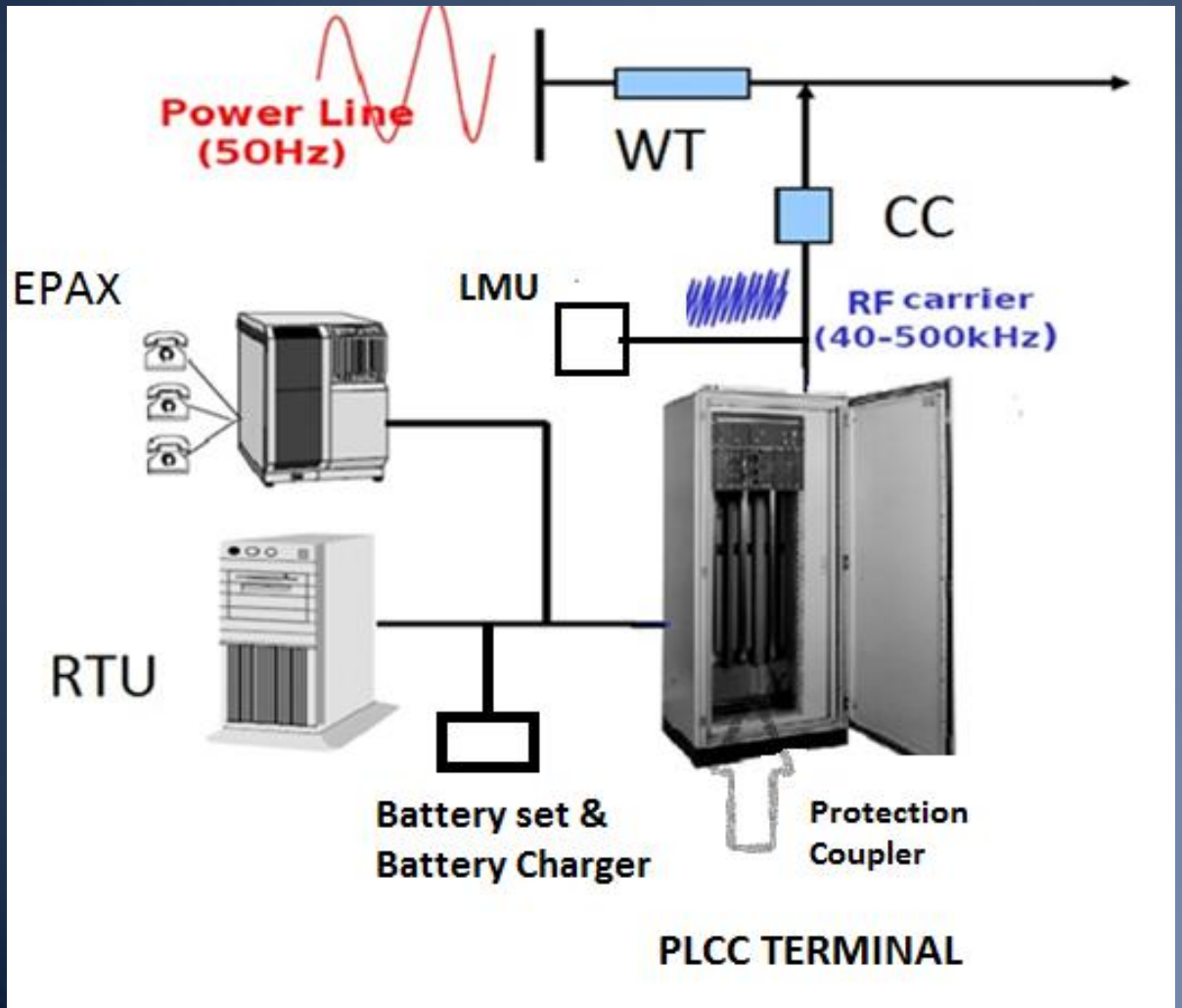
- PLCC is used for tele-communication, tele-monitoring and tele-protection between electric substations through high voltage power lines. This is economic and reliable for inter grid message transfer as well as low bit rate RTU signals

- The voice/data are mixed with radio frequency carrier (50-500kHz), amplified to a level of 10-80W RF power and injected in to high voltage power line using a suitable coupling capacitor. The power line as a rigid long conductor parallel to ground, guides the carrier waves to travel along the transmission line. Point to point communication takes place between two transceivers at both ends.

Power Line Carrier Comm.



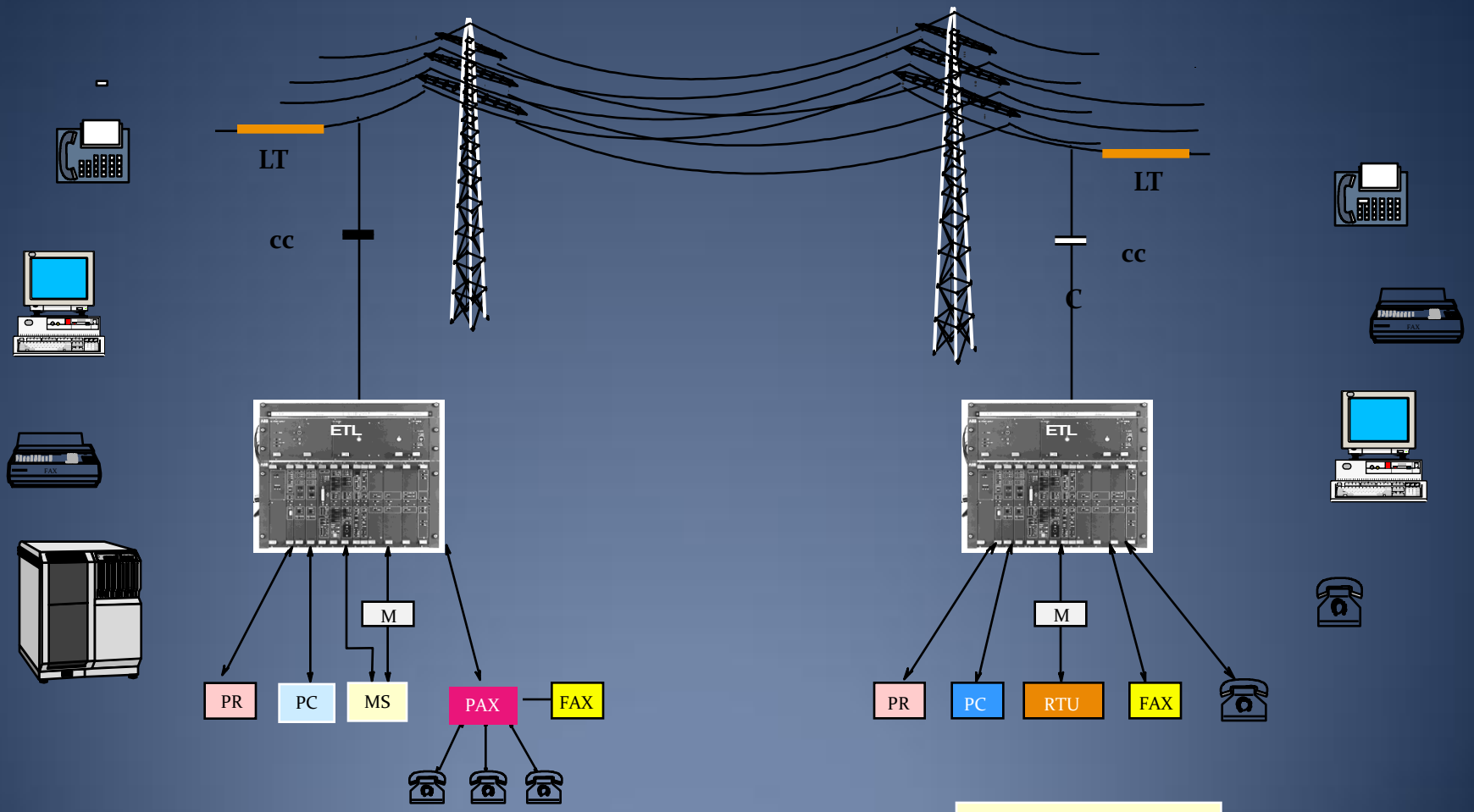
PLCC System



EQUIPMENTS USED

- PLCC Terminal
- Line Matching Unit (LMU)
- CVT/CC
- Battery set
- Battery Charger
- Wave Trap
- Electronic Private Auto Exchange (EPAX)
- Remote Terminal Unit (RTU)

Typical PLCC Installation



PLCC COMPONENTS

Coupling Capacitor (C.C) = Couples high frequency carrier with Power Line (4000 to10000pF) Coupling capacitor connects the carrier equipment to the transmission line. The high capacitance offers low impedance to carrier frequency ($1/\omega C$) but high impedance to power frequency (50 Hz).

Wave Trap / Line Trap (W.T) = Do not allow the transmitted HF carrier to enter inside the sub-station. (L = 0.5 to 2mH). The Wave trap offers high impedance (ωL) to HF carrier frequency and low impedance to Power frequency (50 Hz)

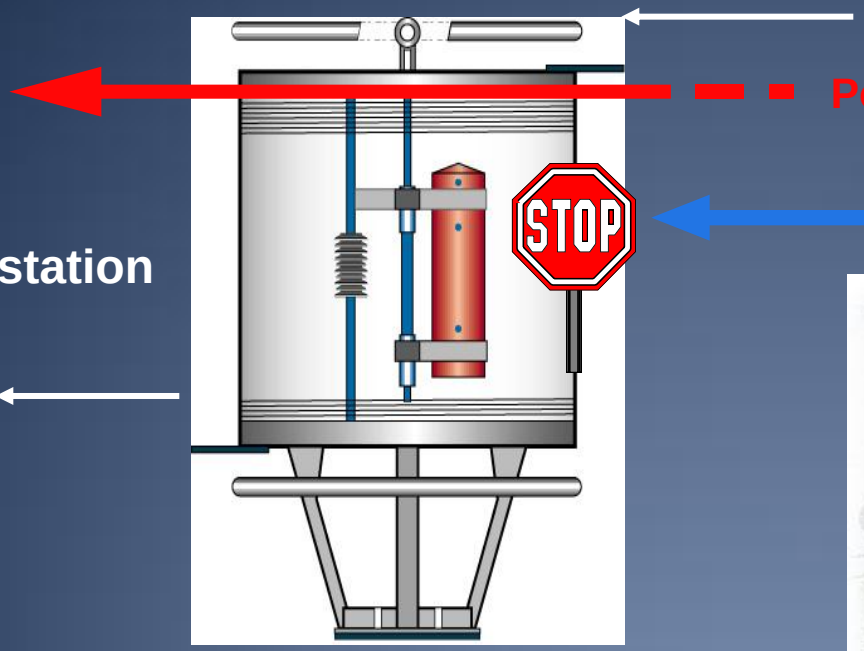
LMU = Line Matching Unit = For impedance matching between line and coaxial cable, includes high voltage protection devices like drainage coil(20mH), lightening arrestor(500V) and an earth switch.

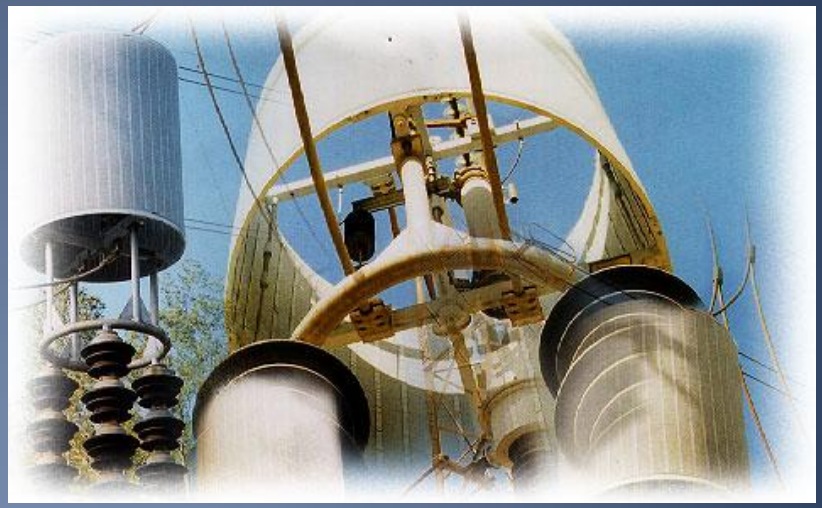
PLCC Terminal = Translates Voice and data into High Frequency Carrier.

Output Power =10 to 80W

Line/Wave Trap function:

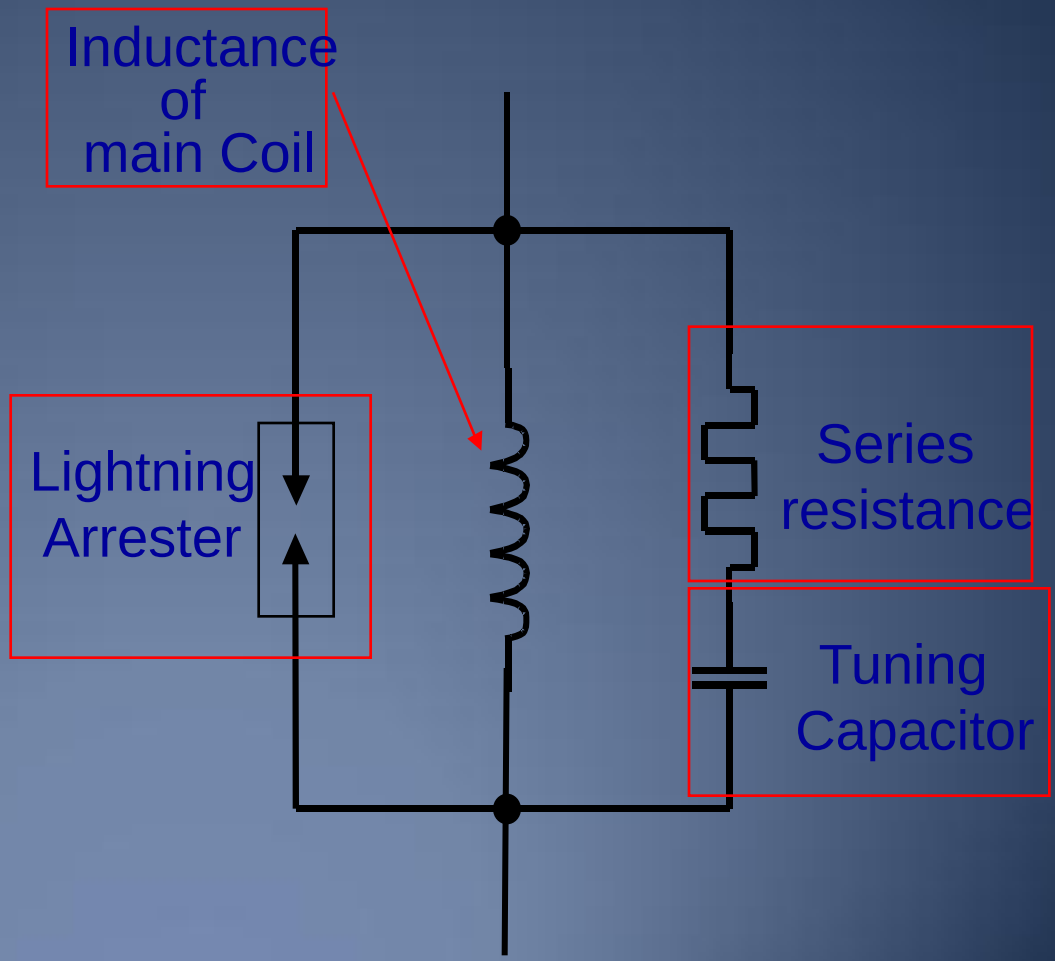
PLC C signal Blocking





Line Trap = High Impedance for PLC signal
Low Impedance for Power energy

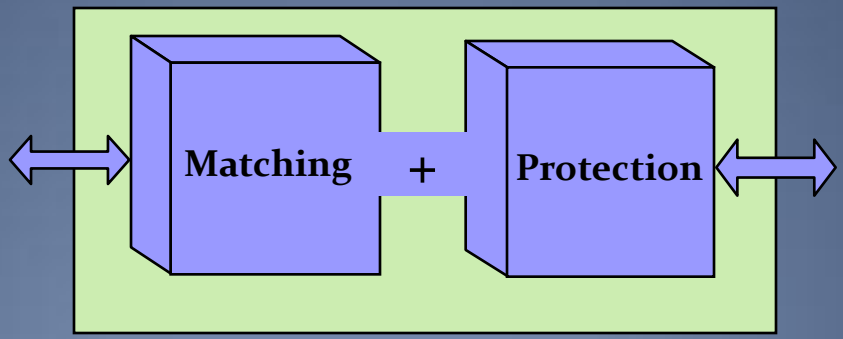
Line Trap is a parallel LC circuit



LMU function

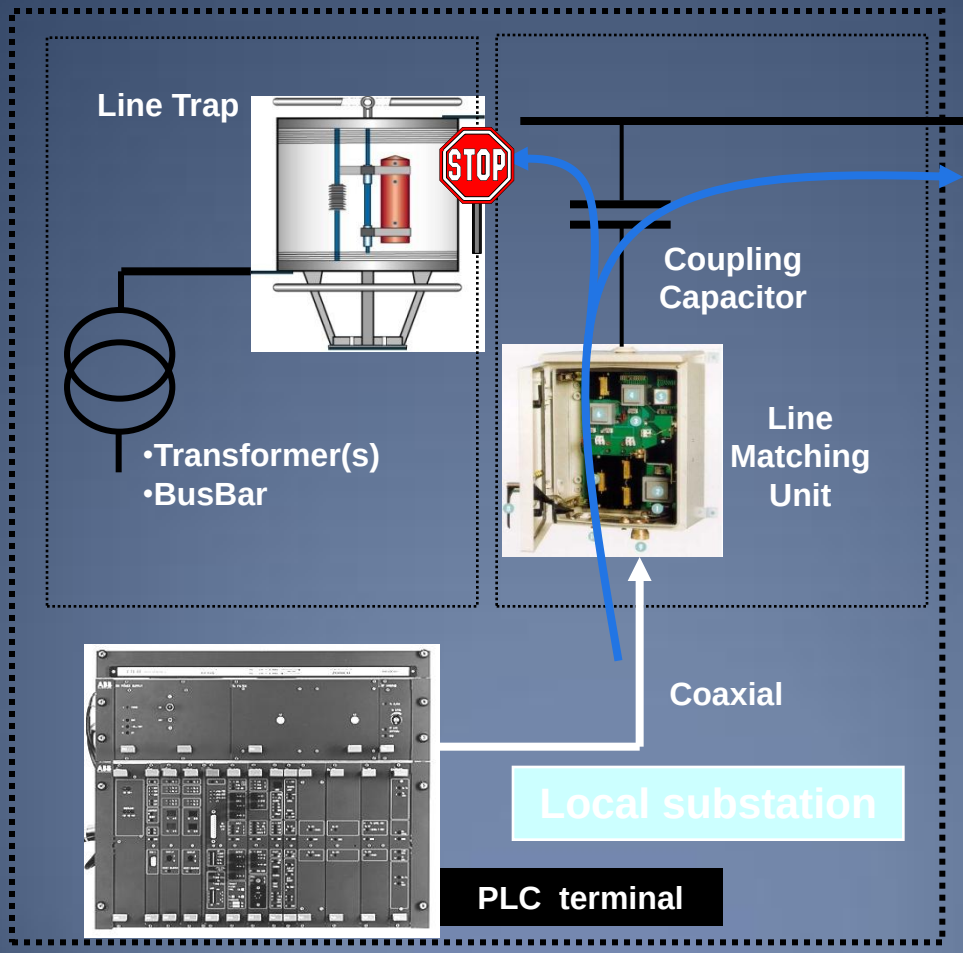
LMU = impedance matching Transformer **+** high voltage Protection

- To prevent dangerous potential on the PLCC connection
- To match PLCC set & transmission Line



LMU

Coupling Scheme

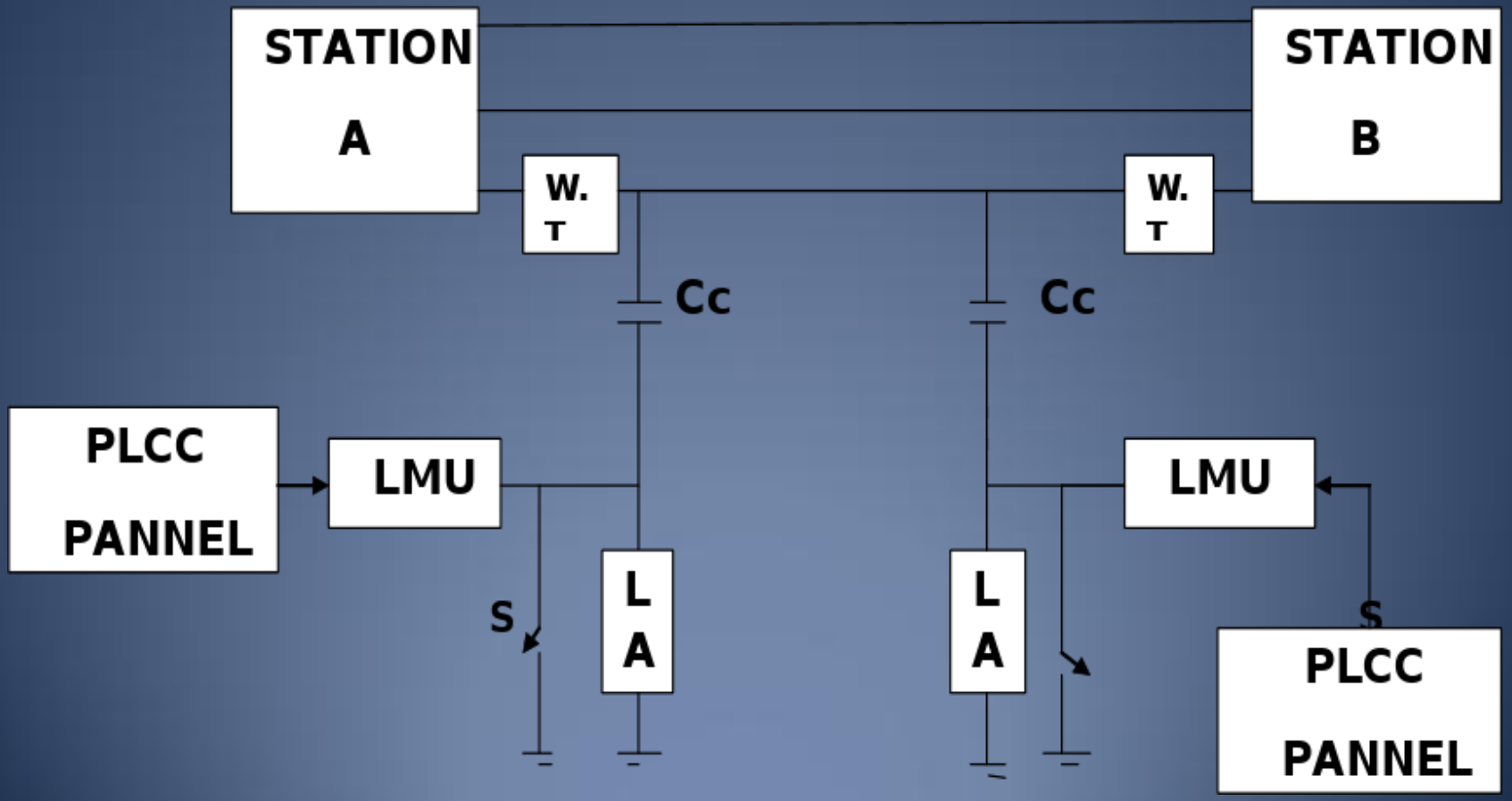


The PLC signal is routed to H.V Line

The PLC signal is not absorbed by the substation

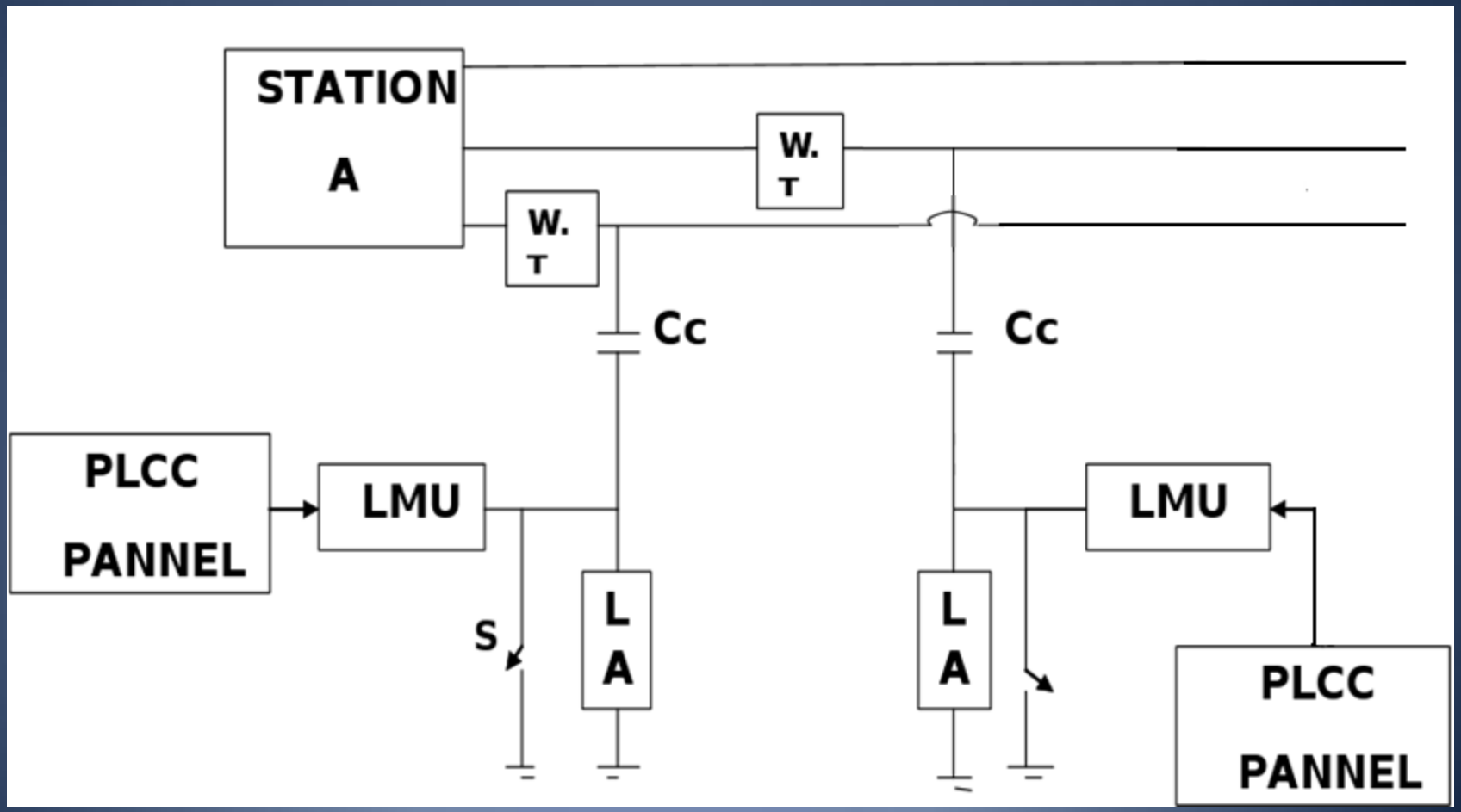
Types of Coupling

(A) Phase to Ground coupling :-

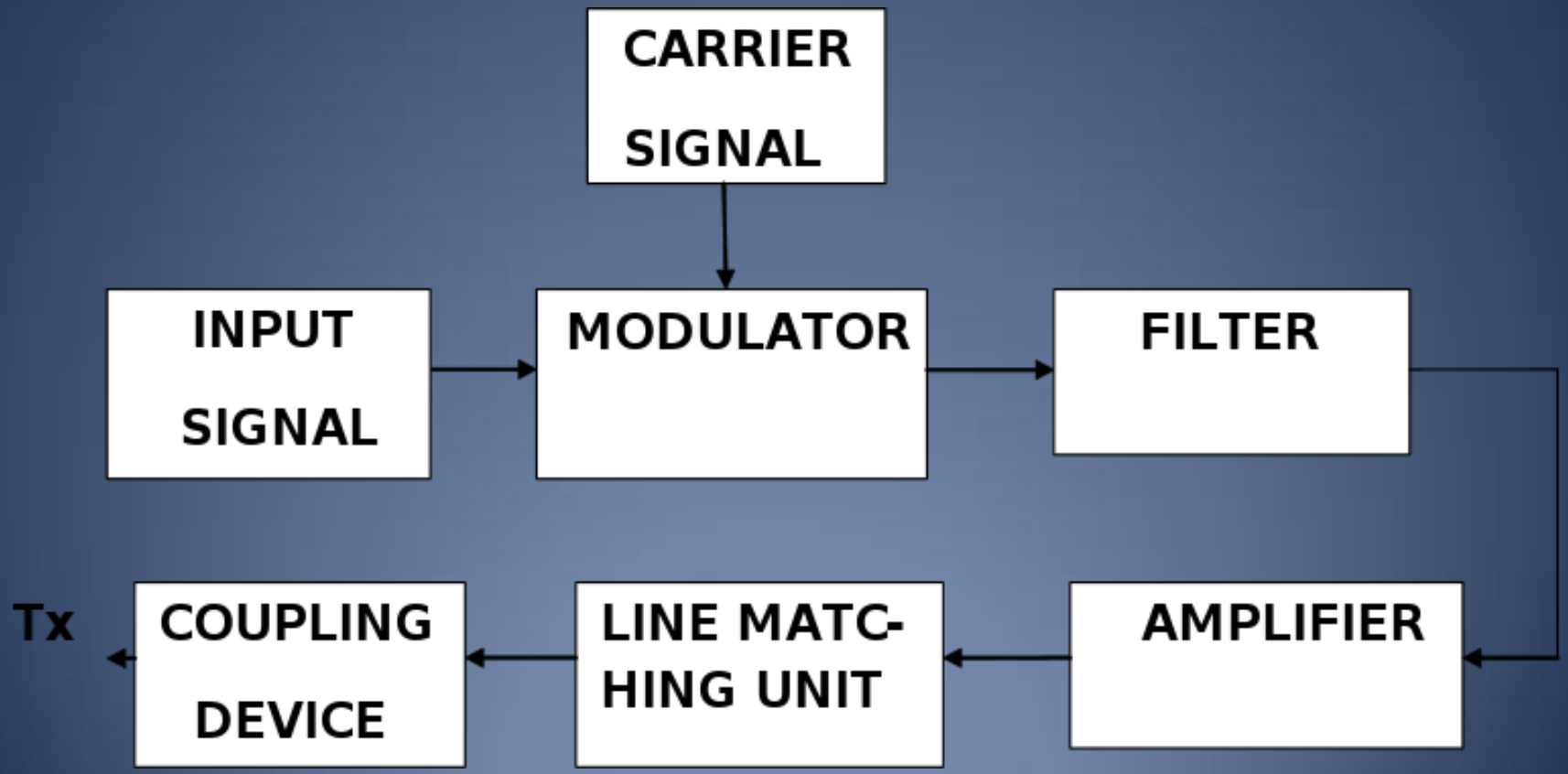


Types of Coupling

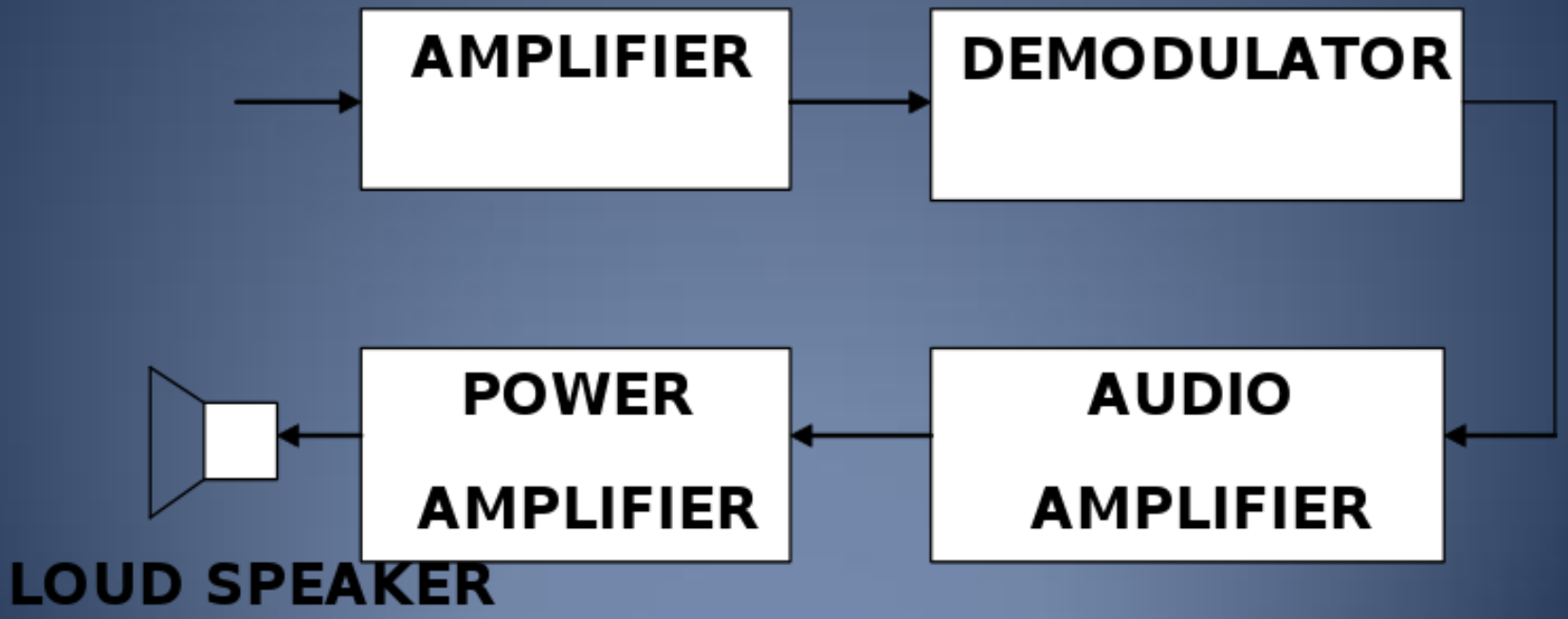
(B) Phase to Phase coupling :-



PLCC Panel Tx Block



PLCC Panel Rx Block



Batteries

- PLCC work on rectified AC or mains supply, when supply goes off, we make use of a device for proper functioning of PLCC called battery charger.
- This is the device that provide supply to the PLCC equipment for uninterrupted working.
- It provide DC to the panel by battery.

PLCC – It's Need in Power system

- Tele-protection of lines
- Helps in Load dispatching operations
- SCADA (Supervisory Control & Data Acquisition System) functions to LD Centre for effective Grid Management
- Works as backbone for reliable and dedicated Tele-communication link even during breakdown/shutdown operations of lines (EHT/HT)
- Reliable communication for exchange of instructions/information

ADVANTAGES OF POWER LINE CARRIER COMMUNICATION SYSTEM

- RELIABLE & TIME TESTED TANSCEIVERS
- COMPACT
- COST EFFECTIVE
- NO RECURRING COST
- HIGH MECHANICAL STRENGTH OF MEDIUM - POWER CONDUCTOR
- ENTIRELY WITHIN POWER UTILITY's CONTROL (FULLY DEDICATED)
- IMMUNITY FROM ATMOSPHERIC CHANGES

DISADVANTAGES OF POWER LINE CARRIER COMMUNICATION SYSTEM

Proper care has to be taken to guard carrier equipment and persons using them against high voltages and currents on the lines.

Noise introduced by power lines is far more than in case of telephone lines. This is due to the noise generated by discharge across insulators, switching processes.