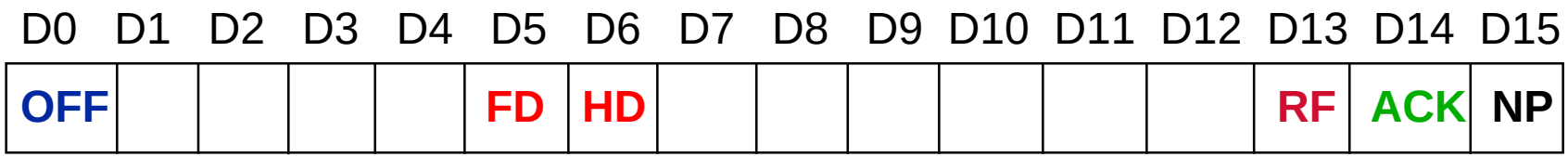
Test/Maintenance/Offline Mode Proposal

The inclusion of a Test/Maintenance/Offline mode has been suggested for Gigabit Ethernet. This proposal defines support for this mode via the existing Link_Startup protocol and a new Config_Register bit.

- **The proposed mode is called Offline.**
- **The Offline protocol proposed here provides the following functions:**
  - Allows the implementation of a Test or Diagnostic mode;
  - Allows the port at one end of a link to provide notification to the attached port to avoid recognizing link errors or link failure;
  - Allows a port to be gracefully powered off by providing a recognizable indication prior to exhibiting loss of signal;
  - Allows a port to be removed from the active configuration;
  - Provides indication of internal PHY failure or Remote Fault.

Config_Register



Config_Register bit usage:

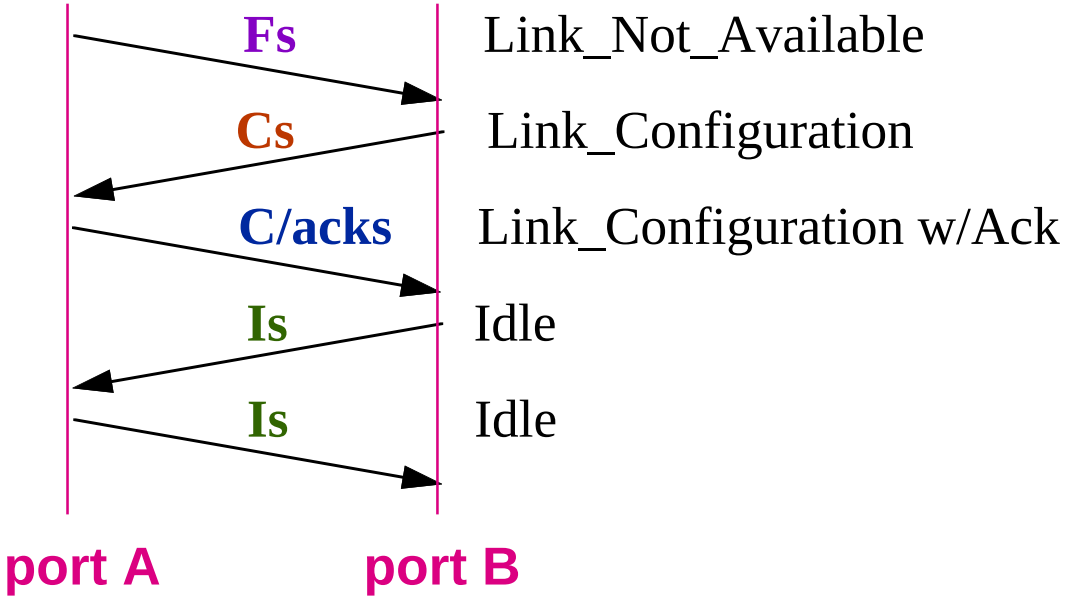
- D0/OFF: Offline mode
- D5/FD: Full duplex capable
- D6/HD: Half duplex capable
- D13/RF: Remote Fault
- D14/ACK: Acknowledge
- D15/NP: Next Page (Escape)

- The Offline_mode bit has the highest priority of all Config_Register bits.
  - If Offline_mode is specified, all other Config_Reg bits, with the exception of Remote Fault, are ignored.

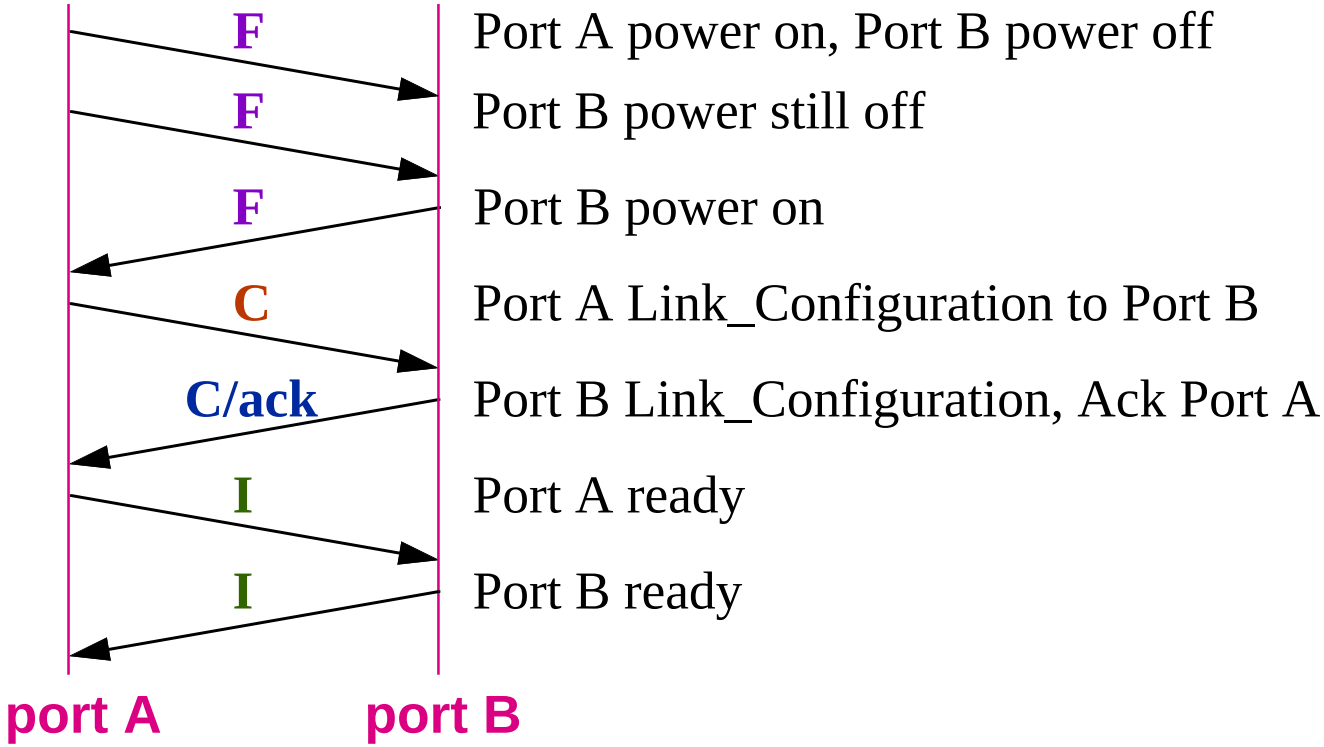
Offline Signaling

- Offline is signaled to indicate any of the following conditions:
  - The transmitting port is powering off;
  - The transmitting port is indicating an error condition;
  - The transmitting port is entering the Offline state.
    - A port enters the Offline state in order to perform diagnostics or simply remain inactive.
    - To exit the Offline state, a port performs the Link Startup protocol.
- A port transmits the Offline indication for a specified (related to maximum link length) minimum period of time before further actions are taken.
  - Offline is indicated by initiating the Link_Startup protocol with the Offline mode bit set in the Config_Reg.
  - To exit the Offline state, a port performs the Link_Startup protocol.

Link_Startup Procedure



Power-On Procedure
One port powers on first



Port A power on, Port B power off

Port B power still off

Port B power on

Port A Link_Configuration to Port B

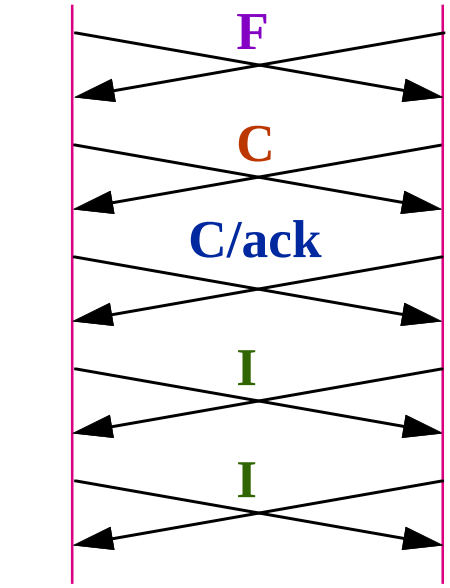
Port B Link_Configuration, Ack Port A

Port A ready

Port B ready

Power-On Procedure

Both ports power on simultaneously



Port A power on, Port B power on

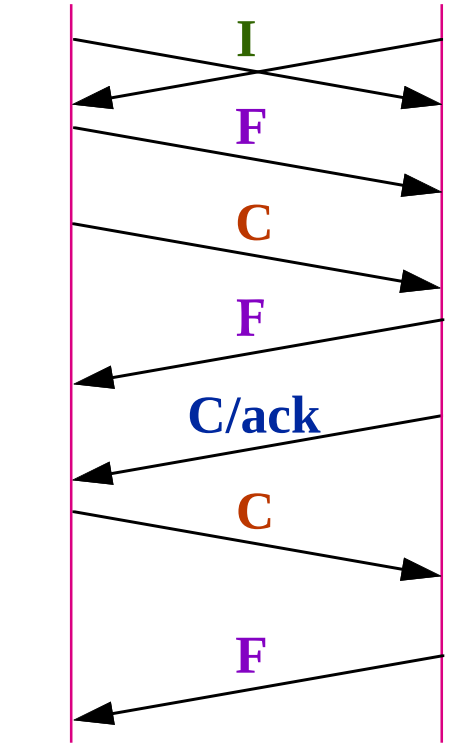
Ports exchange Link_Configuration data

Ports exchange Link_Configuration Acks

Ports ready

Port B ready

Power-Off Procedure
One port powers off



Ports active

Port A starts Power_Off procedure

Port A Link_Configuration w/Offline

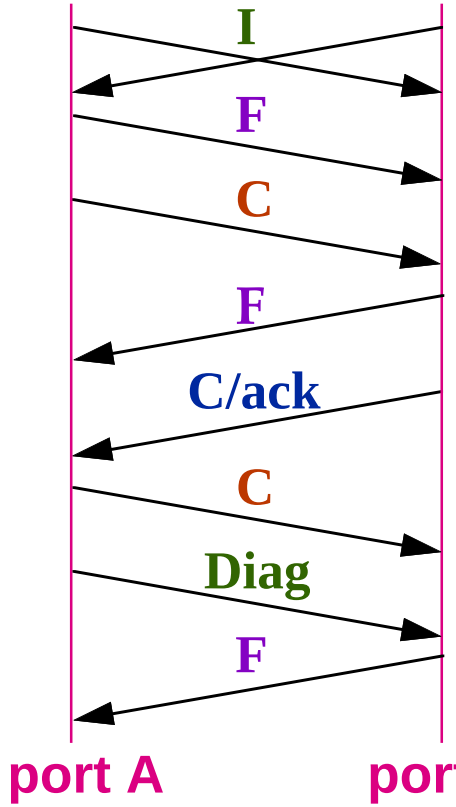
Port B recognizes Port A Link_Startup

Port B LCAck of Port A offline

Port A signals Offline for a minimum time

Port A powered off;
Port B awaits Link_Startup from Port A

Diagnostic Procedure
One port runs diagnostics



Ports active

Port A starts Power_Off procedure

Port A Link_Configuration w/Offline

Port B recognizes Port A Link_Startup

Port B LCAck of Port A offline

Port A signals Offline for a minimum time

Port A signals Offline for a minimum time

Port A starts diagnostics;
Port B awaits Link_Startup from Port A

Diagnostics

- Gigabit Ethernet PMA and PMD levels do not detect transmit code violations, invalid ordered sets, or any other alterations of the encoded bit stream.
  - Individual implementations may wish to transmit such invalid bit streams to provide diagnostic capability at the higher levels.
- Any transmission violation, such as invalid ordered sets, which follow valid character encoding rules are transparent to the PMA and PMD and will cause no difficulties.
- A limited set of diagnostic functions may be optionally specified for testing of the transmitter function of the port.
  - A typical diagnostic function is the ability to transmit invalid transmission characters within an otherwise valid bit stream.
  - Certain invalid bit streams may cause a receiver to lose word and/or bit synchronization.
  - Some diagnostic functions are intended for component testing and not for test to be performed at the customer site on a shippable or production adapter.

Random Jitter Testing

- An example diagnostic function is one for transmitter random jitter testing:
  - In order to test the FC-0 transmitter for random jitter, a compliant transmitter has to be capable of transmitting the following two test patterns:

    a) A continuous sequence of D21.5 data bytes. This constitutes an alternating sequence of ones and zeros.

    b) A continuous sequence of K28.7 special characters. This constitutes an alternating sequence of five ones and five zeros.
- These patterns may be implemented at a bit or character level. They are to be used for transmitter testing only. The receiver may not have the capability to accept these diagnostic sequences.