Philips Semiconductors

PDIUSBH11A

Enhanced USB Hub with Multiple embedded

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Agenda

- Hardware Description
- Command Description
- The Embedded function
- Command Summary

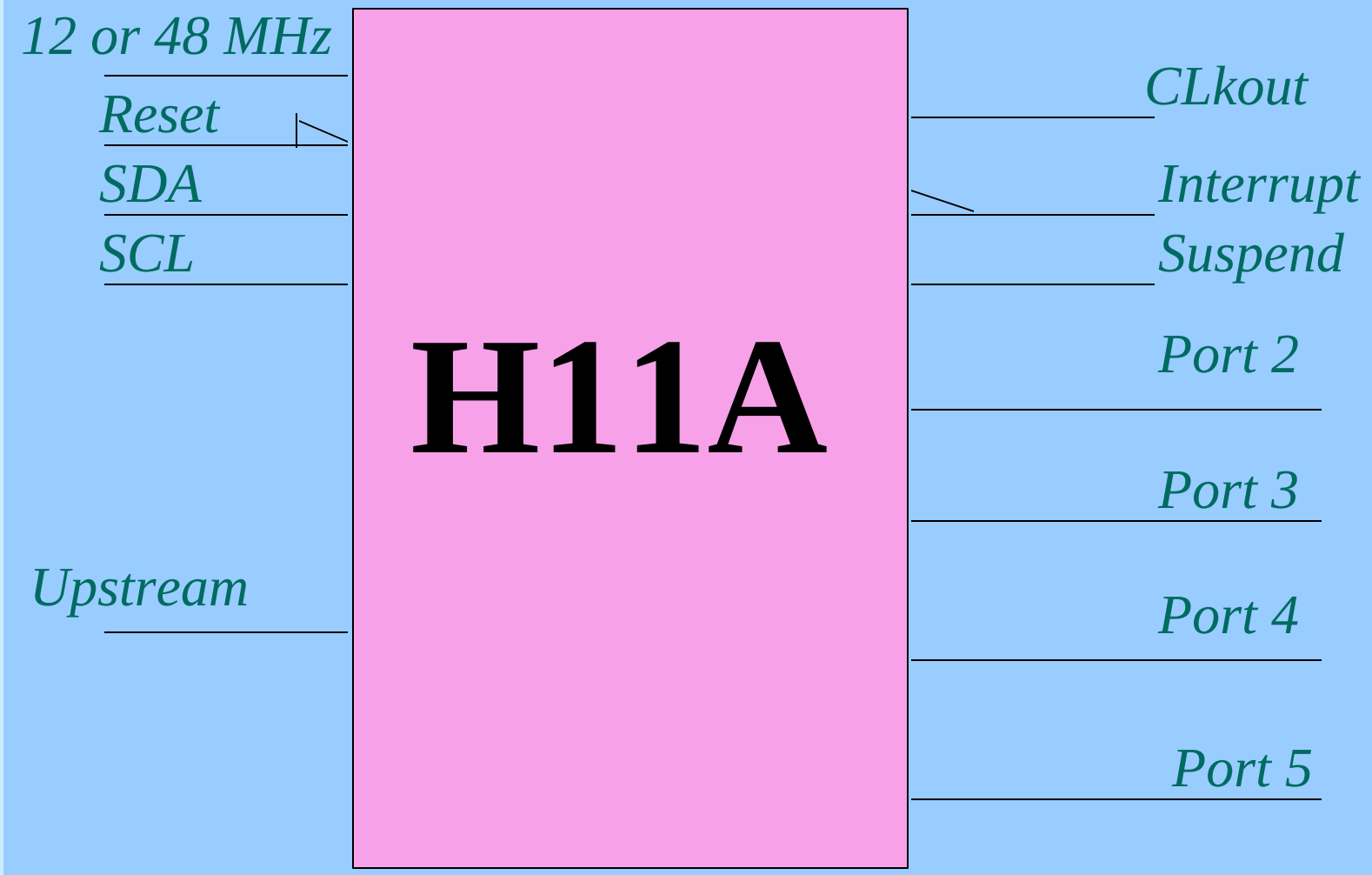
USB
UNIVERSAL SERIAL BUS

Hardware Discriptions

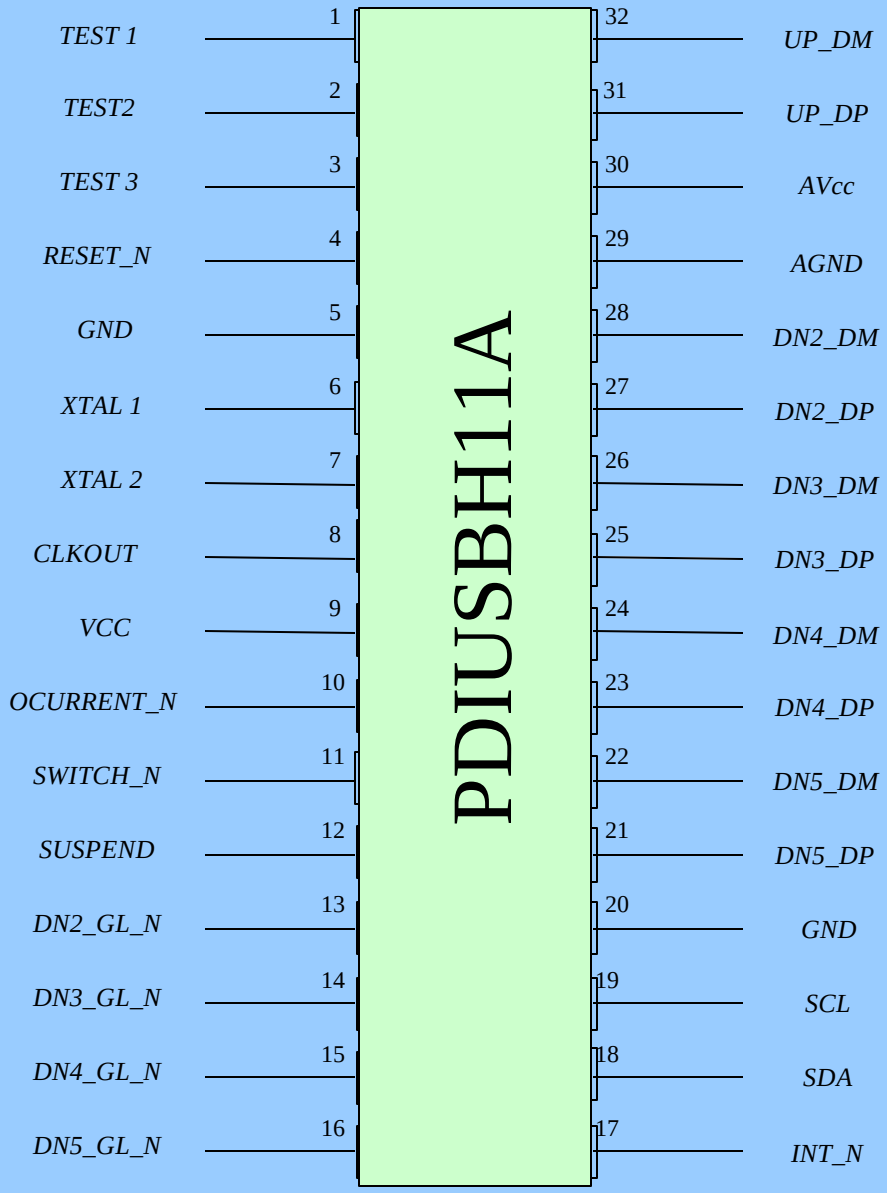
- **Block Diagrams**
  - H11A
  - H11A Pin List
  - H11A Internal Blocks

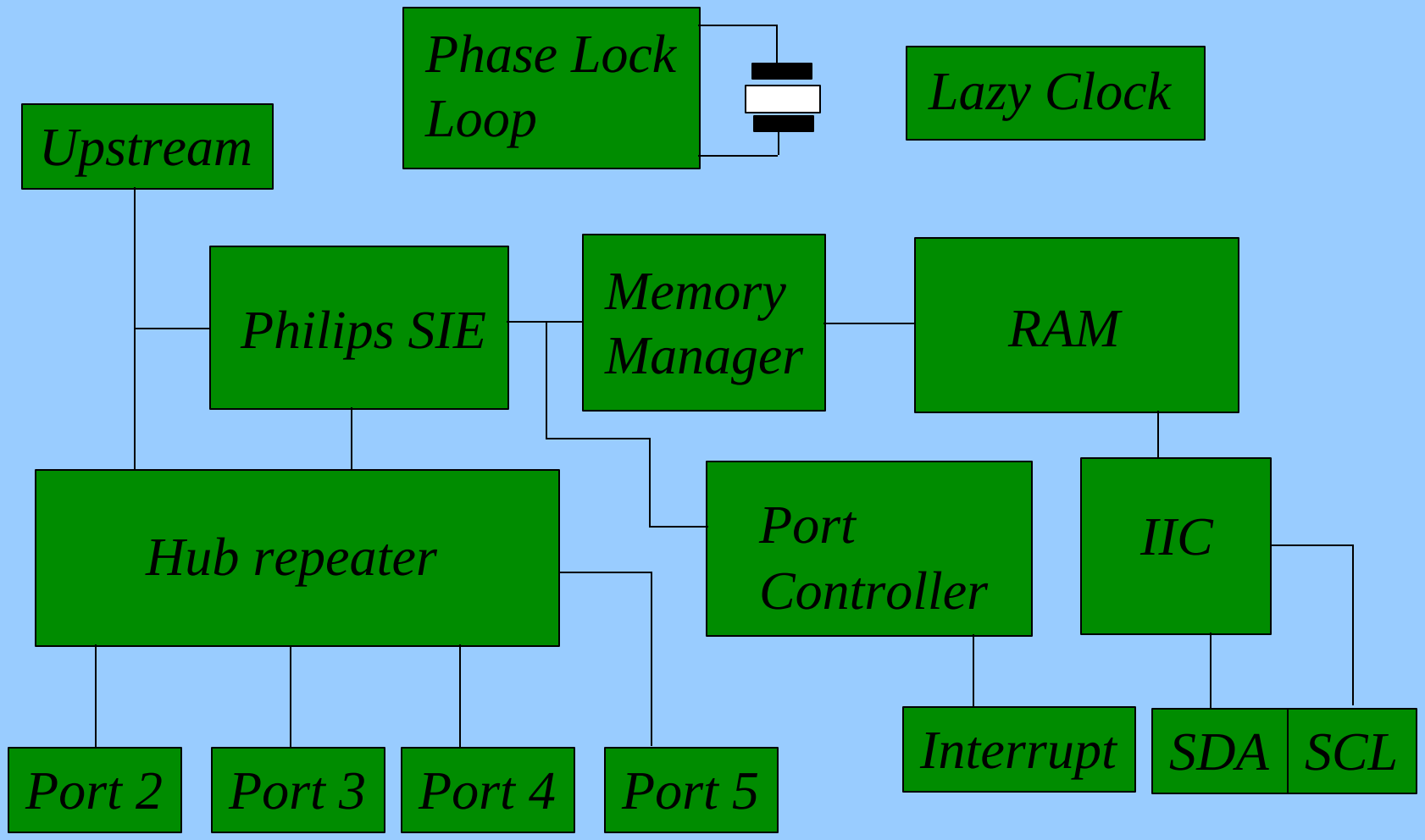
Host Interface (I^2C)

- ✓ Protocol
- ✓ Timing

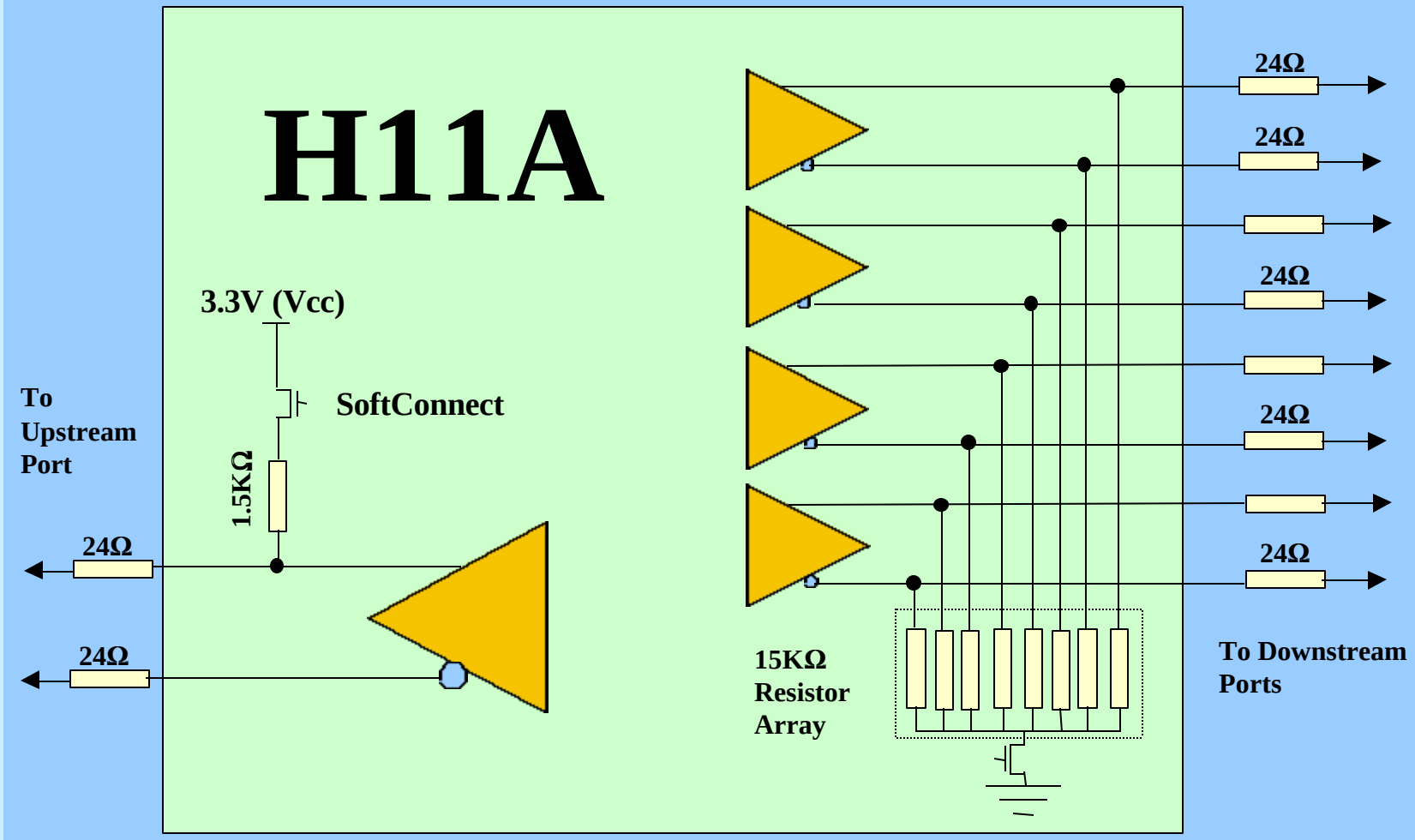


H11A Pin List



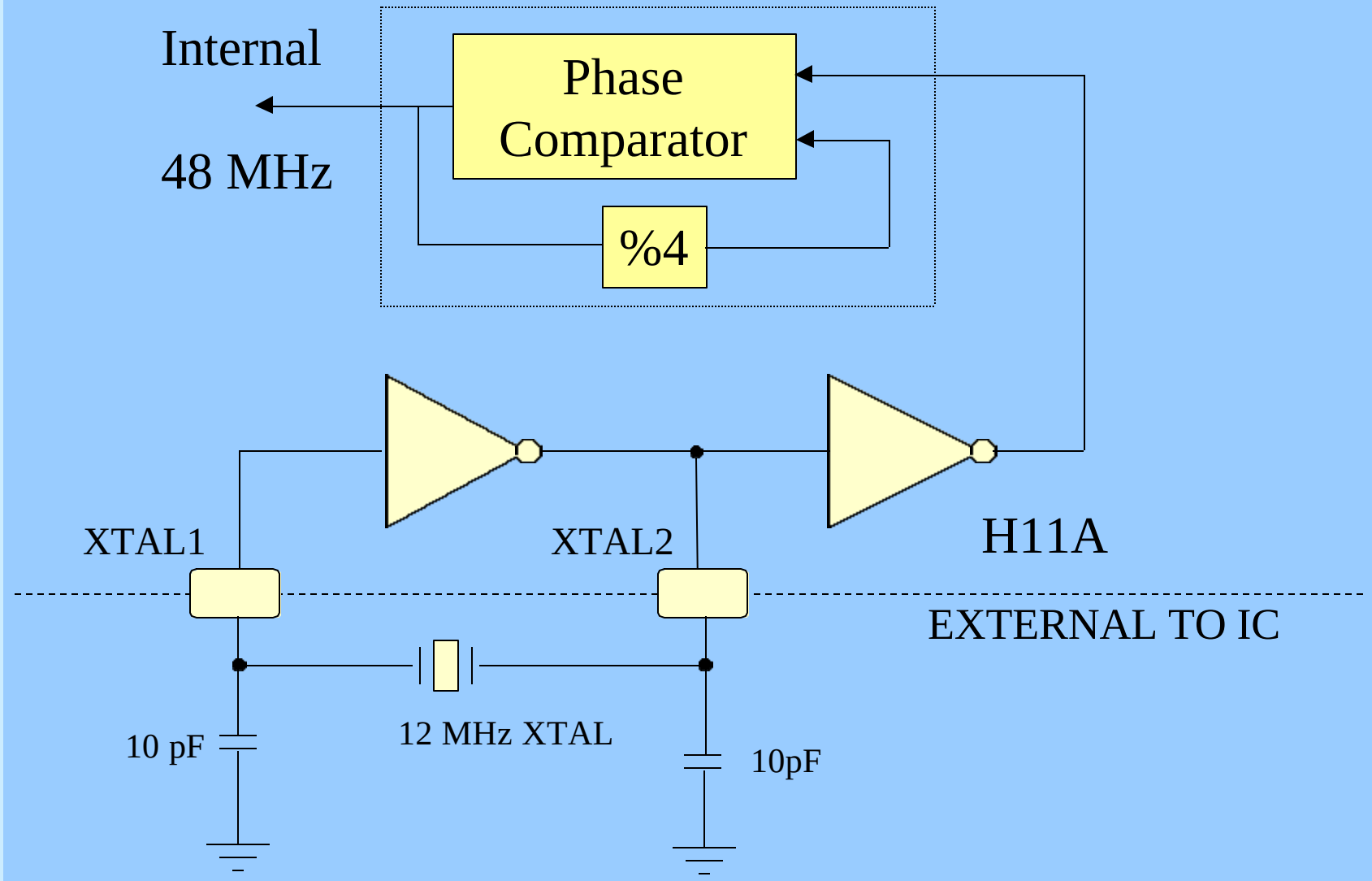


SoftConnect

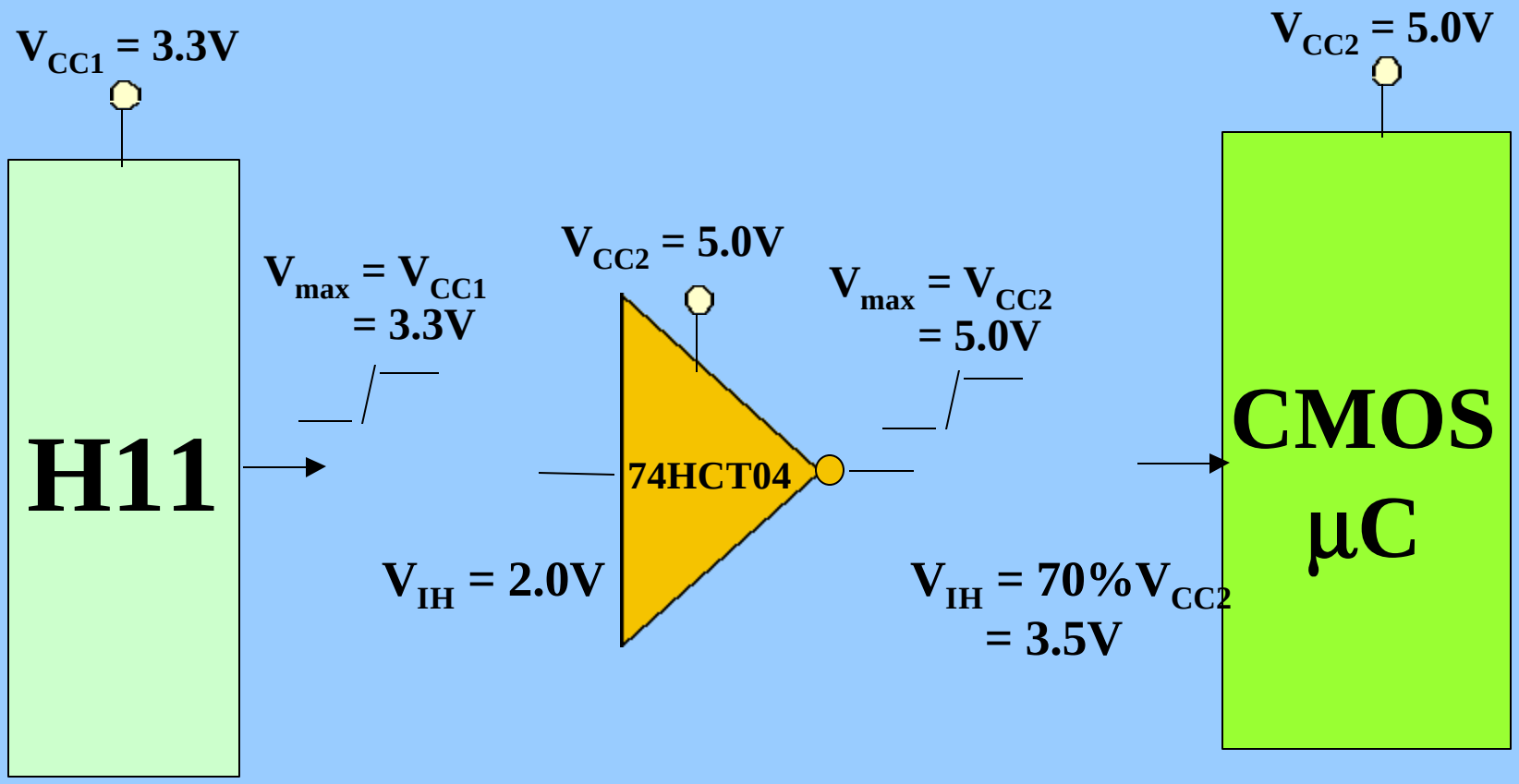


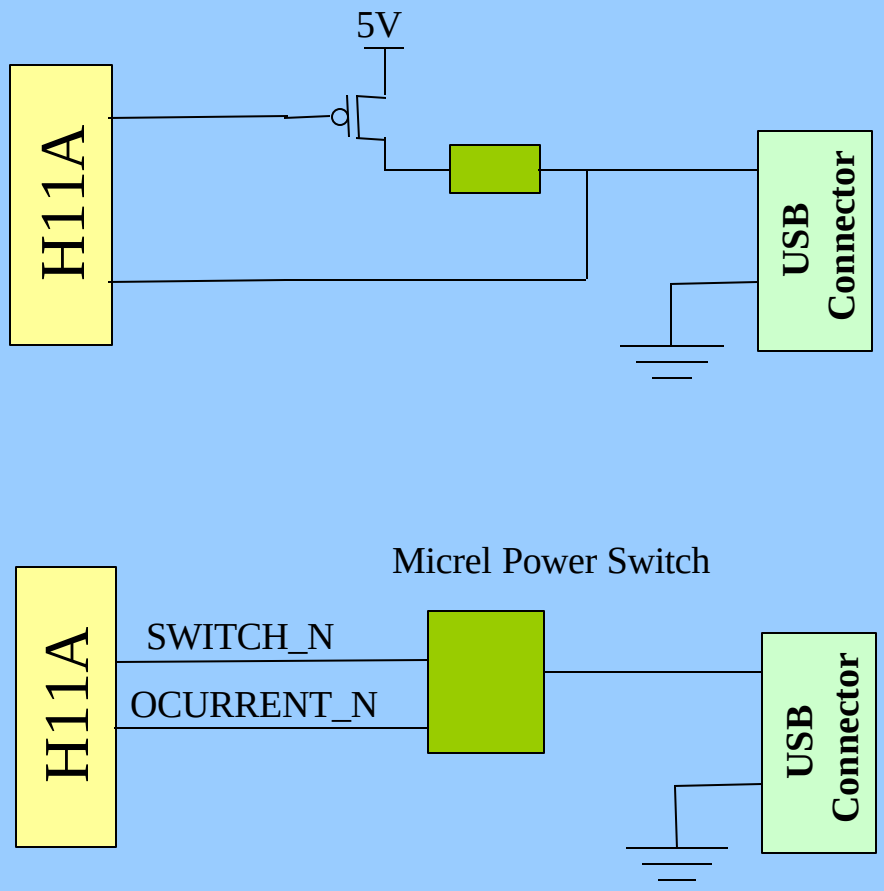
Note : 24Ω impedance matching resistors

Internal Phase Lock Loop



Clock Buffer Circuit





There are three types of Current Limiting :

2) Smart Switches
3) Simple Discrete circuit

Host Interface (I2C)

- Command Transaction
- Data Transaction
- Read/Write
- Interrupt

Command Address	0011 0110b	36h
Data Address Write	0011 0100b	34h
Data Address Read	0011 0101b	35h

^{2}C)

- ✓ Protocol
  - Start Condition
  - Address
  - Command or Data
  - Stop or re-Start condition
  - Acknowledge

^{2}C)

✓Timing

Master writes to the H11A
Data is sampled 1 microsecond after the rising edge of SCL

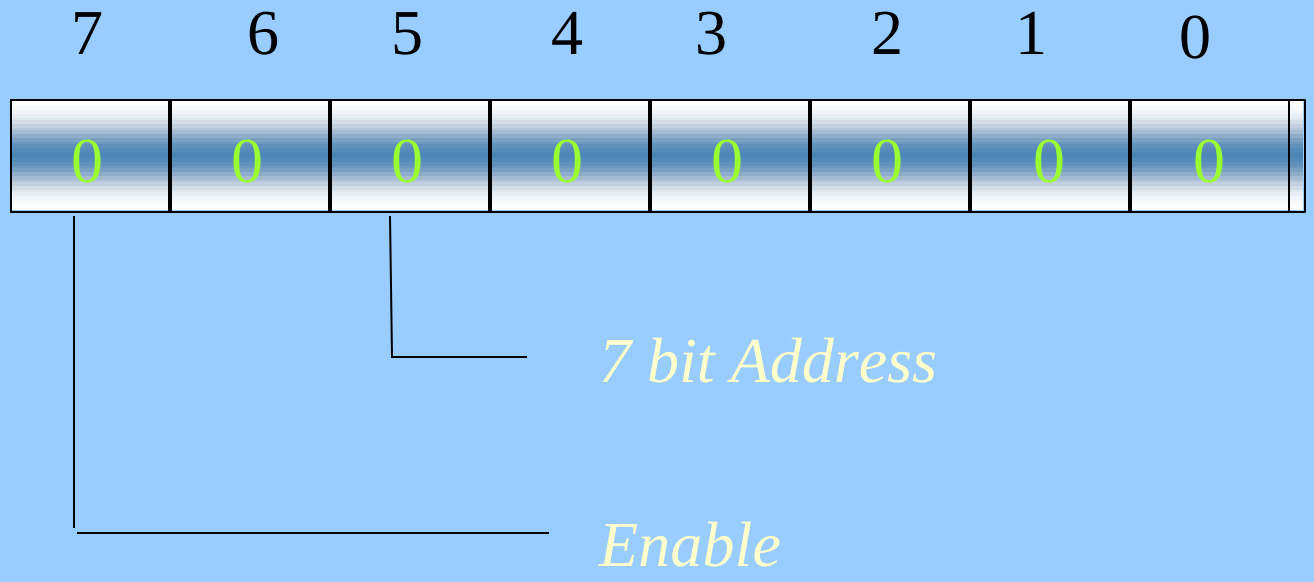
H11A writes to the master
Data is driven 1 microsecond after the falling edge of SCL

Command Description

- **Command Procedure**
- **Initilization Commands**
- **Data Flow Commands**
- **Hub Specific Commands**
- **General Commands**

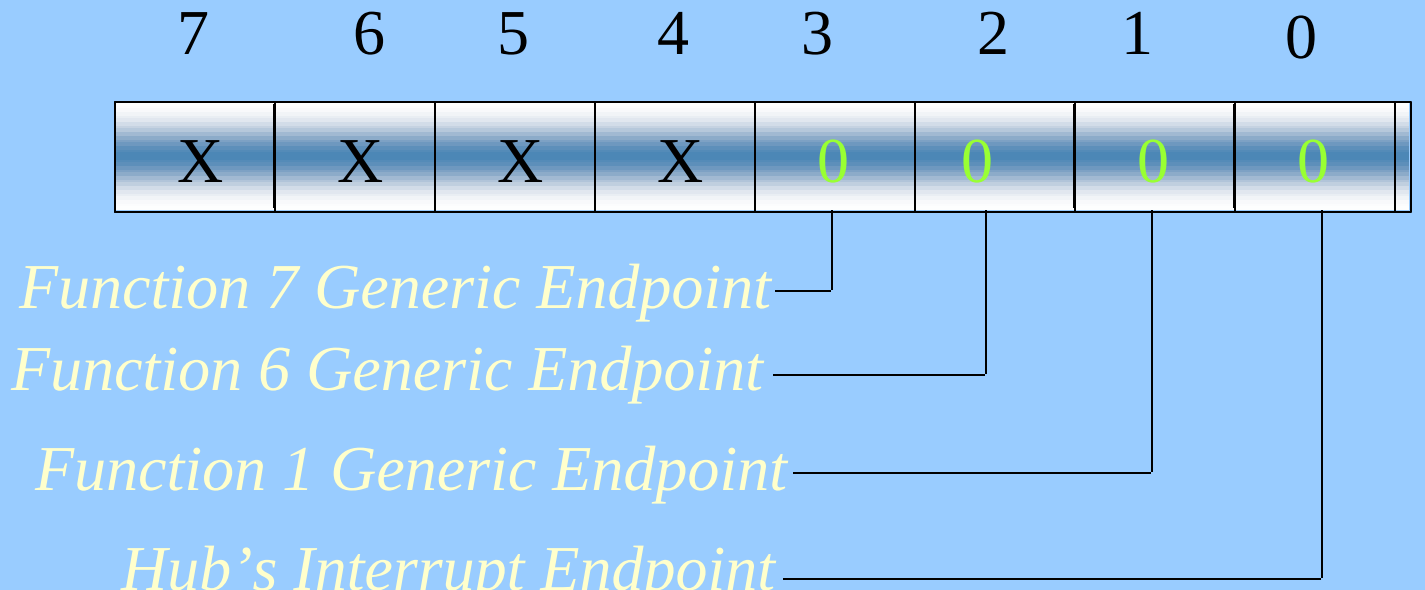
✓Set Address/Enable

- **Command:**
  - Hub 0xD0
  - Embedded Function 1 0xD1
  - Embedded Function 6 0xD2
  - Embedded Function 7 0xD3
- **Data : Write 1 byte**



✓Set Endpoint Enable

- Command : D8h
- Data: Write 1 byte



X - Reserved

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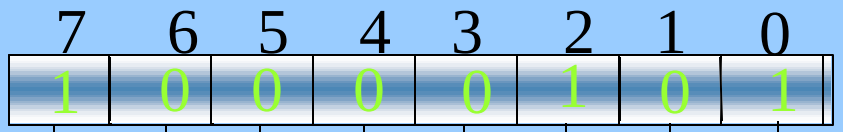
✓Set Mode

- **Command : F3h**
- **Data: Write 2 bytes**

1st Byte :

CONFIGURATION BYTE



Remote Wakeup

No Lazy Clock

Clock Running

Debug Mode

SoftConnect

Connect Downstream Resistors

Non-blinking LEDs

Embedded Function Mode

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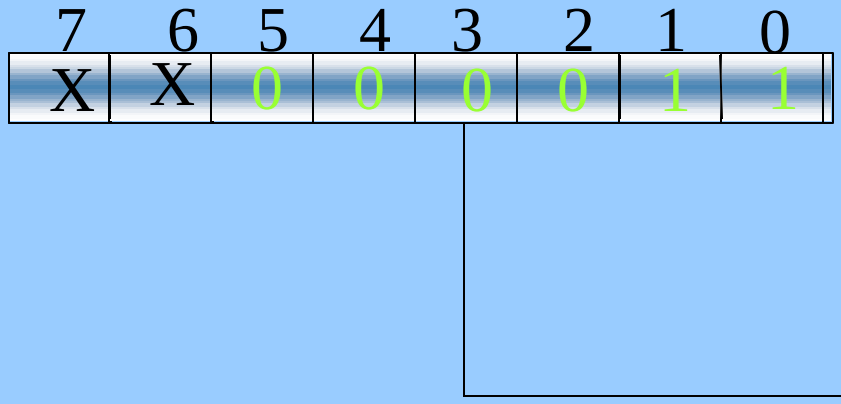
✓Set Mode

- Command : F3h
- Data: Write 2 bytes



2nd Byte :

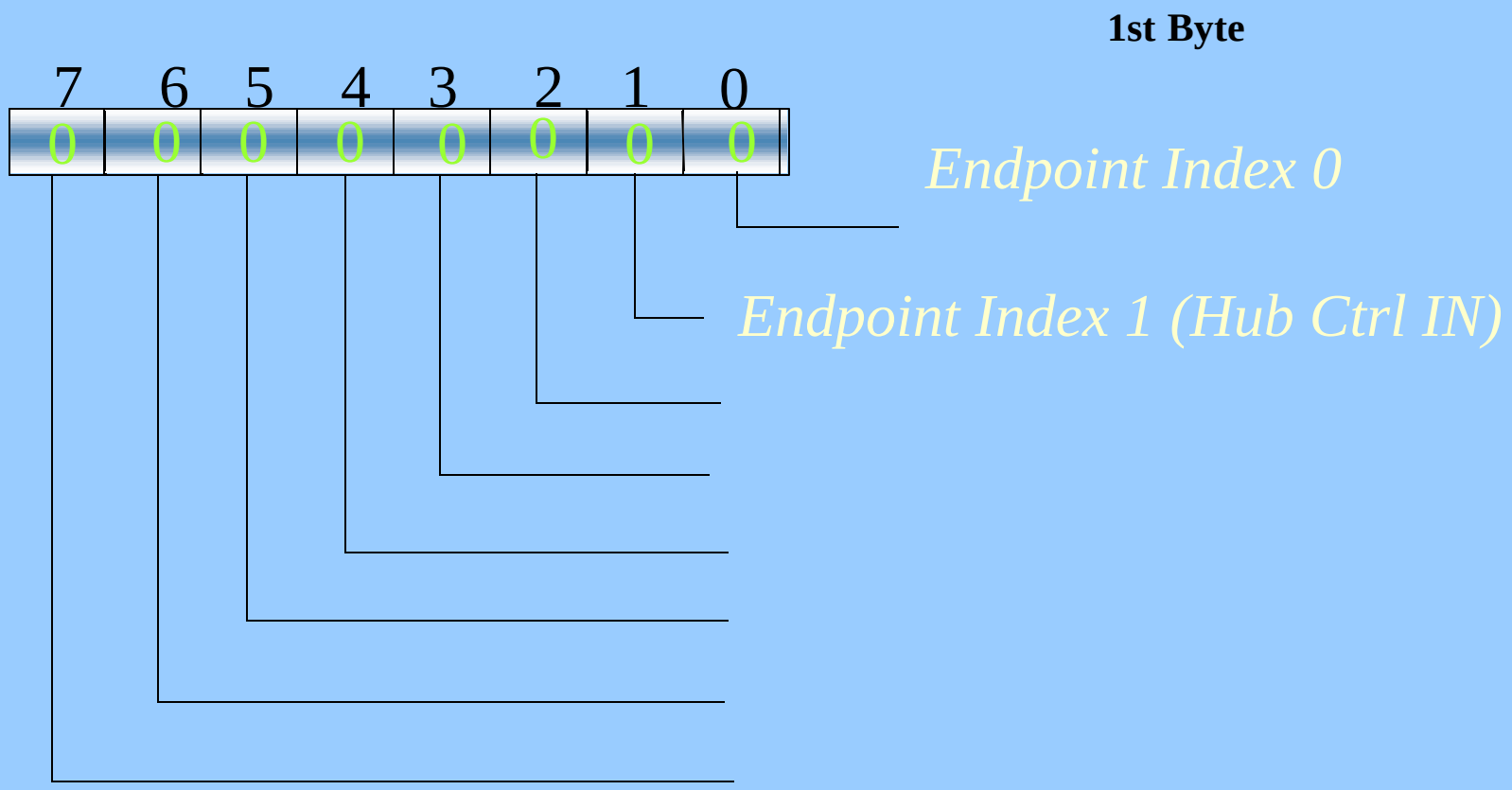
CLOCK DIVISION FACTOR

CLOCK OUT = 48 MHz / (N + 1)

X - Reserved

✓Read Interrupt Register

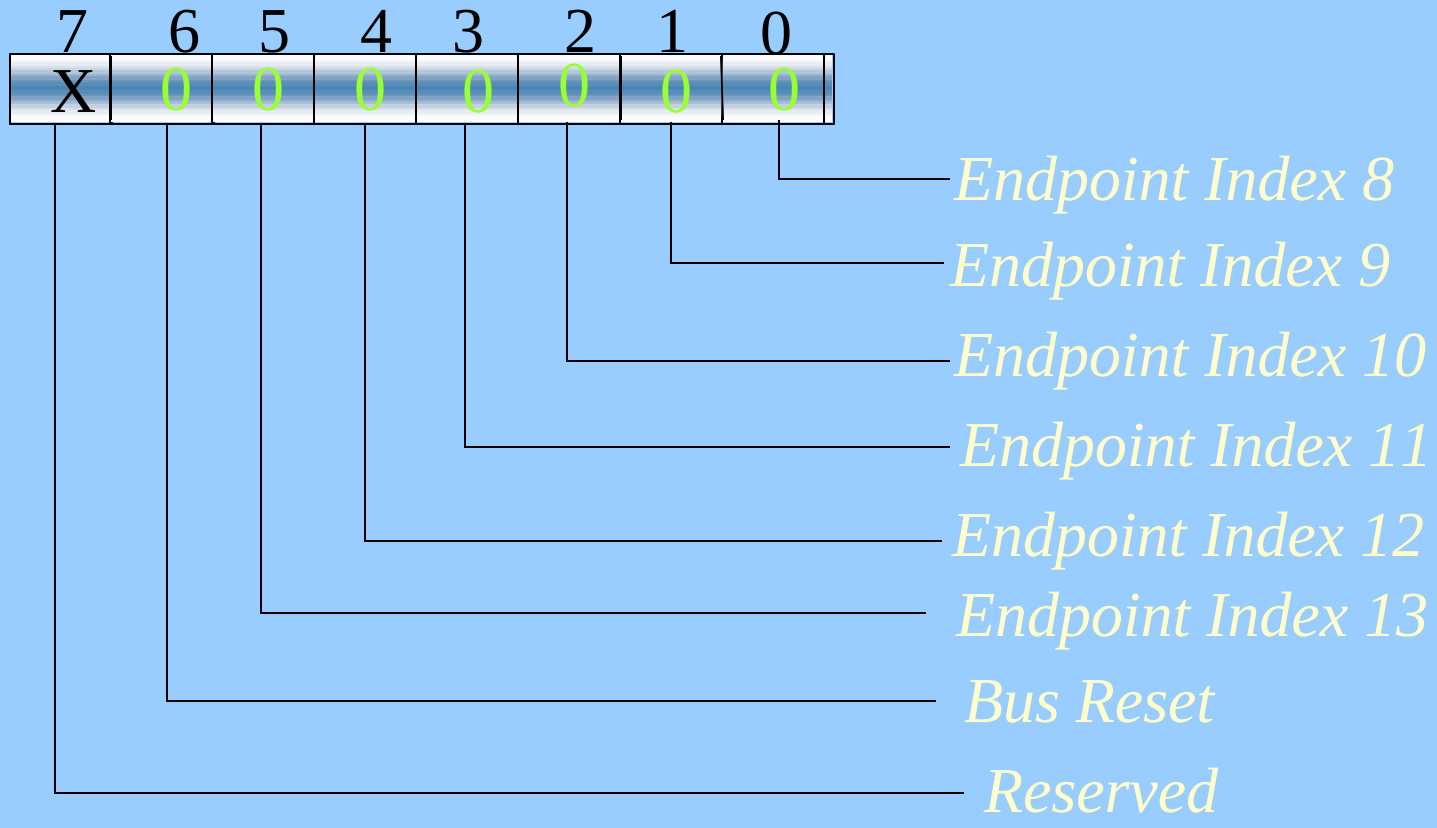
- Command: F4h
- Data: Read 2 Bytes



✓Read Interrupt Register

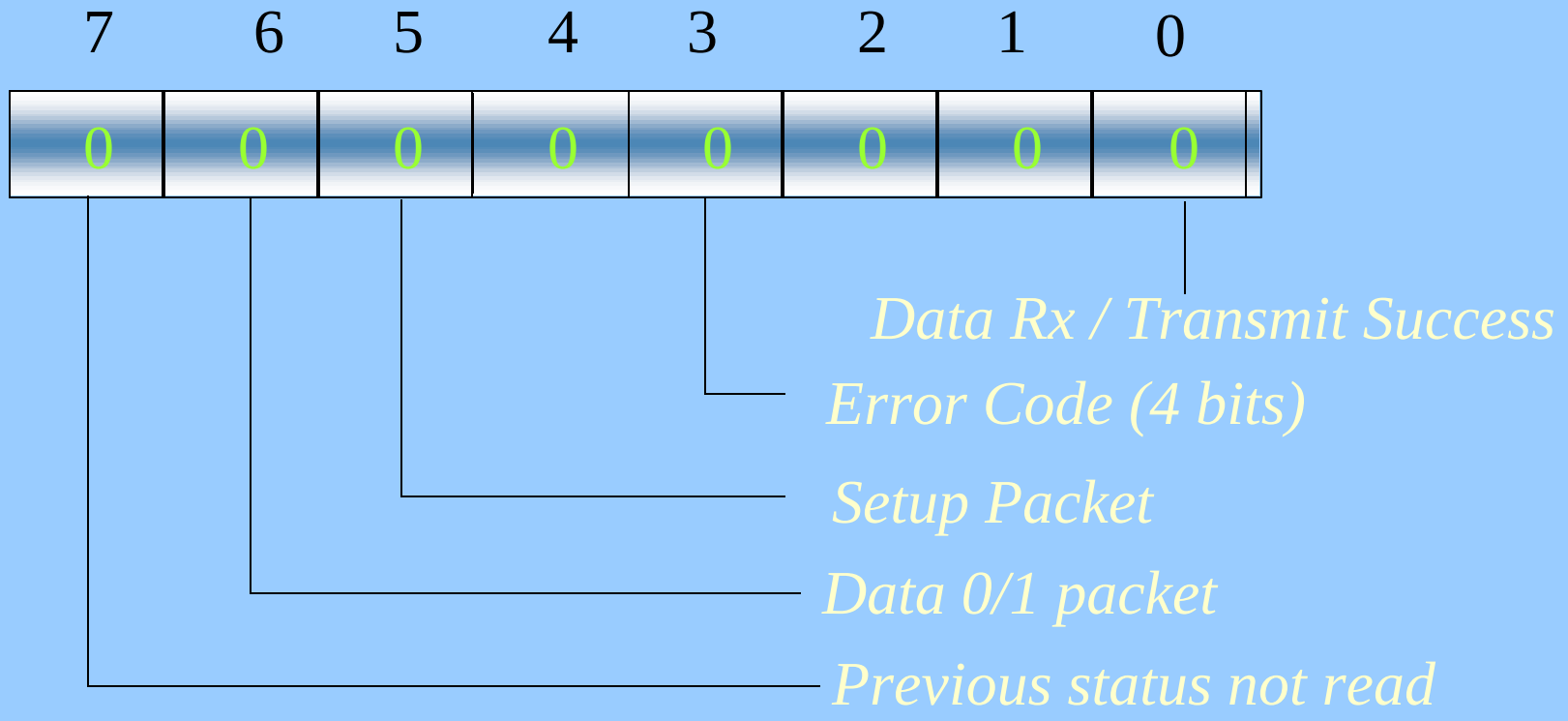
- Command: F4h
- Data: Read 2 Bytes

2nd Byte



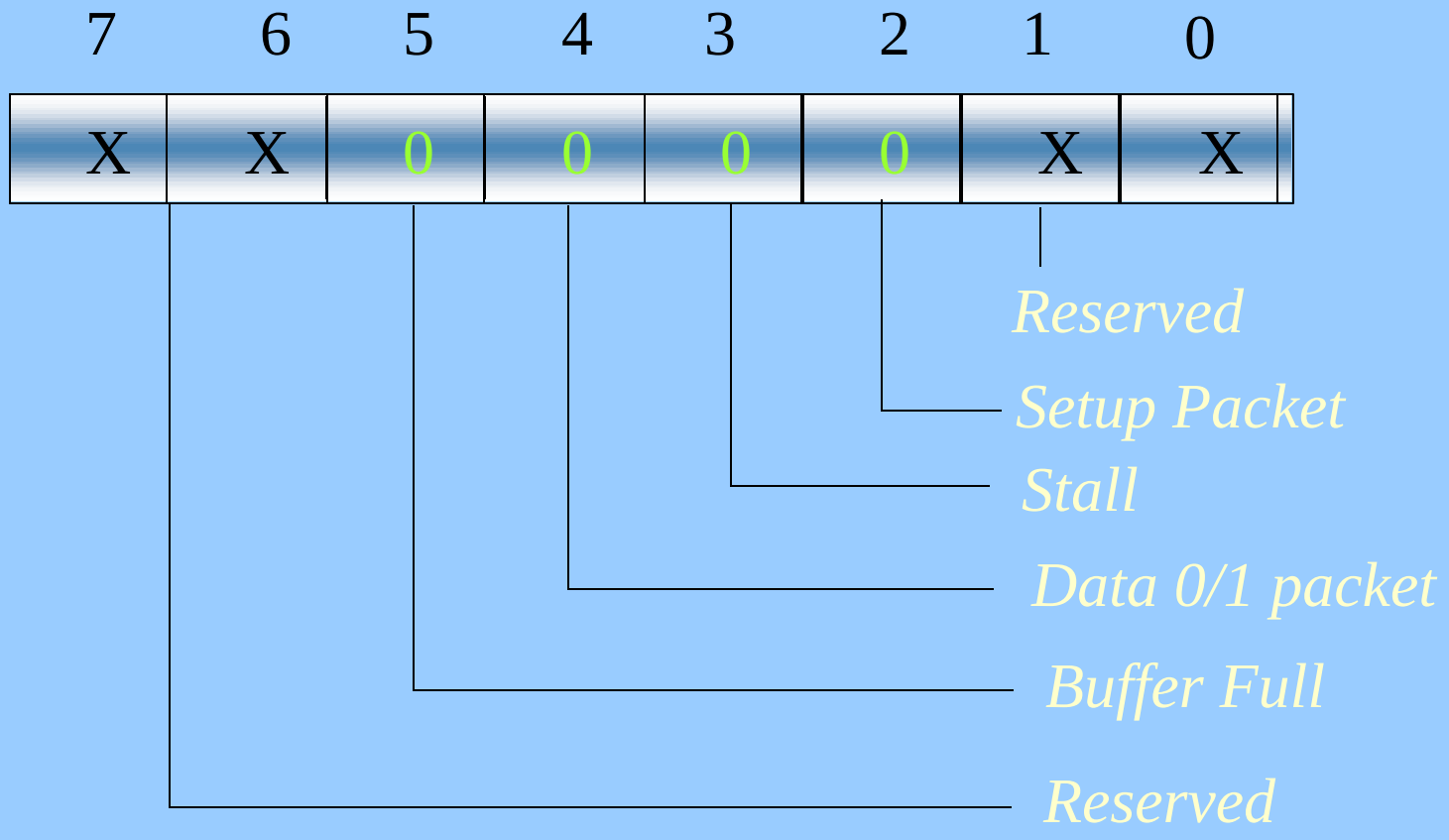
✓Read Last Transaction Status

- **Command: 40-4Dh**
- **Data: Read 1 byte (Clears the interrupt source)**



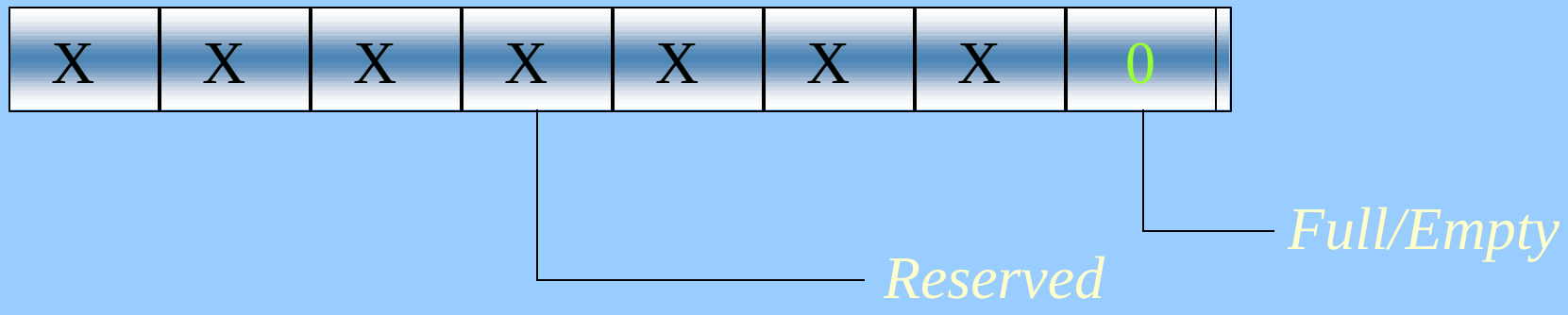
✓Read Endpoint Status

- Command: 80-8Dh
- Data: Read 1 byte



✓Select Endpoint

- **Command**
  - Hub Control Ep Out 0x00
  - HubControl Ep In 0x01
  - Emb Fn Endpoint Index 0x00 + Index
- **Data: Optional Read**



✓Read Buffer

- **Command: F0h**
- **Data: Read (Multiples Bytes)**

The Data in the buffer is organized as follows:

byte 1: Number of byte in the buffer
byte 2: Data byte 1
byte 3: Data byte 2

- ✓ **Write Buffer**
  - **Command F0h**
  - **Data: Write (One or more Bytes)**

Data must be organized in the same way as described in

Data Flow Commands

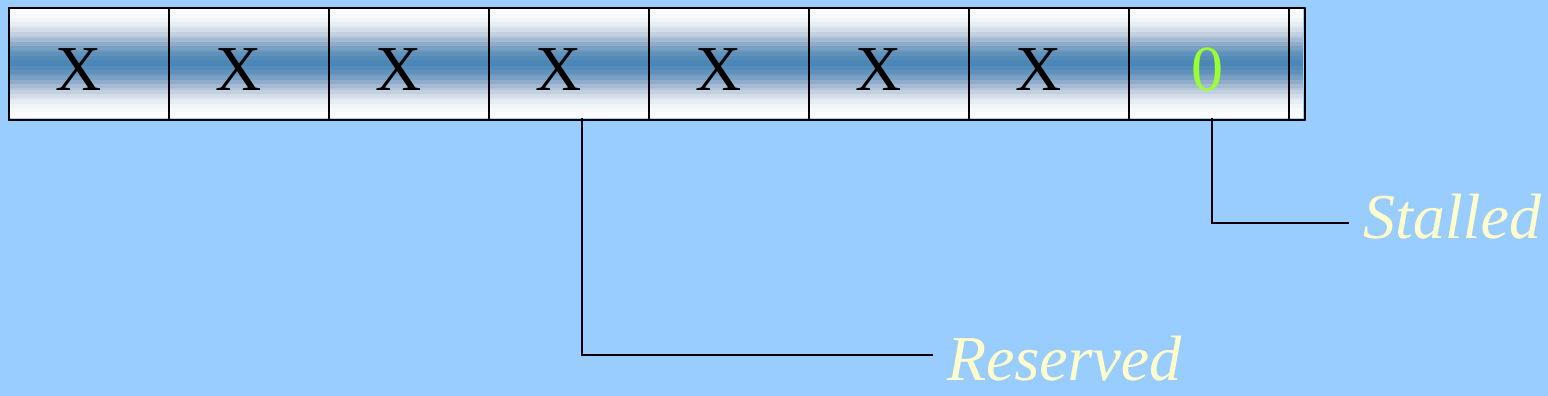
- ✓ **Clear Buffer**
  - **Command: F2h**
  - **Data: No Data**

✓Validate Buffer

- Command: FAh
- Data: No Data

✓Set Endpoint Status

- Command: 0x40 - 0x4D
  - Hub Control Out 0x40
  - Hub Control In 0x41
  - Function Endpoint 0x40+Index
- Data: Write



✓ Acknowledge Setup

- Command F1h
- Data: No Data

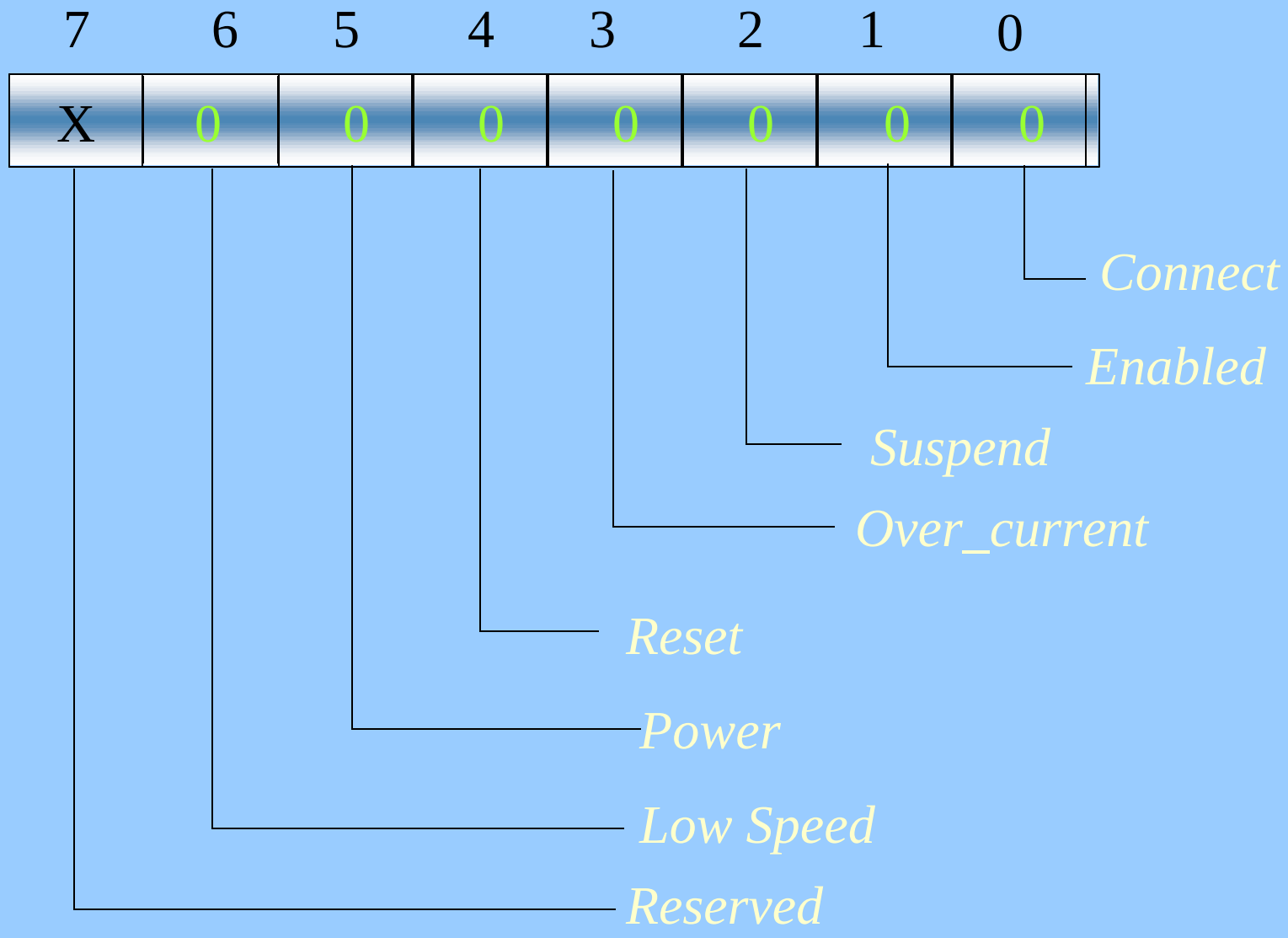
✓Clear Port Feature (Hub Only)

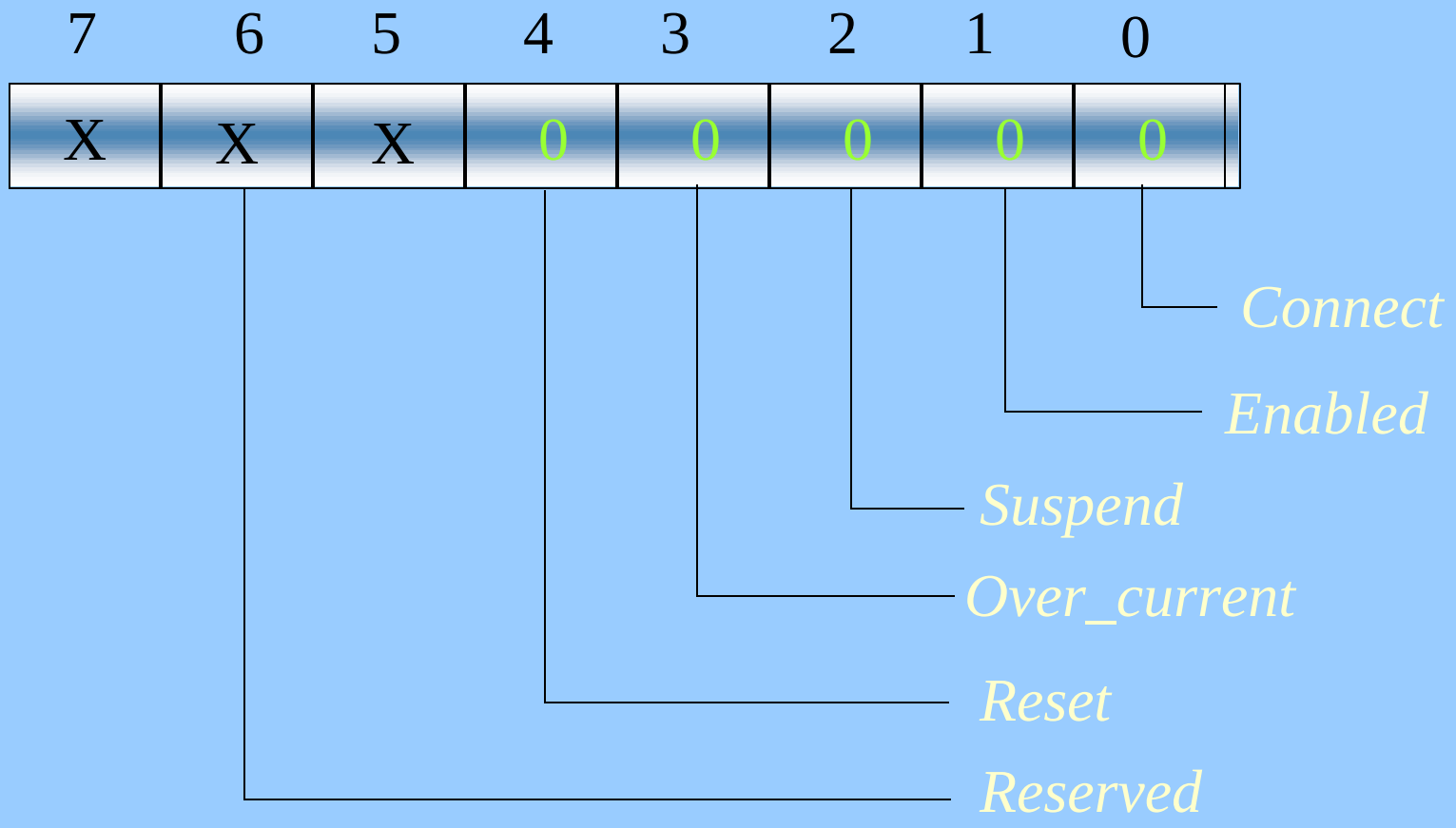
- **Command : E0h-E3h**
- **Data: Write Feature Code 0-7**

F_Port_Enable0	Enable		Disable
F-Port_Suspend	1	Suspend	Resume
FC_Port Reset	2	Reset	Clear change bit
F_Port_Power	3	Power	Unpower
C_Port_Connection	4		Clear change bit
C_Port_Enable	5		Clear change bit
C_Port_Suspend	6		Clear change bit
C_Port_Overcurrent	7		Clear Change bit

- ✓ Set Port Feature
  - Command: E8h-EBh
  - Data: Write Feature Code 0-7

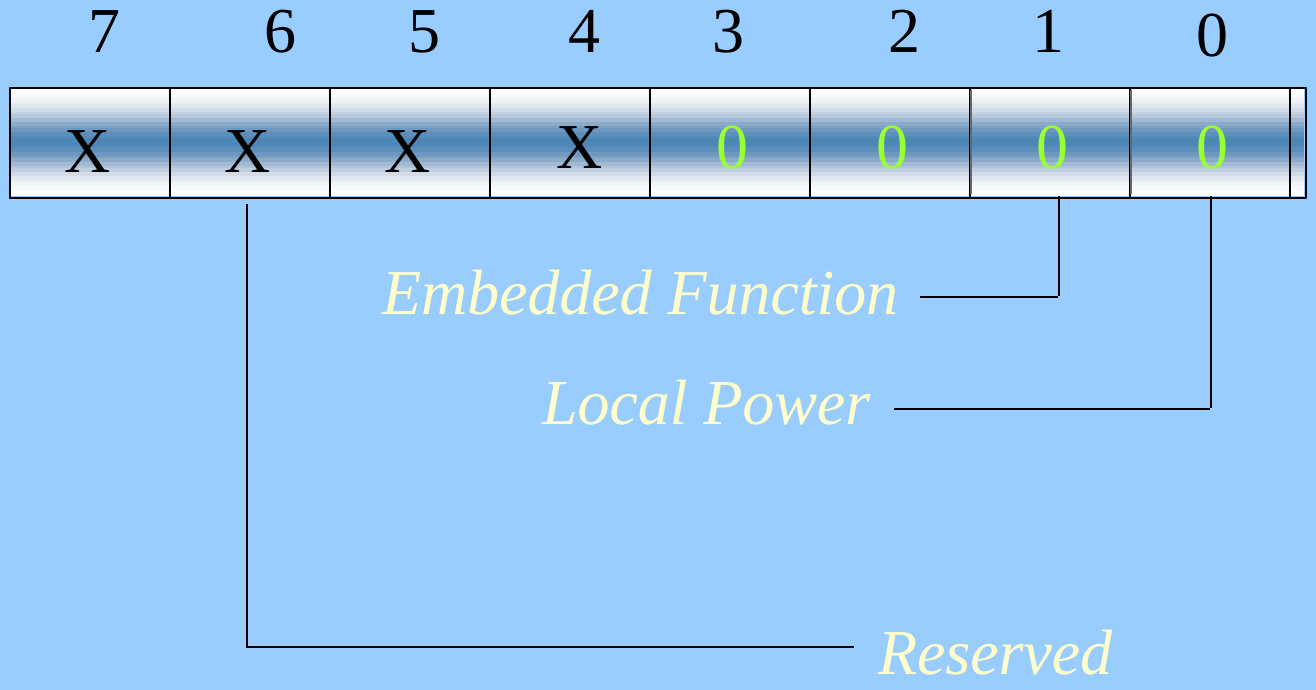
- **Hub Specific Commands**
  - ✓ Get Port Status
    - Command: E0h-E3h
    - Data: Read 2 Bytes
      - Port Status Byte
      - Port Status Change Byte


7 6 5 4 3 2 1 0
X 0 0 0 0 0 0 0
Connect
Enabled
Suspend
Over_current
Reset
Power
Low Speed
Reserved


7 6 5 4 3 2 1 0
X X X 0 0 0 0 0
Connect
Enabled
Suspend
Over_current
Reset
Reserved

✓Set Status Change Bits

- **Command: F7h**
- **Data: Write**

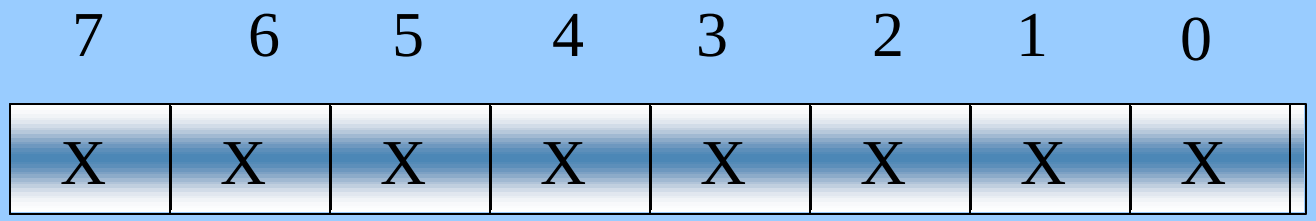


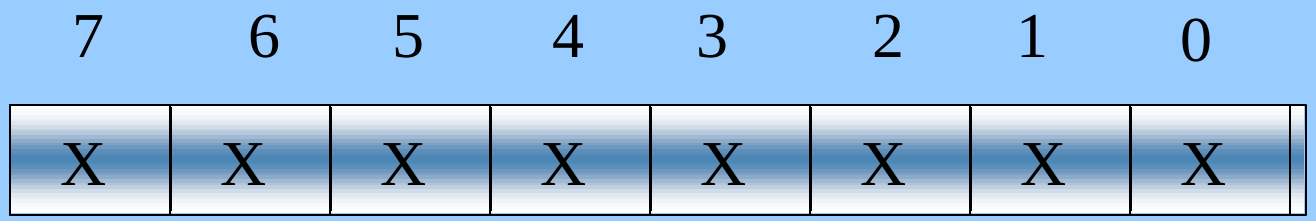
✓Send Resume

- Command: F6h
- Data: None

✓Read Current Frame Number

- **Command: F5h**
- **Data: Read one or two bytes**





Embedded Function

- ✓ SetFeature Port_Reset
- ✓ SetFeature Port_Enable
- ✓ SetFeature Port_Suspend
- ✓ ClearFeature Port_Enable
- ✓ ClearFeature Port_Supend
- ✓ ClearFeature any Change Indicator

Command Summary

Command Name	Recipient	R/W	Data	Coding
Initialization Commands				
Set Address/Enable	Hub	W	1	D0h
	Emb Fn 1	W	1	D1h
	Emb Fn 6	W	1	D2h
	Emb Fn 7	W	1	D3h
Set Endpoint Enable	Hub/Emb	W	1	D8h
Set Mode		W	2	F3h
Data Flow Commands				
Read Interrupt Register		R	1	F4h
Read Endpoint Status				
	Hub Ctrl OUT	R	1	80h
	Hub Ctrl IN	R	1	81h
	Emb Fn	R	1	80h+index

Command Name	Recipient	R/W	Data	Coding
Select Endpoint				
	Hub Ctrl Out	R*	1	00h
	Hub Ctrl In	R*	1	01h
	Emb Fn	R*	1	00h+index
Read Buffer	Selected Endpoint	R	X	F0h
Write Buffer	Selected Endpoint	W	X	F0h
Set Enpoint Status				
	Hub Ctrl Out	W	1	40h
	Hub Ctrl In	W	1	41h
	Emb Fn	W	1	40h+index

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Command Name	Recipient	R/W	Data	Coding
Acknowledge Setup	Selected Ep	X	none	F1h
Clear Buffer	Selected Ep	X	none	F2h
Validate Buffer	Selected Ep	X	none	FAh
Hub Commands				
Clear Port Feature	Port 2	W	1	E0h
	Port 3	W	1	E1h
	Port 4	W	1	E2h
	Port 5	W	1	E3h
Set Port Feature	Port 2	W	1	E8h
	Port 3	W	1	E9h
	Port 4	W	1	EAh
	Port 5	W	1	EBh

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Command Name	Recipient	R/W	Data	Coding
Get Port Status	Port 2	R	1 or 2	E0h
	Port 3	R	1 or 2	E1h
	Port 4	R	1 or 2	E2h
	Port 5	R	1 or 2	E3h
Set Status Change Bits		W	1	F7h
General Commands				
Send Resume			none	F6h
Read Current Frame Number		R	1 or 2	F5h

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