# A NEW PERIPHERAL INTERFACE ?????

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RKR 03/93

MAXTOR CORPORATION
SYSTEM ENGINEERING

X3T9.2/93-049 R1

# PERIPHERAL DEVICE INTERFACE

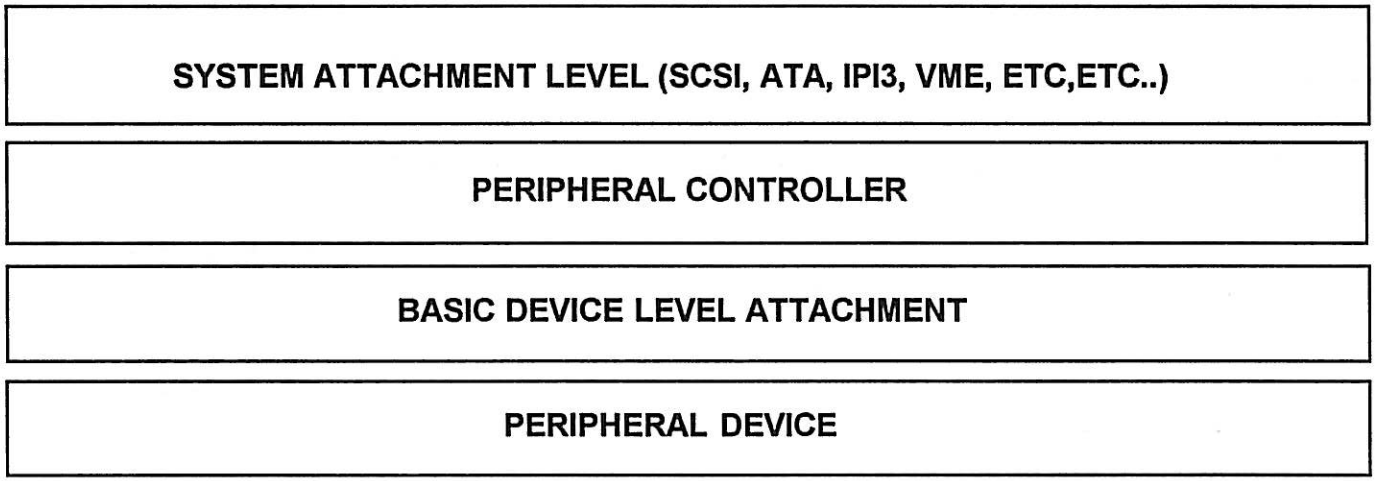
## ANOTHER INTERFACE !!!

### DESIGN GOALS

- LOW LEVEL ACCESS TO THE MEDIA... IF REQUIRED
- VARIABLE DATA TRANSFER RATES FOR PERFORMANCE VS COST TRADE-OFFS
- ALLOW VENDORS TO TAKE ADVANTAGE OF VOLUME PRODUCTION
- PROVIDE EASY IMPLEMENTATION OF ARRAYS OF DISKS
- PROVIDE SIMPLIFIED COMMAND STRUCTURES AND FLOW
- PROVIDE FOR MAXIMUM THROUGH-PUT
- PROVIDE FOR ERROR FREE TRANSFERS

# PERIPHERAL DEVICE INTERFACE

## ARCHITECTURAL MODEL



# PERIPHERAL DEVICE INTERFACE

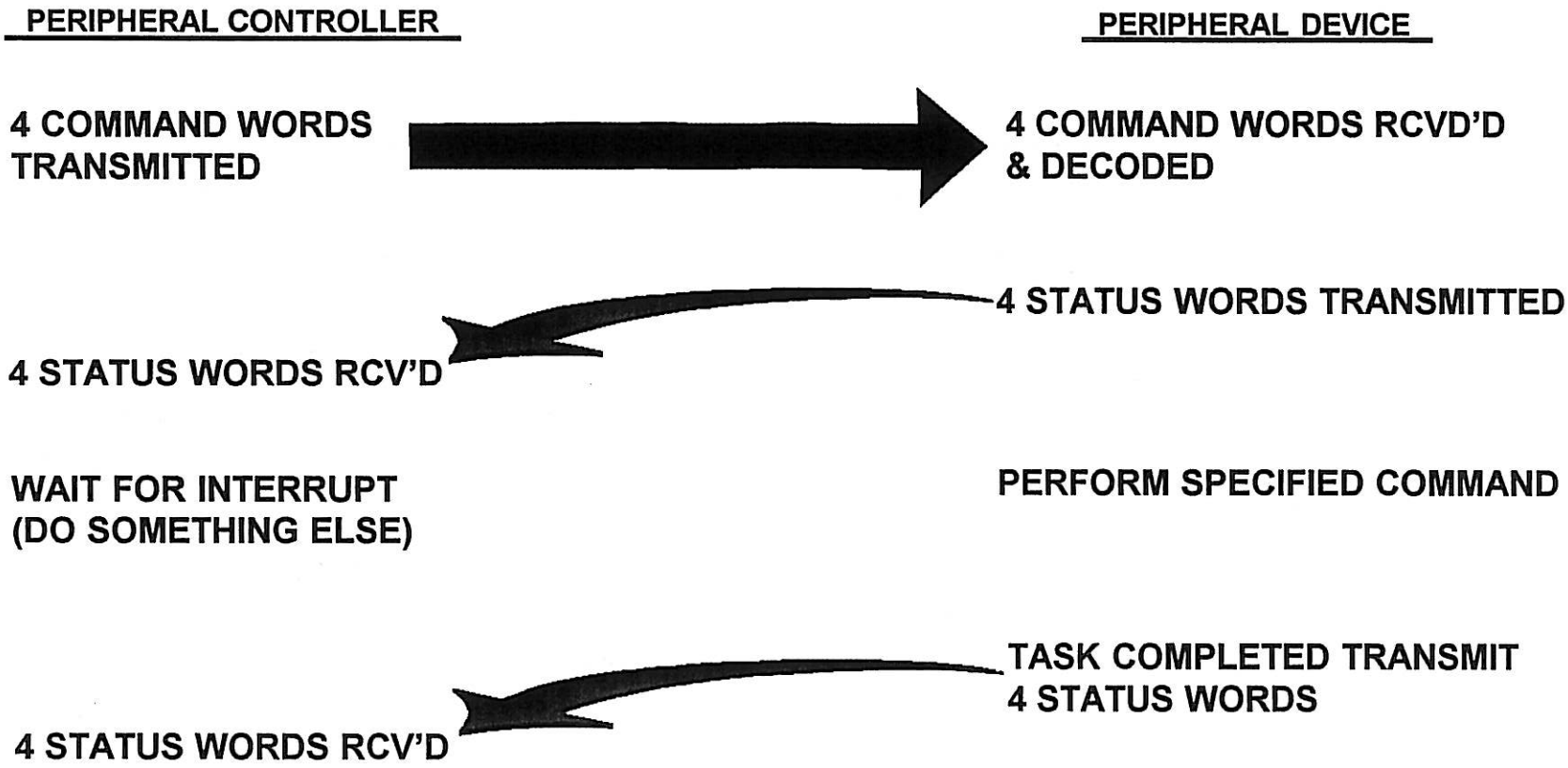
# ARCHITECTURAL MODEL

## ATTRIBUTES OF LEVELS

| PERIPHERAL CONTROLLER | PERIPHERAL DEVICE |
|---|---|
| SYSTEM INTERFACE CONTROLS | ALL SERVO CONTROLS |
| CACHE MEMORIES(IF REQUIRED) | ENCODER DECODER |
| CONTROLS MULTIPLE DEVICES(NO LIMITS) | READ/WRITE CIRCUITS |
| BUFFER AREAS | ECC ON THE FLY |
| SYSTEM SPECIFIC KNOWLEDGE | STORAGE MEDIA |
| | SPINDLE SYNC CKTS |
| | POWER CONTROLS |

# PERIPHERAL DEVICE INTERFACE

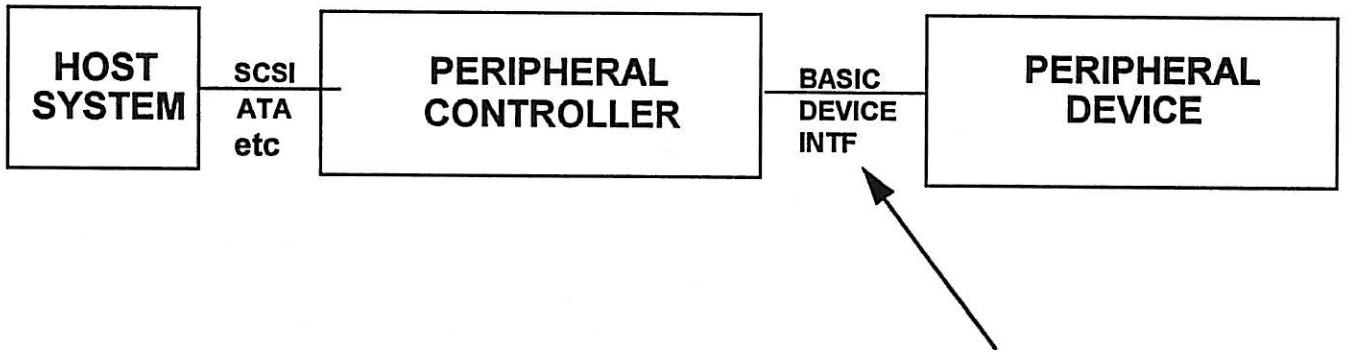
## INFORMATION MOVEMENT PROTOCOL



# PERIPHERAL DEVICE INTERFACE

## WHERE DOES IT FIT

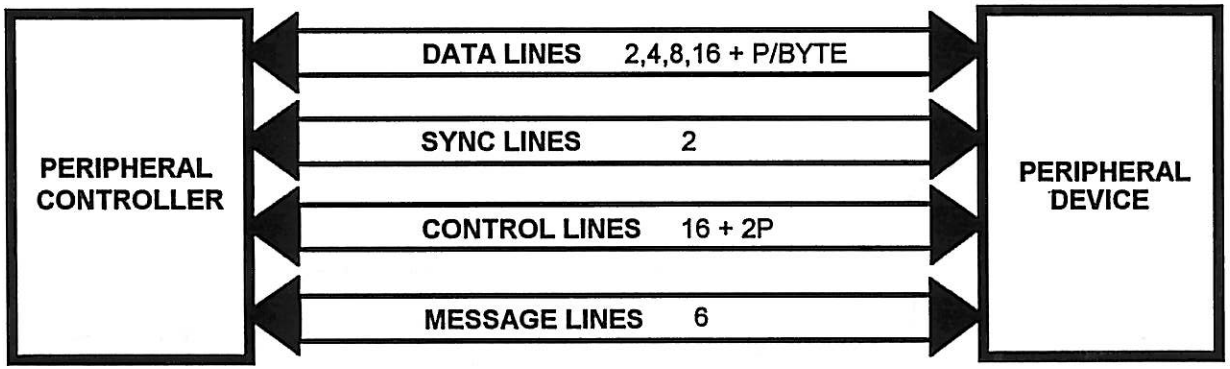
## IN THE HIERARCHY OF THE SUBSYSTEM ??




## TYPICAL PERIPHERAL SUB-SYSTEM

# PERIPHERAL DEVICE INTERFACE

## INTERFACE LINES



# CONTROL SIGNALS

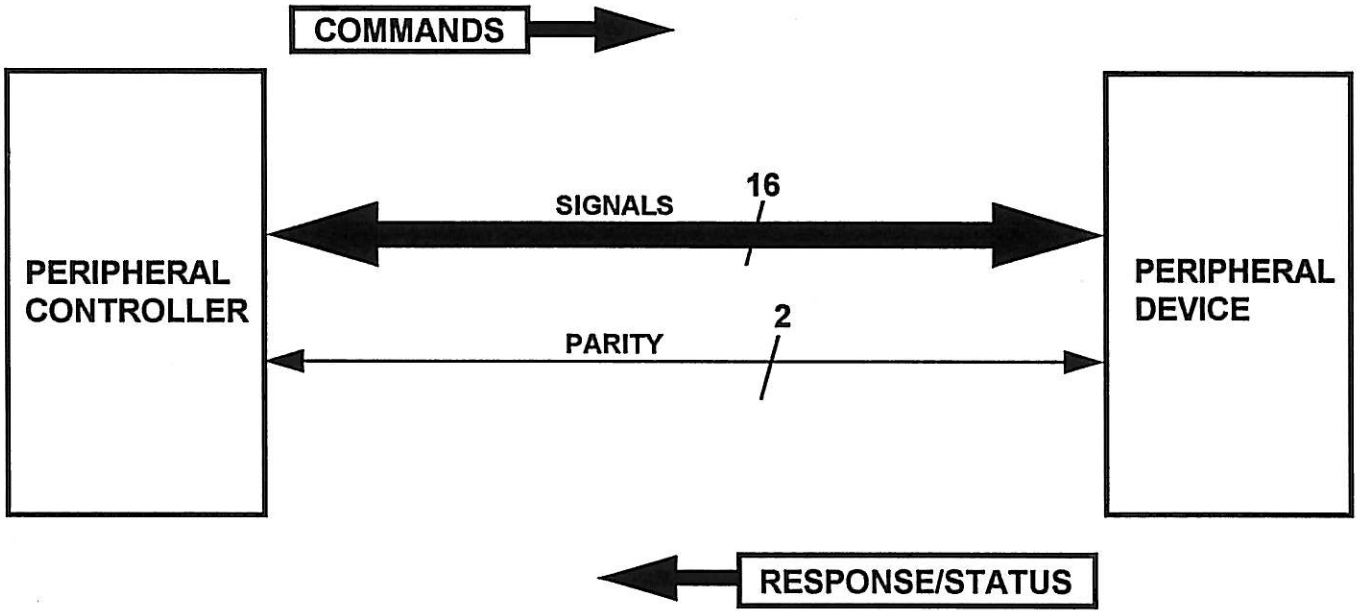
## CONTROL SIGNALS ARE BI-DIRECTIONAL

TRANSPORTS COMMAND DATA TO THE PERIPHERAL DEVICE

TRANSPORTS RESPONSE/SENSE DATA TO THE PERIPHERAL CONTROLLER

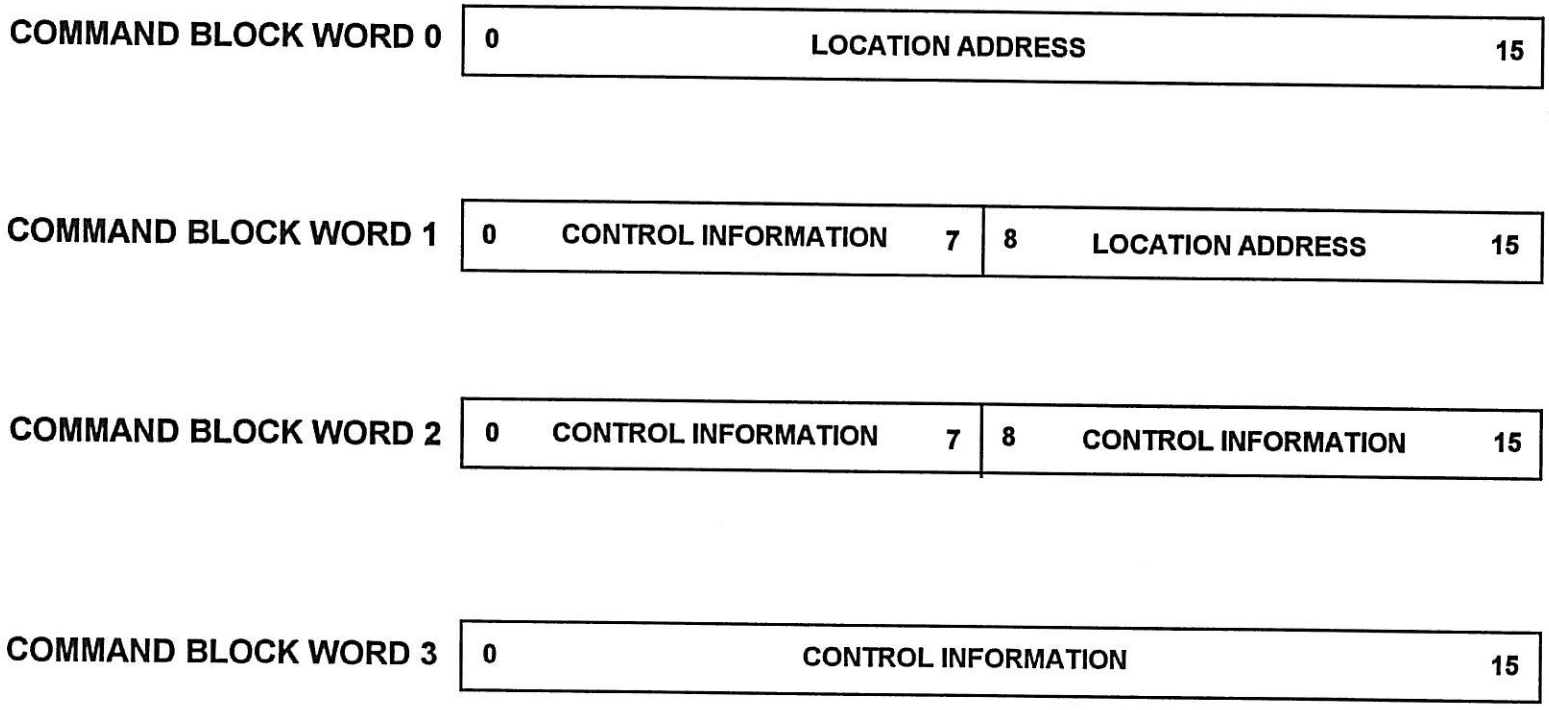
# PERIPHERAL DEVICE INTERFACE

## CONTROL SIGNAL FLOW



# PERIPHERAL DEVICE INTERFACE

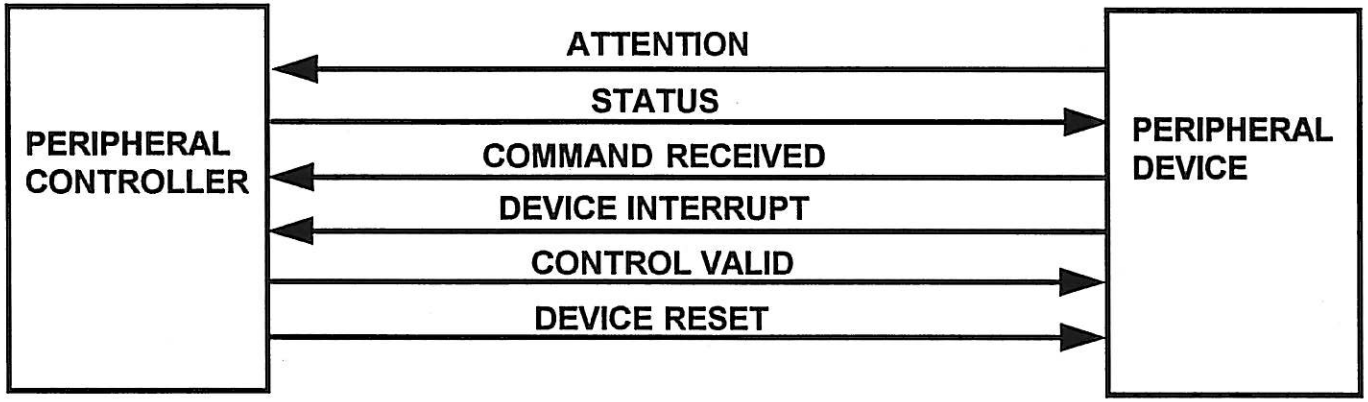
# COMMAND BLOCK FORMAT



# PERIPHERAL DEVICE INTERFACE

## MESSAGE SIGNALS

MESSAGE SIGNALS COMMUNICATE EXACT MESSAGES BETWEEN THE PERIPHERAL CONTROLLER AND THE PERIPHERAL DEVICE



# PERIPHERAL DEVICE INTERFACE

# MESSAGE SIGNAL DEFINETIONS

| | |
|---|---|
| ATTENTION | Asserted by peripheral device to request service. |
| STATUS | When asserted by controller request status from the device, when negated it indicates transfer of control information. |
| COMMAND RECEIVED | Asserted by device to indicate receipt of last word of control information. Remains asserted until completion of that command indicating device is in a busy state. |
| DEVICE INTERRUPT | Asserted by the device to execution of a command or completion of any request. |
| DEVICE RESET | Asserted by the controller to initialize the device. |
| CONTROL VALID | Asserted by the controller to indicate information is valid on the control lines. |

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# DATA SIGNALS

DATA SIGNALS ARE BI-DIRECTIONAL

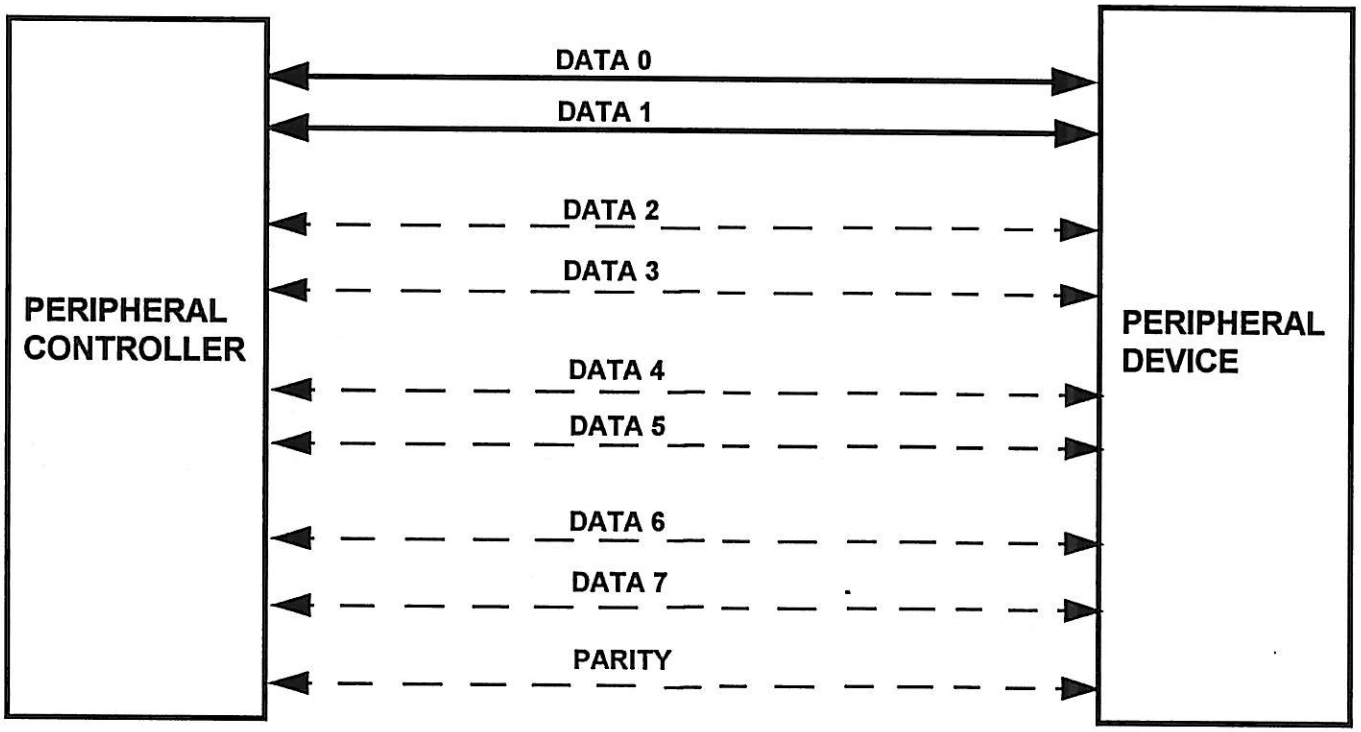
DATA SIGNALS MAY CONSIST OF 2, 4, OR 8 PHYSICAL LINES

IF 4 OR 8 PHYSICAL LINES ARE USED A PARITY BIT MUST ALSO BE USED

NUMBER OF DATA SIGNALS DETERMINED BY SYSTEM PERFORMANCE REQUIREMENTS

# PERIPHERAL DEVICE INTERFACE

## DATA SIGNALS




BI-DIRECTIONAL SIGNALS

PARITY IS OPTIONAL FOR 2 BIT TRANSFER
MANDATORY ON 4 & 8 BIT TRANSFERS

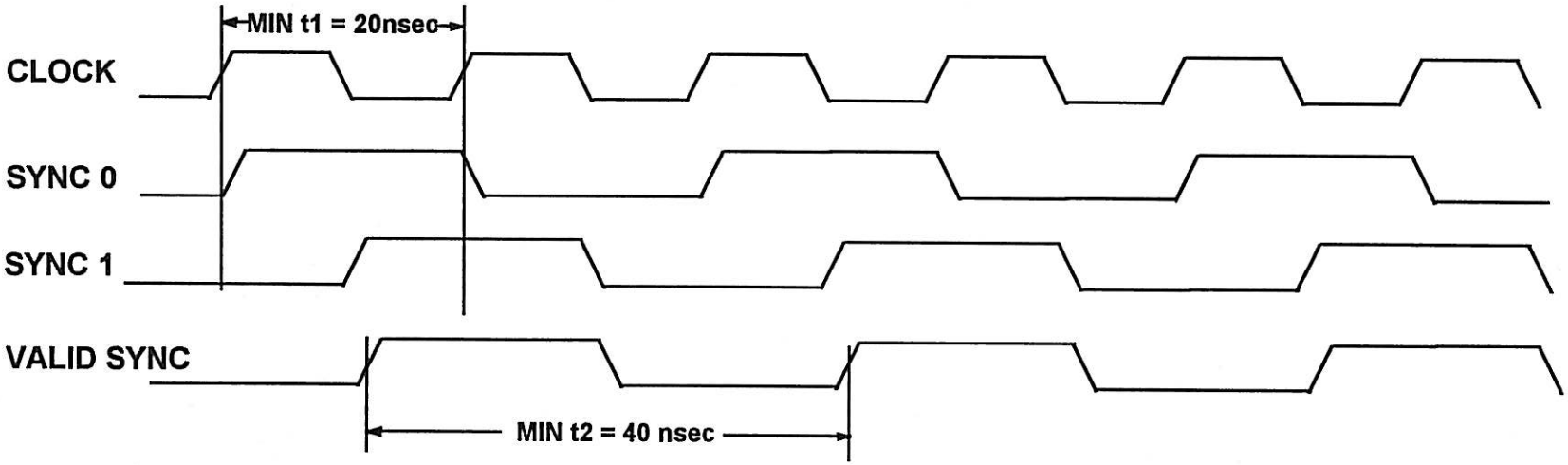
# SYNC SIGNALS

## SYNC SIGNALS ARE BI-DIRECTIONAL

## SYNC SIGNALS ARE USED IN CONJUNCTION WITH TRANSFER OF DATA, COMMAND, AND STATUS BETWEEN THE PERIPHERAL CONTROLLER AND THE PERIPHERAL DEVICE

# PERIPHERAL DEVICE INTERFACE

## SYNCRONIZATION

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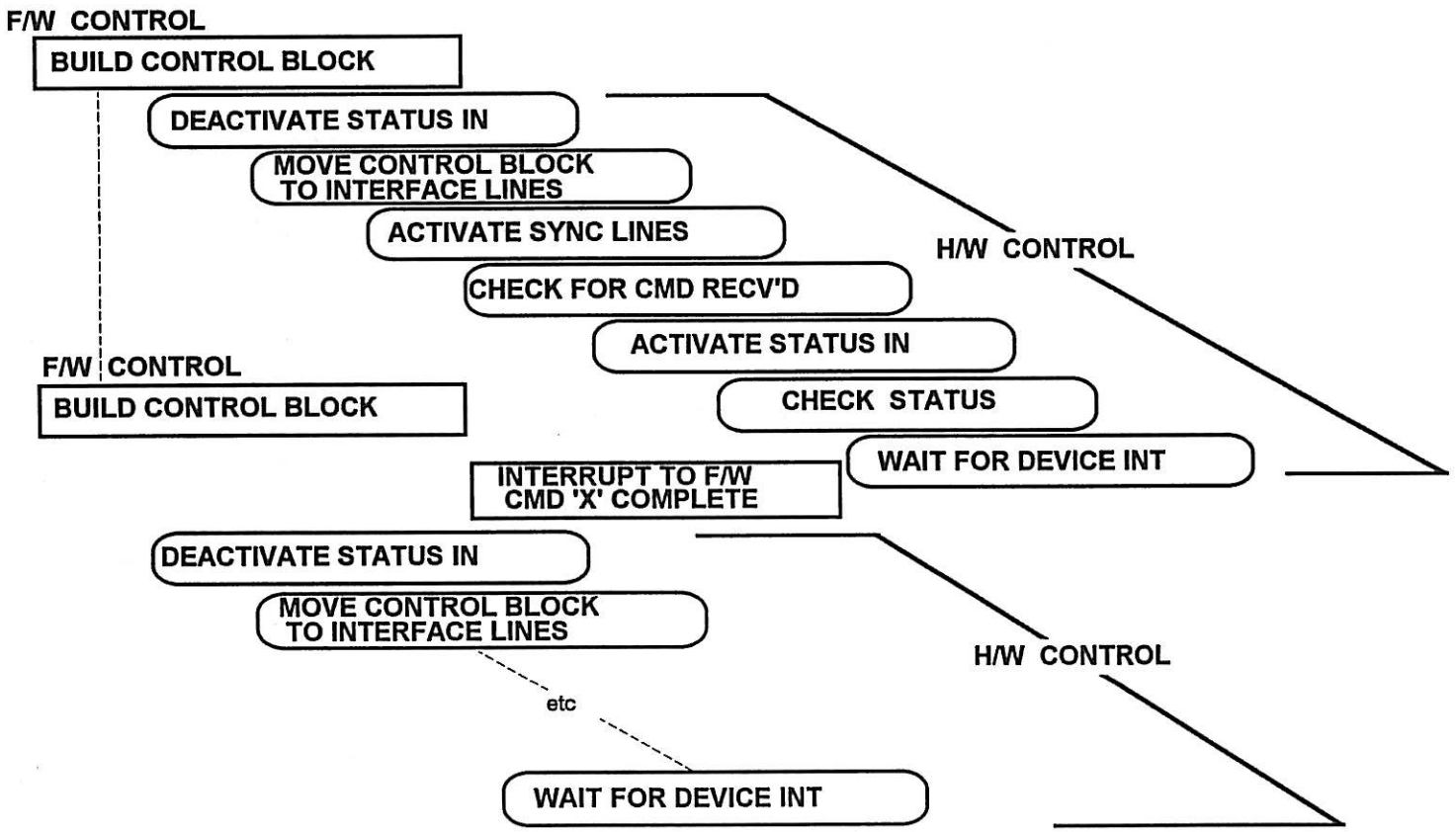
**VALID SYNC SEQUENCE**

**WHILE SYNC 0 IS ASSERTED, AND WHEN SYNC 1 IS ASSERTED, THE DURATION OF SYNC 1 BECOMES VALID SYNC TIME.**

**SYNC SIGNALS ARE SYNCRONIZED WITH THE CLOCK OF THE SENDING END OF THE INTERFACE.**

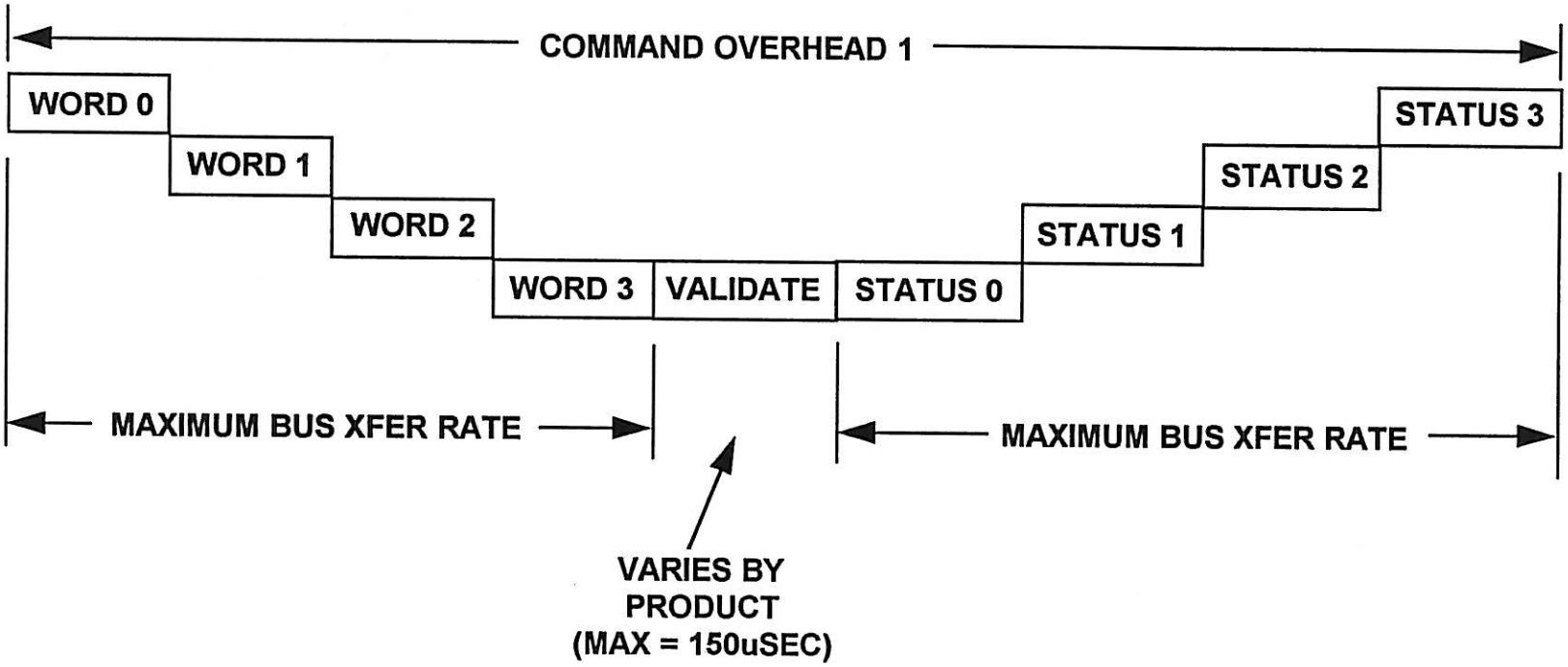
# PERIPHERAL DEVICE INTERFACE

## COMMAND BLOCK FLOW



# PERIPHERAL DEVICE INTERFACE

# TIMING CONSIDERATIONS




PREDICTABLE AND CONSISTENT LATENCY

# PERIPHERAL DEVICE INTERFACE

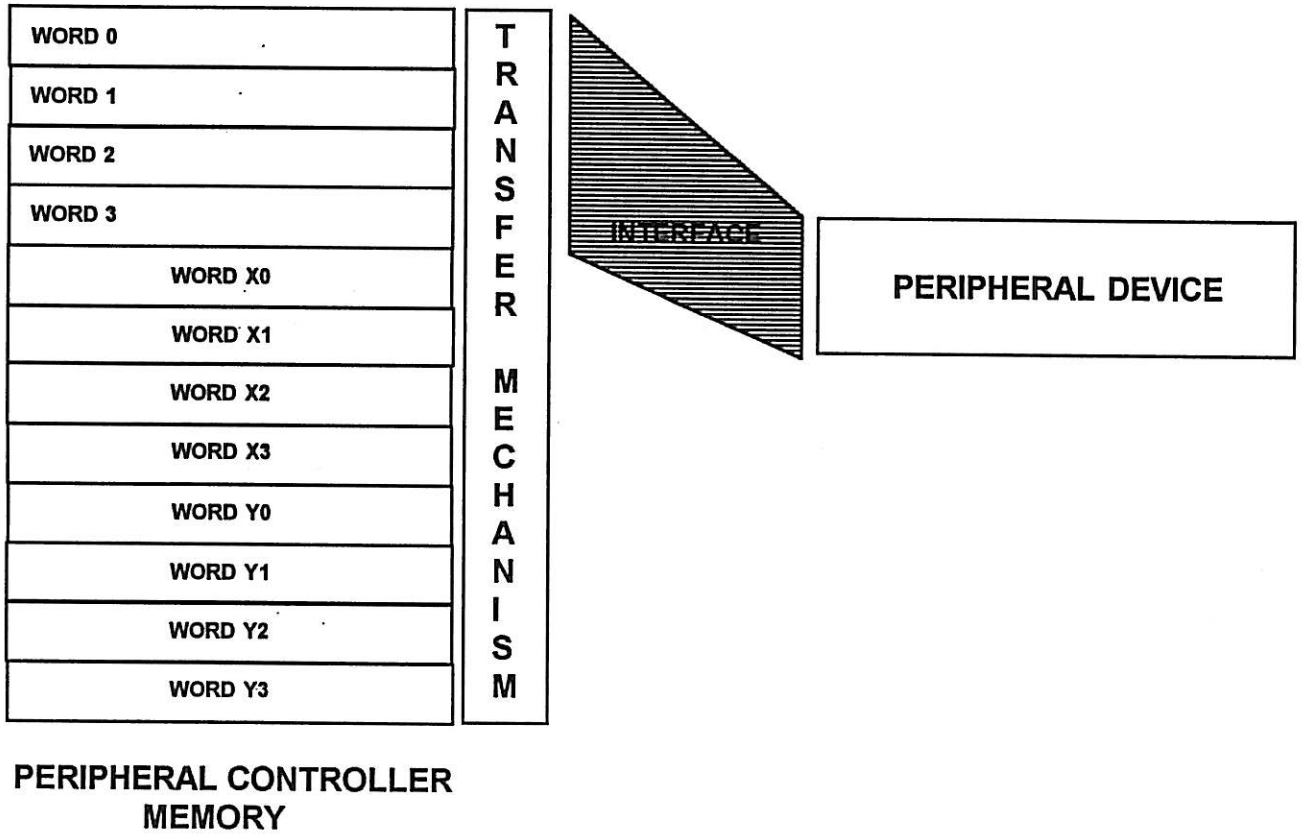
# TIMING SPECIFICATIONS

| | |
|---|---|
| MAXIMUM CLOCK FREQUENCY | 50 MHz |
| MAXIMUM TRANSFER RATES: (NON-BUFFERED) | |
| 2 BIT | 12.5 MBytes/SEC |
| 4 BIT | 25.0 MBytes/SEC |
| 8 BIT | 50.0 MBytes/SEC |
| MAXIMUM COMMAND TRANSFER TIME | 320 nsec |
| MAXIMUM COMMAND VALIDATION TIME | 150 usec |
| MAXIMUM STATUS TRANSFER TIME | 320 nsec |

NOTE:
TIMING BASED ON A MAXIMUM MEDIA
TRANSFER RATE OF 100MHz

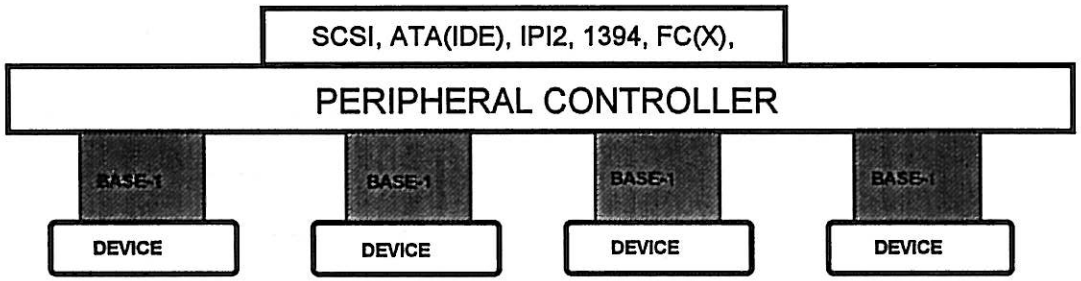
# PERIPHERAL DEVICE INTERFACE

## COMMAND RETRIEVAL



# PERIPHERAL DEVICE INTERFACE

## CONFIGURATION POSSIBILITIES




RADIAL CONNECTION

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# PERIPHERAL DEVICE INTERFACE

## ADVANTAGES OF INTERCONNECTION SCHEME

- PROVIDES LOW LEVEL ACCESS TO MEDIA (if required)
- SIMPLIFIES PERIPHERAL DEVICE FIRMWARE
- LESS COSTLY PERIPHERAL DEVICES
- EASE OF IMPLEMENTATION FOR ARRAYS OF DISKS (RAID's ??)
- PERIPHERAL GUIDED VS SYSTEM AFTER THOUGHT
- PERFORMANCE ORIENTED WITH LESS $ THAN SCSI (PER SYSTEM)