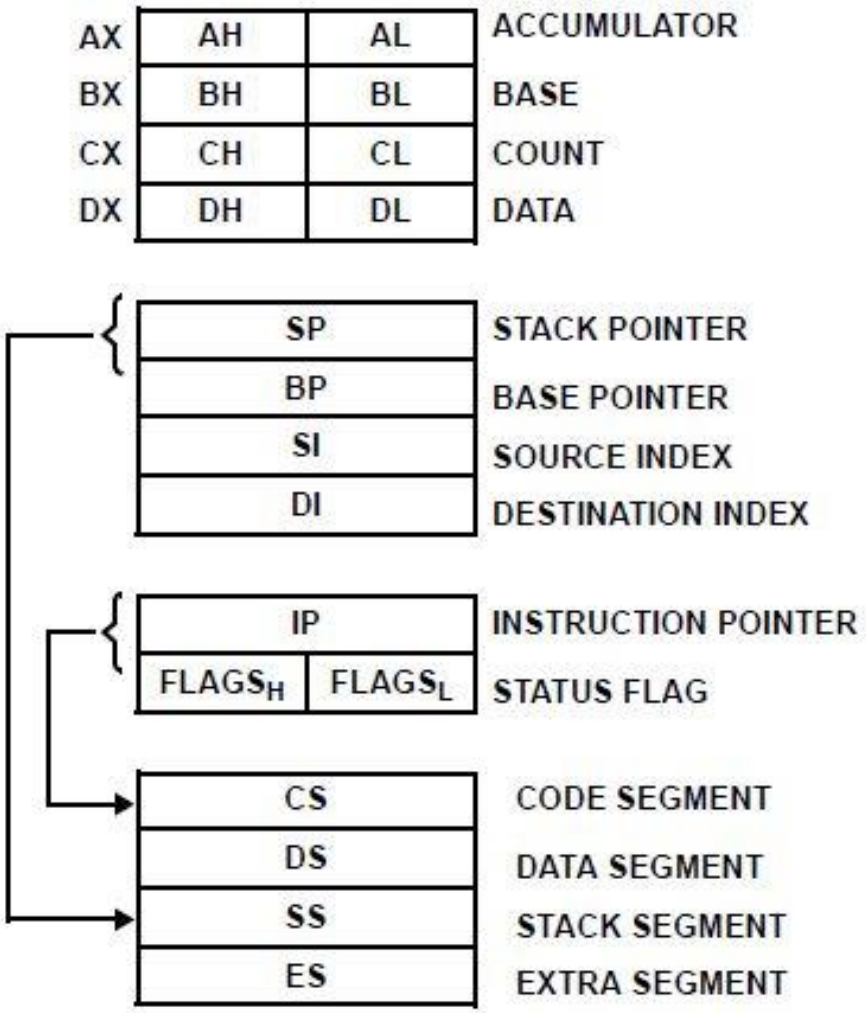
# REAL MODE x86

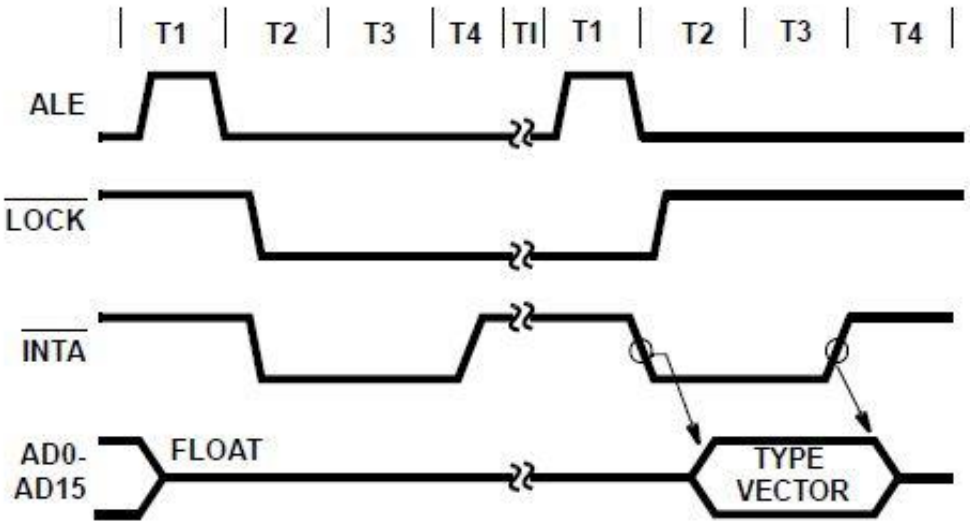


# REAL MODE x86

- **INICIALIZÁCIA PROCESORA**
- **16-BITOVÝ REÁLNY MÓD**
- **FYZICKÁ ŠTARTOVACIA ADRESA**
- **V/V PRIESTOR**

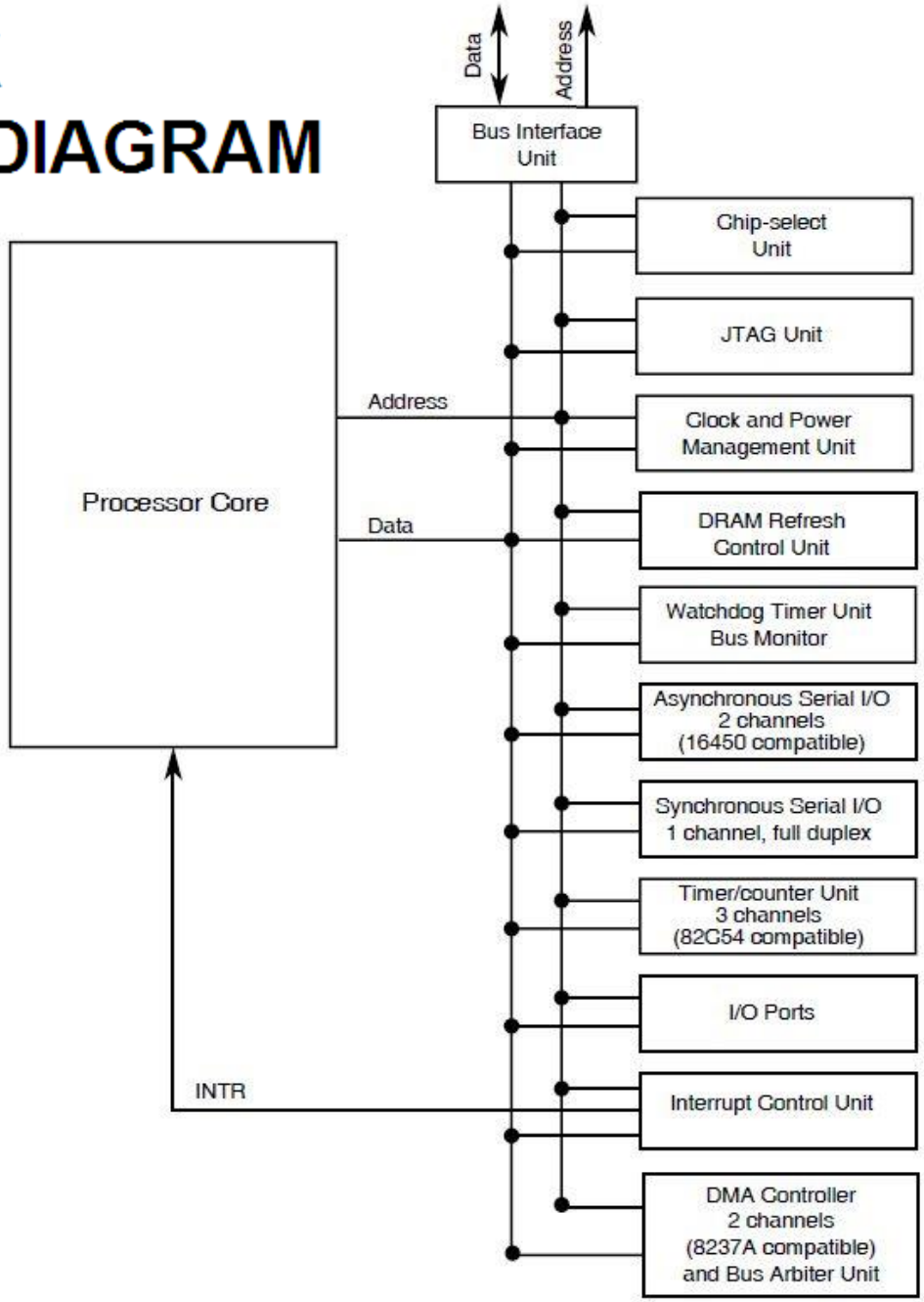
- **HARDVÉROVÉ A SOFTVÉROVÉ PRERUŠENIE**

# REAL MODE x86



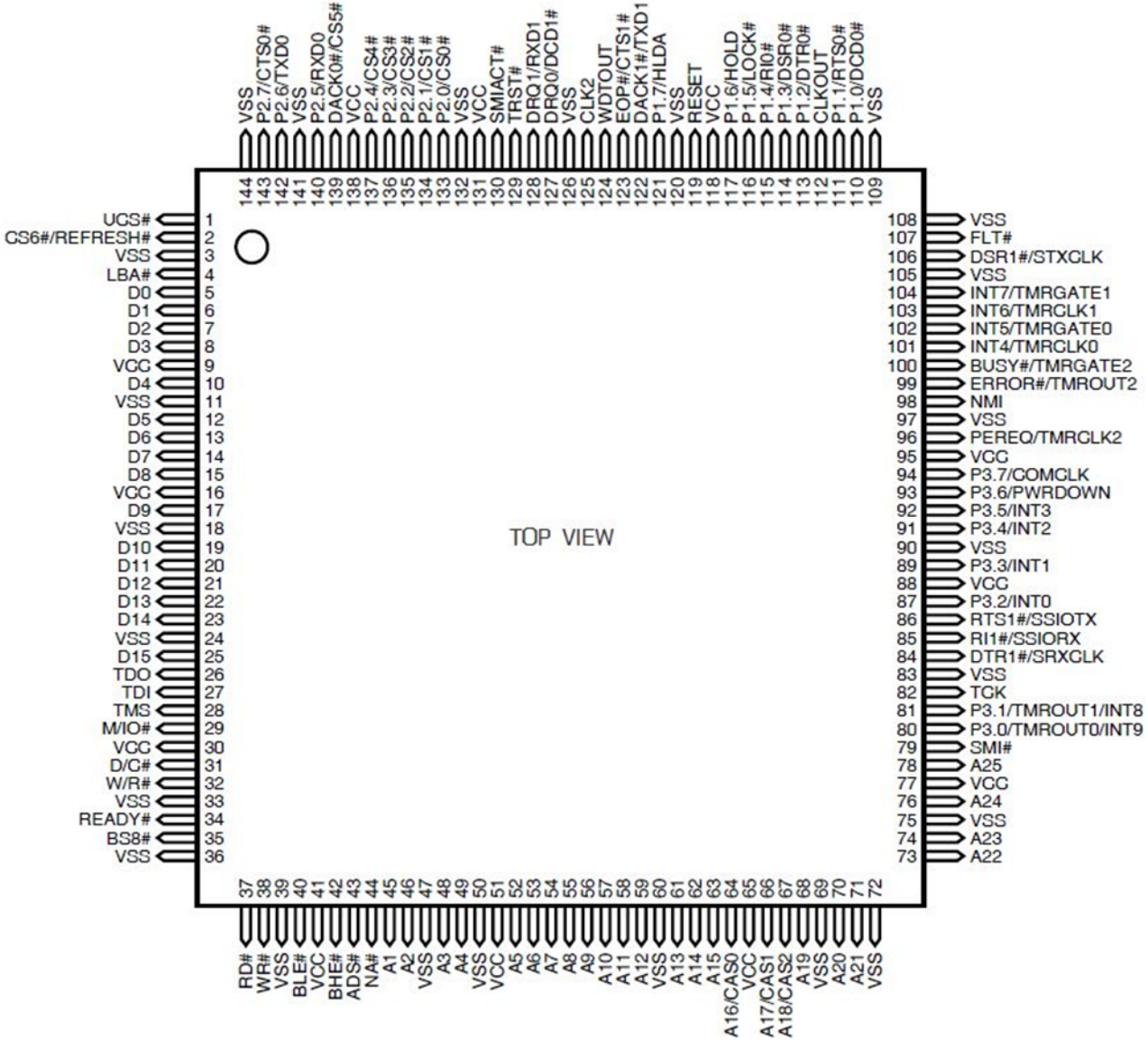

- **VEKTOR A ŠTARTOVACIA ADRESA OBSLUŽNÉHO PODPROGRAMU**

# 80386EX
# BLOCK DIAGRAM

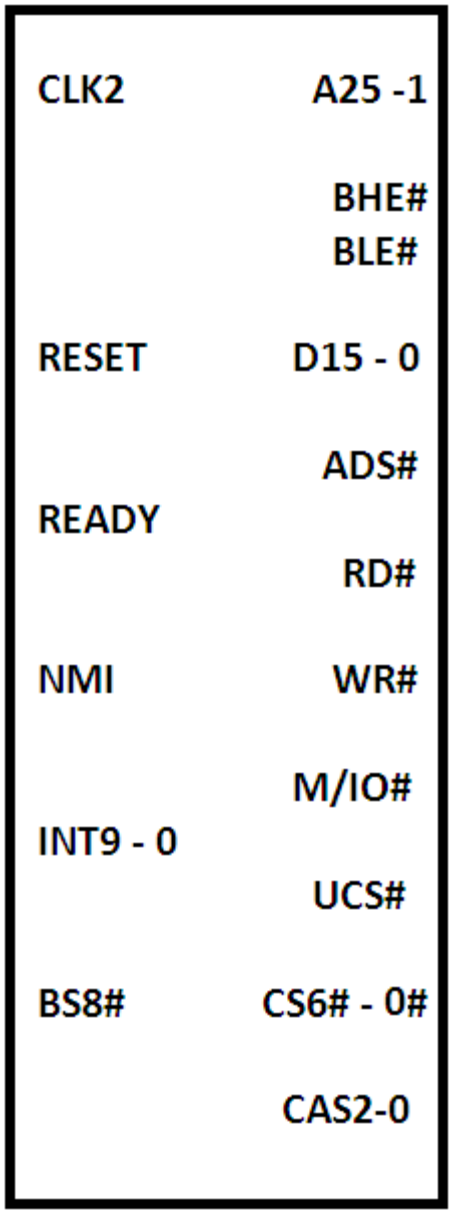


# 80386EX

# PINOUT



# 80386EX
# VYBRANÉ SIGNÁLY



# 80386EX

## PROGRAMOVATEĽNÝ DEKÓDER (CHIP Select Unit)

- UCS#, CS6# - CS0#
- 15-bit CHANNEL ADDRESS
- 15-bit MASK ADDRESS
- 26-bit ACTIVE ADDRESS

# SYSTÉM NA BÁZE 80386EX

- **Frekvencia hodín procesora 25 MHz**
- **Signál RESET (tlačidlo a nábeh NN)**
- **Signál NMI (ošetrené tlačidlo)**
- **128 kB 8-bitovej pamäte EPROM**
  **(1x 27C1001, boot, interný dekóder)**
- **64 kB 16-bitovej pamäte RWM**
  **(2x 62256, vektory, interný dekóder)**

# SYSTÉM NA BÁZE 80386EX

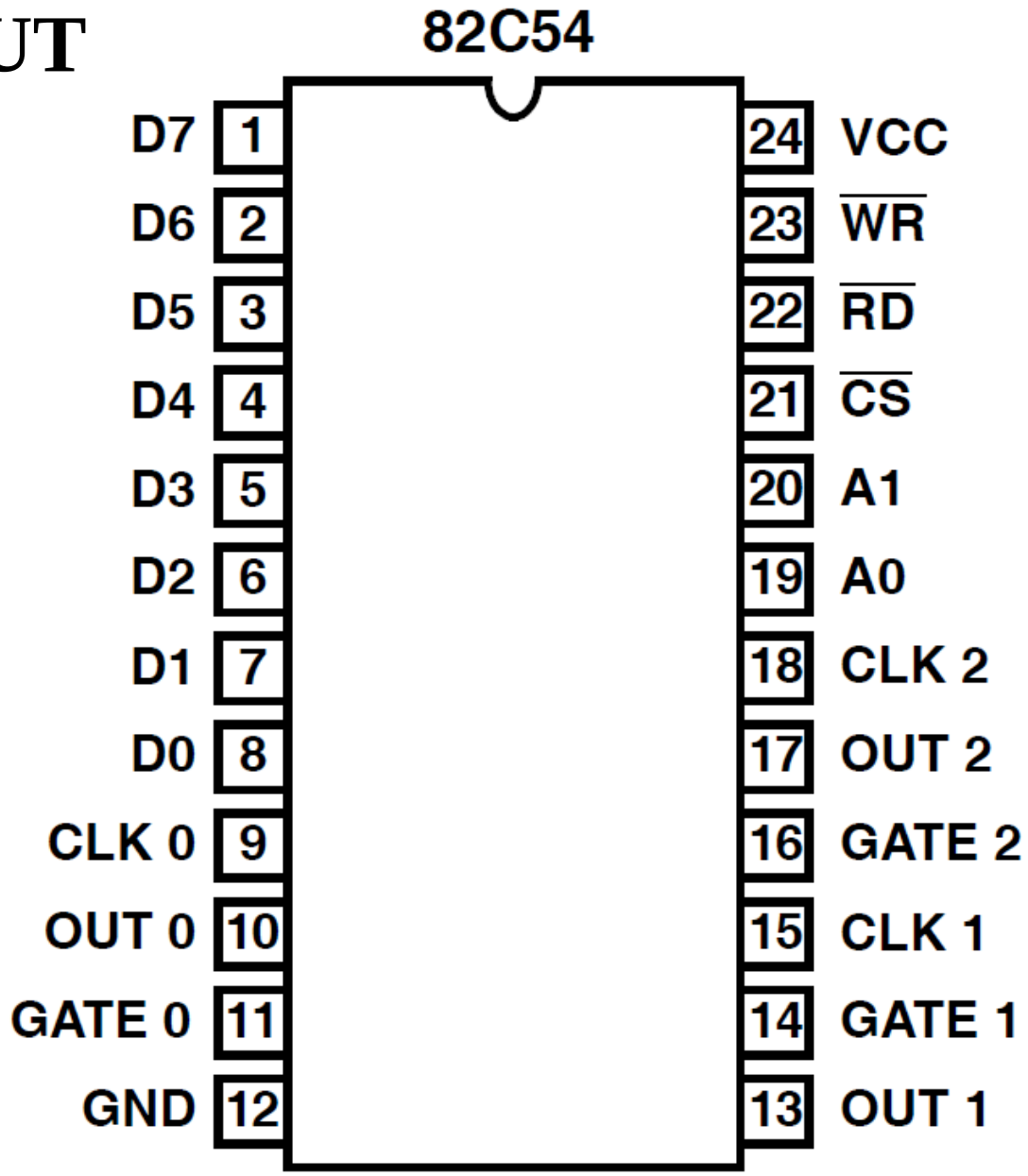
**Externý úplny dekóder:**

- **128 kB 8-bitovej pamäte EPROM (1x 27C1001, boot)**
- **64 kB 16-bitovej pamäte RWM (2x 62256, vektory)**

# PERIFÉRNE OBVODY PRE x86

- **82C54**
- **82C55**
- **16C550**
- **82C59A**

# 8254 PINOUT


82C54
D7 1
D6 2
D5 3
D4 4
D3 5
D2 6
D1 7
D0 8
CLK 0 9
OUT 0 10
GATE 0 11
GND 12
24 VCC
23 WR
22 RD
21 CS
20 A1
19 A0
18 CLK 2
17 OUT 2
16 GATE 2
15 CLK 1
14 GATE 1
13 OUT 1

# 8254 CONTROL WORD (8253)

A1, A0 = 11; $\overline{CS}$ = 0; $\overline{RD}$ = 1; $\overline{WR}$ = 0

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|
| SC1 | SC0 | RW1 | RW0 | M2 | M1 | M0 | BCD |

**SC - SELECT COUNTER**

| SC1 | SC0 | |
|---|---|---|
| 0 | 0 | Select Counter 0 |
| 0 | 1 | Select Counter 1 |
| 1 | 0 | Select Counter 2 |
| 1 | 1 | Read-Back Command (See Read Operations) |

| RW1 | RW0 | |
|---|---|---|
| 0 | 0 | Counter Latch Command (See Read Operations) |
| 0 | 1 | Read/Write least significant byte only. |
| 1 | 0 | Read/Write most significant byte only. |
| 1 | 1 | Read/Write least significant byte first, then most significant byte. |

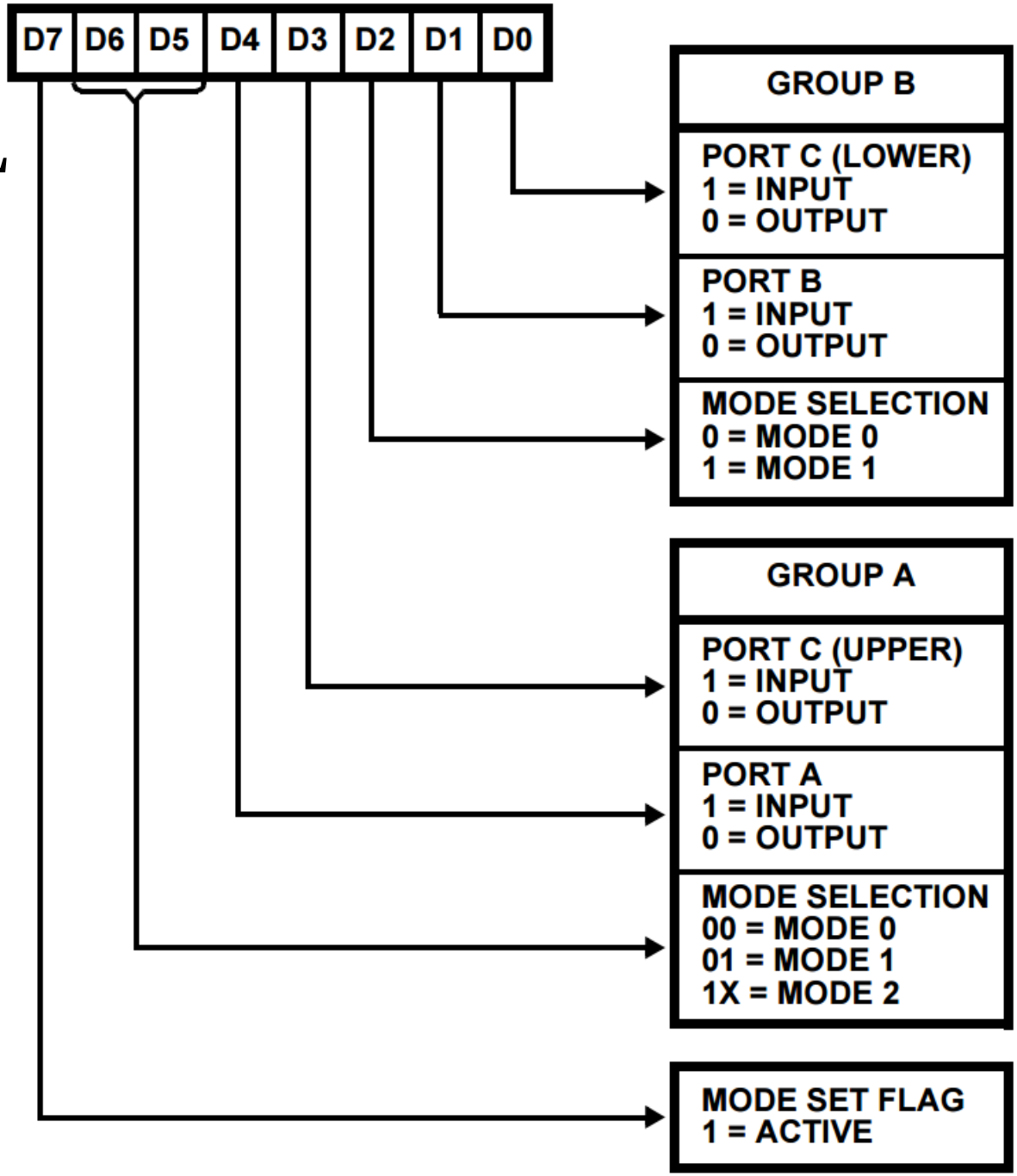
**M - MODE**

| M2 | M1 | M0 | |
|---|---|---|---|
| 0 | 0 | 0 | Mode 0 |
| 0 | 0 | 1 | Mode 1 |
| X | 1 | 0 | Mode 2 |
| X | 1 | 1 | Mode 3 |
| 1 | 0 | 0 | Mode 4 |
| 1 | 0 | 1 | Mode 5 |

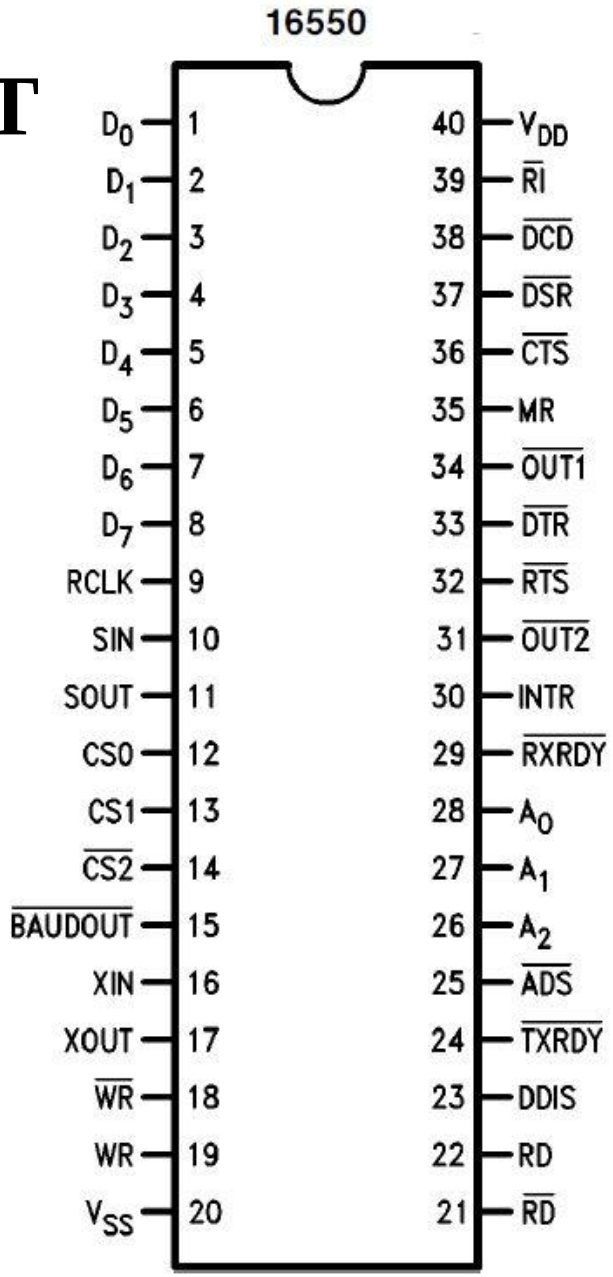
**BCD - BINARY CODED DECIMAL**

| | |
|---|---|
| 0 | Binary Counter 16-bit |
| 1 | Binary Coded Decimal (BCD) Counter (4 Decades) |

# 8255 CONTROL WORD



# 16550 PINOUT



## Register Addresses

| DLAB | $A_2$ | $A_1$ | $A_0$ | Register |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | Receiver Buffer (read), Transmitter Holding Register (write) |
| 0 | 0 | 0 | 1 | Interrupt Enable |
| X | 0 | 1 | 0 | Interrupt Identification (read) |
| X | 0 | 1 | 0 | FIFO Control (write) |
| X | 0 | 1 | 1 | Line Control |
| X | 1 | 0 | 0 | MODEM Control |
| X | 1 | 0 | 1 | Line Status |
| X | 1 | 1 | 0 | MODEM Status |
| X | 1 | 1 | 1 | Scratch |
| 1 | 0 | 0 | 0 | Divisor Latch (least significant byte) |
| 1 | 0 | 0 | 1 | Divisor Latch (most significant byte) |

# Line Control Register

| DL | SB | ST | P | PE | S | L1 | L0 |
|---|---|---|---|---|---|---|---|

# FIFO Control Register

| RT1 | RT0 | 0 | 0 | DMA | TRS | RRS | FEN |
|---|---|---|---|---|---|---|---|

# Interrupt Control Register

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | EM | EL | ET | ER |

# Line Status Register

| ER | TE | TH | BI | FE | PE | OE | DR |
|---|---|---|---|---|---|---|---|

# Interrupt Identif. Register

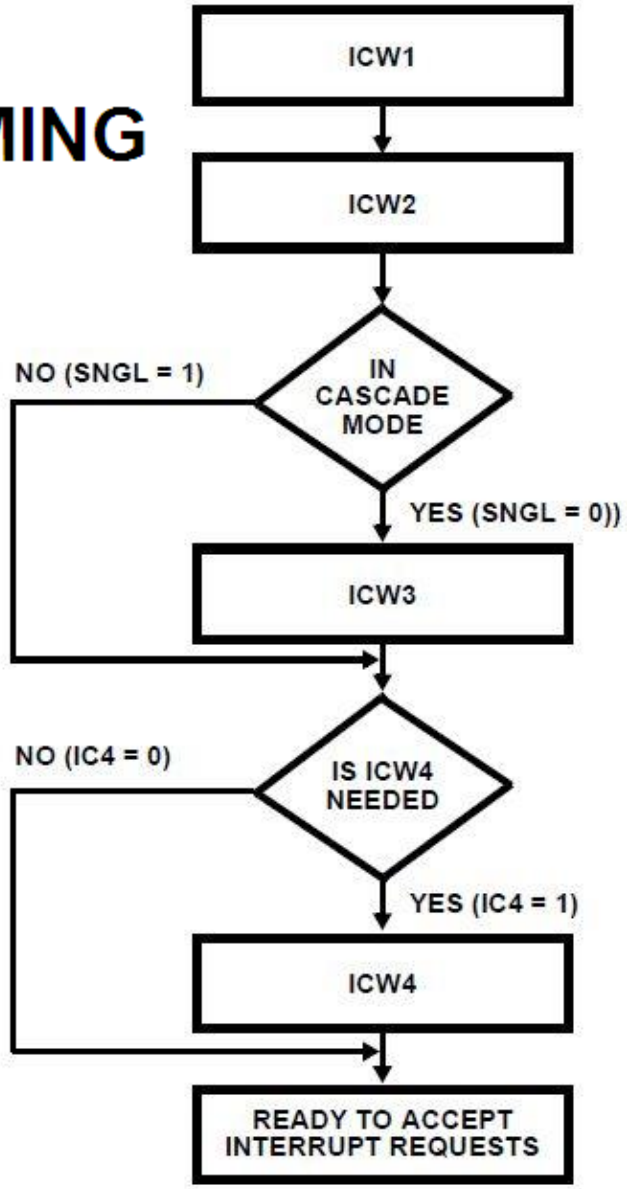
| 0 | 0 | 0 | 0 | ID | ID | ID | PN |
|---|---|---|---|---|---|---|---|

# 82C59A (PIC)

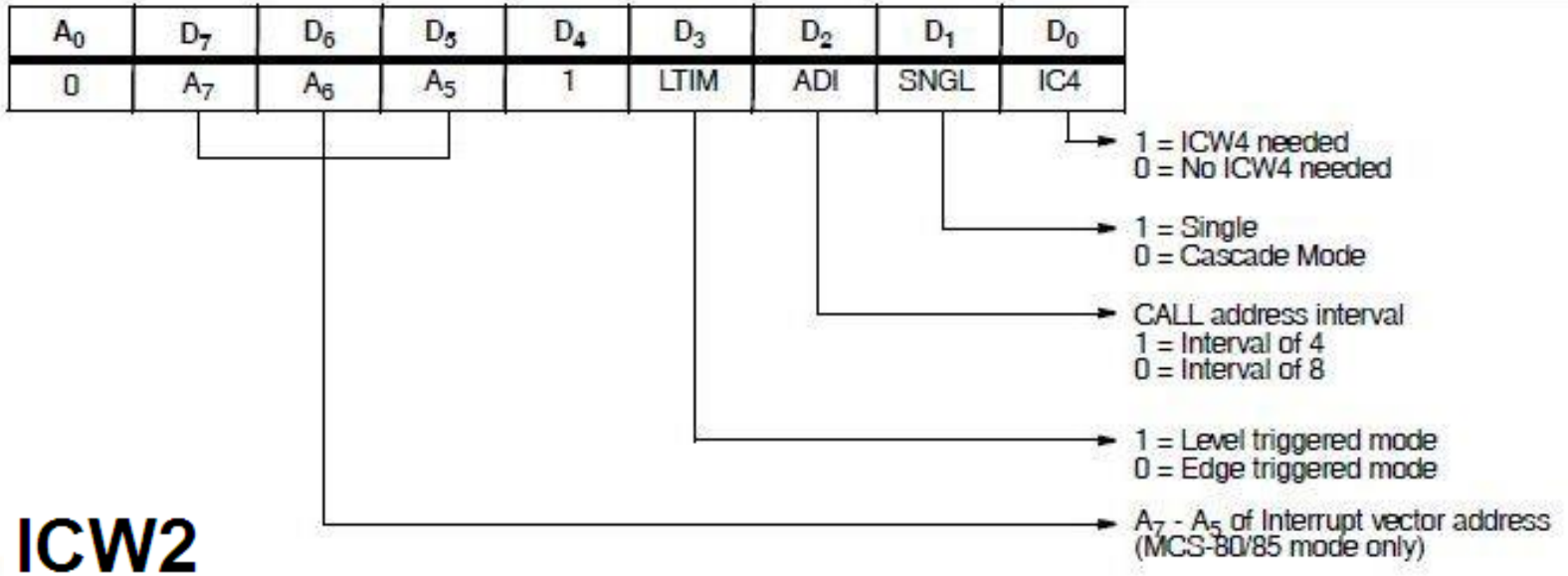
- **BLOKOVÁ SCHÉMA**

- **JEDNOÚROVNOVÝ SYSTÉM**
- **DVOJÚROVŇOVÝ SYSTÉM**
- **TROJÚROVŇOVÝ SYSTÉM**

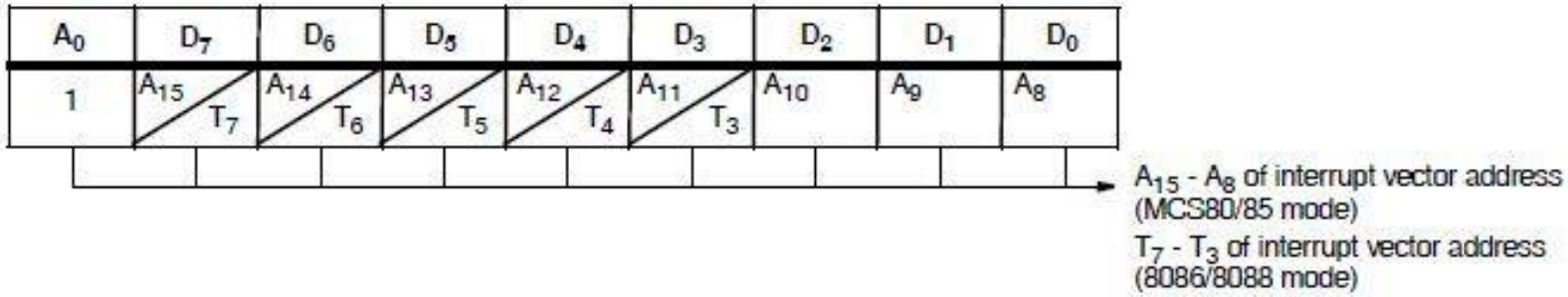
# 8259A PROGRAMMING



# ICW1


A0 D7 D6 D5 D4 D3 D2 D1 D0
0 A7 A6 A5 1 LTIM ADI SNGL IC4
1 = ICW4 needed
0 = No ICW4 needed
1 = Single
0 = Cascade Mode
CALL address interval
1 = Interval of 4
0 = Interval of 8
1 = Level triggered mode
0 = Edge triggered mode
A7 - A5 of Interrupt vector address
(MCS-80/85 mode only)

# ICW2


A0 D7 D6 D5 D4 D3 D2 D1 D0
1 A15 T7 A14 T6 A13 T5 A12 T4 A11 T3 A10 A9 A8
A15 - A8 of interrupt vector address
(MCS80/85 mode)
T7 - T3 of interrupt vector address
(8086/8088 mode)

# ICW3 (MASTER)

| $A_0$ | $D_7$ | $D_6$ | $D_5$ | $D_4$ | $D_3$ | $D_2$ | $D_1$ | $D_0$ |
|---|---|---|---|---|---|---|---|---|
| 1 | $S_7$ | $S_6$ | $S_5$ | $S_4$ | $S_3$ | $S_2$ | $S_1$ | $S_0$ |

1 = IR input has a slave
0 = IR input does not have a slave

# ICW3 (SLAVE)

| $A_0$ | $D_7$ | $D_6$ | $D_5$ | $D_4$ | $D_3$ | $D_2$ | $D_1$ | $D_0$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | $ID_2$ | $ID_1$ | $ID_0$ |

SLAVE ID (NOTE)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |

# ICW4

| $A_0$ | $D_7$ | $D_6$ | $D_5$ | $D_4$ | $D_3$ | $D_2$ | $D_1$ | $D_0$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | SFNM | BUF | M/S | AEOI | µPM |

1 = 8086/8088 mode
0 = MCS-80/85 mode

1 = Auto EOI
0 = Normal EOI

| | | |
|---|---|---|
| 0 | X | - Non buffered mode |
| 1 | 0 | - Buffered mode slave |
| 1 | 1 | - Buffered mode master |

1 = Special fully nested moded
0 = Not special fully nested mode

# OCW1

| $A_0$ | $D_7$ | $D_6$ | $D_5$ | $D_4$ | $D_3$ | $D_2$ | $D_1$ | $D_0$ |
|---|---|---|---|---|---|---|---|---|
| 1 | $M_7$ | $M_6$ | $M_5$ | $M_4$ | $M_3$ | $M_2$ | $M_1$ | $M_0$ |

Interrupt Mask
1 = Mask set
0 = Mask reset

# OCW2

| $A_0$ | $D_7$ | $D_6$ | $D_5$ | $D_4$ | $D_3$ | $D_2$ | $D_1$ | $D_0$ |
|---|---|---|---|---|---|---|---|---|
| 0 | R | SL | EOI | 0 | 0 | $L_2$ | $L_1$ | $L_0$ |

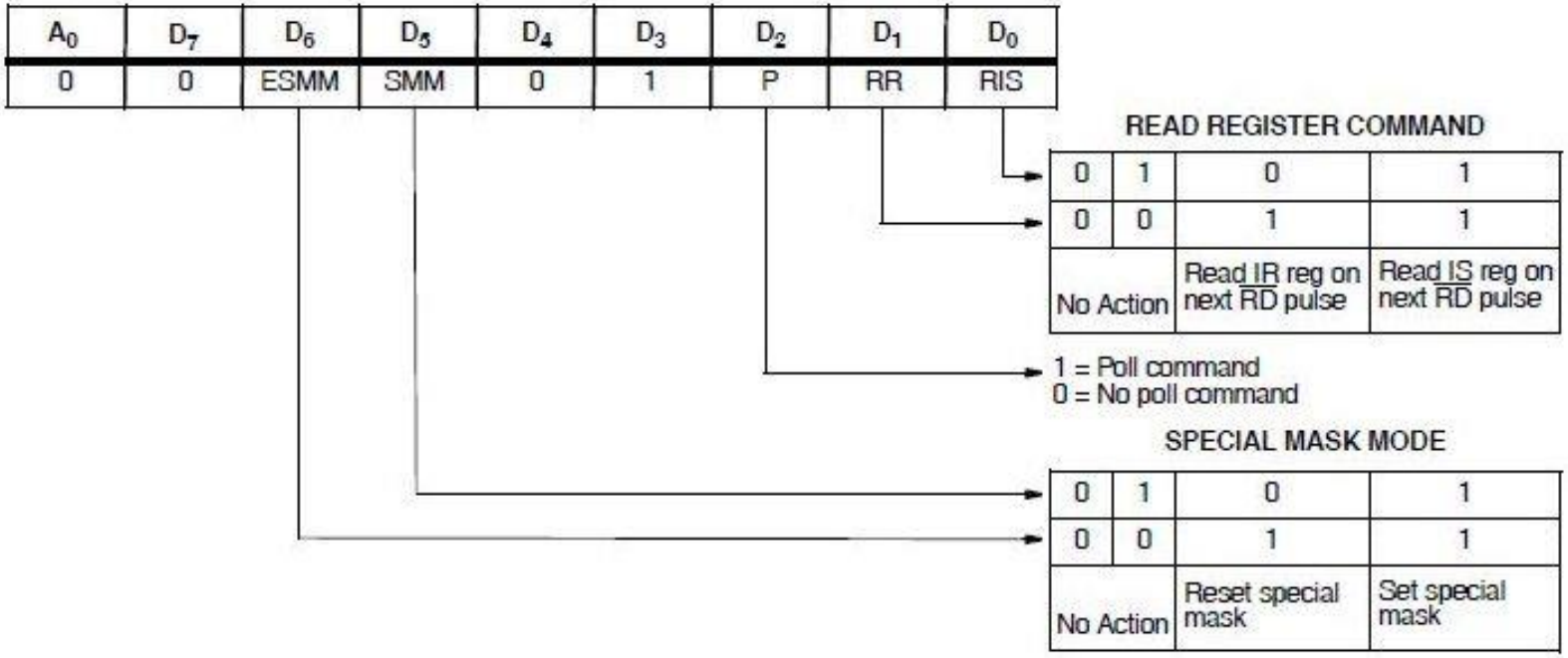
IR LEVEL TO BE ACTED UPON

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |

| | | | | |
|---|---|---|---|---|
| 0 | 0 | 1 | Non-specific EOI command | End of interrupt |
| 0 | 1 | 1 | † Specific EOI command | |
| 1 | 0 | 1 | Rotate on non-specific EOI command | Automatic rotation |
| 1 | 0 | 0 | Rotate in automatic EOI mode (set) | |
| 0 | 0 | 0 | Rotate in automatic EOI mode (clear) | |
| 1 | 1 | 1 | † Rotate on specific EOI command | |
| 1 | 1 | 0 | † Set priority command | Specific rotation |
| 0 | 1 | 0 | No operation | |

† $L_0$ - $L_2$ are used

# OCW3


A0 D7 D6 D5 D4 D3 D2 D1 D0
0 0 ESMM SMM 0 1 P RR RIS
READ REGISTER COMMAND
0 1 0 1
0 0 1 1
No Action
Read IR reg on next RD pulse
Read IS reg on next RD pulse
1 = Poll command
0 = No poll command
SPECIAL MASK MODE
0 1 0 1
0 0 1 1
No Action
Reset special mask
Set special mask

# SYSTÉM NA BÁZE 80386EX

- **8254/1: F300H - F303H**
- **8254/2: F304H - F307H**
- **8255/1: F310H - F313H**
- **8255/2: F314H - F317H**
- **16550/1: F380H - F387H**
- **16550/2: F390H - F397H**
- **externý úplny dekóder, overiť M vs. IO priestor**