

PROGRAMMING THE 8259A

The 8259A accepts two types of command words generated by the CPU:

1. Initialization Command Words (ICWs): Before normal operation can begin, each 8259A in the system must be brought to a starting point by a sequence of 2 to 4 bytes timed by WR pulses.
2. Operation Command Words (OCWs): These are the command words which command the 8259A to operate in various interrupt modes. These modes are:
 - a. Fully nested mode
 - b. Rotating priority mode
 - c. Special mask mode
 - d. Polled mode

The OCWs can be written into the 8259A anytime after initialization.

INITIALIZATION COMMAND WORDS (ICWS)

General

Whenever a command is issued with $A0 = 0$ and $D4 = 1$, this is interpreted as Initialization Command Word 1 (ICW1). ICW1 starts the initialization sequence during which the following automatically occur.

- a. The edge sense circuit is reset, which means that following initialization, an interrupt request (IR) input must make a low-to-high transition to generate an interrupt.
- b. The Interrupt Mask Register is cleared.
- c. IR7 input is assigned priority 7.
- d.

The slave mode address is set to 7.

- e. Special Mask Mode is cleared and Status Read is set to IRR.
- f. If $IC4 = 0$, then all functions selected in ICW4 are set to zero. (Non-Buffered mode*, no Auto-EOI, MCS-80, 85 system).

*NOTE:

Master/Slave in ICW4 is only used in the buffered mode.

Initialization Command Words 1 and 2 (ICW1, ICW2)

A5–A15: Page starting address of service routines. In an MCS 80/85 system, the 8 request levels will generate CALLs to 8 locations equally spaced in memory. These can be programmed to be spaced at intervals of 4 or 8 memory locations, thus the 8 routines will occupy a page of 32 or 64 bytes, respectively.

The address format is 2 bytes long (A0–A15). When the routine interval is 4, A0–A4 are automatically inserted by the 8259A, while A5–A15 are programmed externally. When the routine interval is 8, A0–A5 are automatically inserted by the 8259A, while A6–A15 are programmed externally.

The 8-byte interval will maintain compatibility with current software, while the 4-byte interval is best for a compact jump table.

In an 8086 system A15–A11 are inserted in the five most significant bits of the vectoring byte and the

8259A sets the three least significant bits according to the interrupt level. A10–A5 are ignored and ADI (Address interval) has no effect.

LTIM: If $LTIM = 1$, then the 8259A will operate in the level interrupt mode. Edge detect logic on the interrupt inputs will be disabled.

ADI: CALL address interval. $ADI = 1$ then interval = 4; $ADI = 0$ then interval = 8.

SNGL: Single. Means that this is the only 8259A in the system. If $SNGL = 1$ no ICW3 will be issued.

IC4: If this bit is set ICW4 has to be read. If

ICW4 is not needed, set $IC4 = 0$.

Initialization Command Word 3 (ICW3)

This word is read only when there is more than one

8259A in the system and cascading is used, in which case $SNGL = 0$. It will load the 8-bit slave register. The functions of this register are:

a. In the master mode (either when $SP = 1$, or in buffered mode when $M/S = 1$ in ICW4) a "1" is set for each slave in the system. The master then will release byte 1 of the call sequence (for MCS-

80/85 system) and will enable the corresponding slave to release bytes 2 and 3 (for 8086 only byte

2) through the cascade lines.

b. In the slave mode (either when $SP = 0$, or if $BUF = 1$ and $M/S = 0$ in ICW4) bits 2–0 identify the slave. The slave compares its cascade input with these bits and, if they are equal, bytes 2 and 3 of the call sequence (or just byte 2 for 8086) are released by it on the Data Bus.

Initialization Command Word 4 (ICW4)

SFNM: If $SFNM = 1$ the special fully nested mode is programmed.

BUF: If $BUF = 1$ the buffered mode is programmed. In buffered mode SP/EN becomes an enable output and the master/slave determination is by M/S .

M/S : If buffered mode is selected: $M/S = 1$ means the 8259A is programmed to be a

master, $M/S = 0$ means the 8259A is programmed to be a slave. If $BUF = 0$, M/S has no function.

AEOI: If $AEOI = 1$ the automatic end of interrupt mode is programmed.

mPM: Microprocessor mode: $mPM = 0$ sets the

8259A for MCS-80, 85 system operation, $mPM = 1$ sets the 8259A for 8086 system operation.