

# MPME216

## An ANC216 Memory Extension

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### Introduction

The MPME216 is an external device ANC216-compatible used to extends and manage external memories.

### Definitions

This section contains all the definitions and abbreviations that can be found in the article.

- Byte: 8 bits.
- Bus: a computer communication system used to connect components and peripherals.
- CPU: Central Processing Unit, is the main processor in a computer.
- EEPROM: Electrically Erasable Programmable Read Only Memory.
- EINR: External Interrupt.
- EMEM: External Memory.
- HEX: Hexadecimal.
- INR: Interrupt.
- IO: Input/Output.
- RAM: Random Access Memory
- ROM: Read Only Memory.
- Word: 16 bits.

### Details

As per standard, the device ID is 0x0102. The device ID is a number used to specify classes of IO device compatible with the ANC216 external bus. 0x0102 identifies all the memory extension devices.

MPME216 stands for Memory Paging Mapping Extension 216 and supports 16-bit data transfer (some devices uses only 8-bit). The data bus is used to specify the 16-bit address.

## Buses

The MPME216 is fully compatible with the ANC216 bus. The ANC216 external bus is actually made up of several buses:

- The address bus (16-bit) is used by the CPU to specify which device it wants communicate with. It is also used by external devices when they receive the grant from the bus arbiter to identify itself to the CPU (in addition to the device id, the CPU needs to know from which address it is communicating).
- The data bus (16-bit) is used to transfer data from the CPU to the external devices and vice versa.
- Finally there is the control bus (8-bit) used to specify the operation type and to request the use of the bus to the arbiter. Every wire of the control bus has its own meaning:
  - The wire 0 is called *ie* and is used only by the CPU to specify an internal or external connection
  - The wire 1 is called *rw* and is used to specify read (0) or write (1).
  - The wire 2 is called *req* and is used to make a request to the bus arbiter.
  - The wire 3 is called *w* (for data width) and specify if data are 8-bit (0) or 16-bit (1).
  - The wire 4 is called *i* (for information) and specify if the request is an information request. An information request can be done by the CPU or external devices and is used if one device wants to know the device ID of another.
  - The wire 5 is called *hreq* and is used to make high priority request to the bus arbiter.
  - The wire 6, called *g*, is used by the arbiter to grant the use of the bus.
  - Finally the wire 7 called *a* (for additional), is an additional bus used by external devices and the CPU to add more information regarding the type of exchange operation.

## Memory paging mapping extension

In OS systems the paging is a way that OS uses to manage memory. In this case is a little different. A MPME unit map portions of memory (RAM, ROM, EEPROM...), that are called pages, in a single EMEM address. The maximum amount of memory that these units can address is 64KB.

The CPU uses the data bus to specify addresses, the MPME unit uses data to send data. These are the possible communications:

- *rw* is 0 and *w* is set in the control bus: The CPU wants to read a 16-bit value and send the address over the data bus.
- *rw* and *w* are set: The CPU wants to write a 16-bit value, first send the address via the data bus, then send the data with *rw* and *w* still set and the additional wire set.
- If *rw* and *w* are clear (are 0), is like the first point but data width is 8-bits.
- If *rw* is set and *w* is clear is like the second point but data width is 8-bits.