


Multimode Pins

- Many pins have multiple names
- Represent two or more functions
- Functionality depends upon
 - Operational mode
 - User selected configuration bits

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68HC11 Processor Mode

- Determined at reset
 - By MODB and MODA pins
 - Status are latched for program access

Pins			HPRIO Bits		
MODB	MODA	Mode	RBOOT	SMOD	MDA
0	0	Special Bootstrap	1	1	0
0	1	Special Test	0	1	1
1	0	Single Chip	0	0	0
1	1	Expanded bus	0	0	1

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Port A (0x1000)

- Pins PA0-PA2 input capture (more later) or input pins if no input capture
- Pins PA3-PA6 output compare, or output pins
- PA7, either input or output. Direction controlled by bit 7 of PACTL (0x1026)

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Port B (0x1004) – Standard

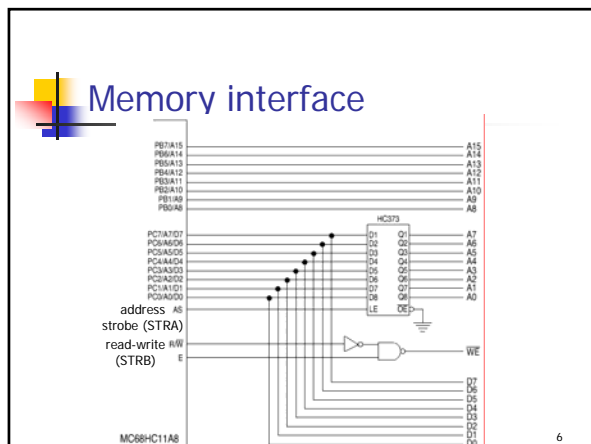
- Usage depends on mode
 - Single chip and bootstrap modes
 - Output pins
 - Expanded bus and test modes
 - Bits A8 to A15 of address bus
 - Port replacement unit (PRU, MC68HC24) enables both uses


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Port C (0x1003) – Standard

- Usage depends on mode
 - Single chip or bootstrap modes
 - Input or output pins
 - Chosen through DDRC (0x1007)
 - Expanded bus and test modes
 - Pins AD0-AD7 of the address/data bus
 - Time multiplexed
 - PRU restores general purpose I/O capability

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Port D (0x1008)

- 6 pins (PD0-PD5) can be used for one of the following
 - General Purpose I/O, selected through DDRD (0x1009)
 - Fox11 – connected to keypad rows
 - Serial I/O


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Port E (0x100A)

- 8 pins (PE0-PE7) can be used for one of the following...
 - Digital inputs
 - Fox11: Connected to keypad columns
 - Analog to digital conversion (A/D converter, ADC)
 - More later


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Port B (0x1404) – Fox11

- Pins PB0-PB7
- Digital outputs
- Connected to the LEDs
- Don't get confused with the other Port B


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Port C (0x1403) – Fox11

- Pins PC0-PC7
- Digital inputs
- Connected to the DIP switches
- Don't get confused with the other Port C


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Port F (0x1401) – Fox11

- Digital outputs
- Connected to the liquid crystal display (LCD)
 - Access by removing display
- Very non-standard


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I/O Methods (1)

- 2 so far...
 - Read/write at any time (memory, LED display, outputs to LEDs)
 - Okay if device is fast and always available
 - Polling (keypad)
 - Keeps processor busy
 - Not efficient enough for many applications, especially when multiple devices must be polled


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I/O Methods (2)

- Handshaking
 - Simple strobed I/O – sender tells the receiver that data is coming
 - Full handshaking
 - Input – Receiver must indicate it is ready
 - Output – Receiver signals after data received


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Simple Strobed Input

- Input on PORTCL
- Set PIOC (0x1002) bit 4 (HNDS – handshaking mode) to 0 (default)
- STRA (strobe A) input pin used to indicate when input data are available
 - Read via STAF (strobe A flag) – bit 7 of PIOC
- STAI bit (6) of PIOC can also enable interrupts when STRA is triggered
- EGA bit (1) of PIOC is 0 to activate on falling edge on STRA, 1 for rising edge

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Simple Strobed Output

- Output on PORTB
- Set PIOC (0x1002) bit 4 (HNDS – handshaking mode) to 0 (same as for simple strobed input)
- STRB output pin active for 2 clocks when data written to port B
 - INVB bit (0) of PIOC indicates polarity of active signal

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