Zilog - Z84C1510FEC Datasheet

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Applications of Embedded - Microprocessors

Embedded microprocessors are utilized across a broad spectrum of applications, making them indispensable in

Details	
Product Status	Obsolete
Core Processor	Z80
Number of Cores/Bus Width	1 Core, 8-Bit
Speed	10MHz
Co-Processors/DSP	-
RAM Controllers	-
Graphics Acceleration	No
Display & Interface Controllers	-
Ethernet	-
SATA	-
USB	-
Voltage - I/O	5.0V
Operating Temperature	-40°C ~ 100°C (TA)
Security Features	-
Package / Case	100-QFP
Supplier Device Package	100-QFP
Purchase URL	https://www.e-xfl.com/product-detail/zilog/z84c1510fec

CPU SIGNALS (Continued)

Pin Name	Pin Number	Input/Output, 3-State	Function
A7RF	55(x13), 70(x15)	Out	1-bit auxiliary address bus. Output is the same as bit-7 (A7) of the address bus. However, during a refresh cycle, this pin outputs the address which is the most significant bit of the 8-bit refresh address signal linked to the low order 7 bits of the address bus.

CTC SIGNALS

Pin Name	Pin Number	Input/Output, 3-State	Function
CLK/TRG0 - CLK/TRG3	75-72(x13), 81-78(x15)	In	External clock/trigger input. These four CLK/TRG pins correspond to four Counter/Timer Channels. In the counter mode, each active edge will cause the downcounter to decrement by one. In timer mode, an active edge will start the timer. It is program selectable whether the active edge is rising or falling.
ZC/TO0 - ZC/TO3	68-71(x13), 74-77(x15)	Out	Zero count/timer out signal. In either timer or counter mode, pulses are output when the down-counter has reached zero.

SIO SIGNALS

Pin Name	Pin Number	Input/Output, 3-State	Function
/W//RDYA, /W//RDYB	32,54(x13), 30,52(x15)	Out	Wait/Ready signal A and Wait/Ready signal B. Used as /WAIT or /READY depending upon SIO programming. When programmed as /WAIT they go active at "0", alerting the CPU that addressed memory or I/O devices are not ready by requesting the CPU to wait. When programmed as /READY, they are active at "0" which determines when a peripheral device associated with a DMA port is for read/write data.
/SYNCA, /SYNCB	33,53(x13), 31,51(x15)	I/O	Synchronous signals.In asynchronous receive mode, they act as /CTS and /CDC. In external sync mode, these signals act as inputs. In internal sync mode, they act as outputs.
RxDA, RxDB	34,52(x13), 32,50(x15)	In	Serial receive data signal.

SIO SIGNALS (Continued)

Pin Name	Pin Number	Input/Output, 3-State	Function
/RxCA, /RxCB	35,51(x13), 33,49(x15)	In	Receive clock signal. In the asynchronous mode, the receive clocks can be 1, 16, 32, or 64 times the data transfer rate.
/TxCA, /TxCB	36,50(x13), 34,48(x15)	In	Transmitter clock signal. In the asynchronous mode, the transmitter clocks can be 1, 16, 32, or 64 times the data transfer rate.
TxDA, TxDB	37,49(x13), 35,47(x15)	Out	Serial transmit data signal.
/DTRA, /DTRB	38,48(x13), 36,46(x15)	Out	Data terminal ready signal. When ready, these signals go active to enable the terminal transmitter. When not ready they go inactive to disable the transfer from the terminal.
/RTSA, /RTSB	39,47(x13), 37,45(x15)	Out	Request to send signal. "0" when transmitting serial data. They are active when enabling their receivers to transmit data.
/CTSA, /CTSB	40,46(x13), 38,44(x15)	In	Clear to send signal. When "0", after transmitting these signals the modem is ready to receive serial data. When ready, these signals go active to enable terminal transmitter. When not ready, these signals go inactive to disable transfer from the terminal.
/DCDA, /DCDB	41,45(x13), 39,43(x15)	In	Data carrier detect signal. When "0", serial data can be received. These signals are active to enable receivers to transmit.

SYSTEM CONTROL SIGNALS

Pin Name	Pin Number	Input/Output, 3-State	Function
IEI	60(x13), 72(x15)	In	Interrupt enable input signal. IEI is used with the IEO to form a priority daisy chain when there is more than one interrupt-driven peripheral.
IEO	59(x13), 71(x15)	Out	The interrupt enable output signal. In the daisy chain interrupt control, IEO controls the interrupt of external peripherals. IEO is active when IEI is "1" and the CPU is not servicing an interrupt from the on-chip peripherals.
/CS0 (C13/C15 only)	42(C13), 40(C15)	Out	Chip Select 0. Used to access external memory or I/O devices. This pin has been assigned to "ICT" pin on Z84013/015. This signal is decoded only from A15-A12 without control signals. Refer to "Functional Description" on-chip select signals for further explanation.

SYSTEM CONTROL SIGNALS (Continued)

Pin Name	Pin Number	Input/Output, 3-State	Function
/CS1 (C13/C15 only)	40(x13), 42(x15)	Out	Chip Select 1. Used to access external memory or I/O devices. This pin has been assigned to "ICT" pin on Z84013/015. This signal is decoded only from A15-A12 without control signals. Refer to "Functional Description" on-chip select signals for further explanation.
/WDTOUT	61(x13), 73(x15)	Out(013/015), Open Drain(C13/C15)	Watch Dog Timer Output signal. Output pulse width depends on the externally connected pin.
/RESET	28(x13), 9(x15)	Input(013/015), I/O (Open Drain) (C13/C15)	Reset signal. /RESET signal is used for initializing MPU and other devices in the system. Also used to return from the steady state in the STOP or IDLE modes.

Note: For the Z84013/Z84015 the /RESET must be kept in active state for a period of at least three system clock cycles.

Note: For the Z84C13/Z84C15, during the power-up sequence, the /RESET becomes an Open drain output and the Z84C13/C15 will drive this pin to "0" for 25 to 75 msec after the power supply passes through approx. 2.2V and then reverts to input. If it receives the /RESET signal after power-on sequence, it will drive /RESET pin for 16-processor clock cycles depending on the status of Reset Output Disable bit in Misc Control Register. If this Reset output is disabled, it must be kept in active state for a period of at least three system clock cycles. Note, that if using Z84C13/C15 in a Z84013/015 socket, modification may be required on the reset circuit since this pin is "pure input pin" on the Z84013/015. Also, the /RESET pin doesn't have internal pull-up resistors and therefore requires external pull-ups. For more details on the device, please refer to "Functional Description."

Pin Name	Pin Number	Input/Output, 3-State	Function
XTAL1	63(x13), 65(x15)	In	Crystal oscillator connecting terminal. A parallel resonant crystal is recommended. If external clock source is used as an input to the CGC unit, supply clock goes into this terminal. If external clock is supply to CLKIN pin (without CGC unit), this terminal must be connected to "0" or "1".
XTAL2	63(x13), 66(x15)	Out	Crystal oscillator connecting terminal.
CLKIN	67(x13), 69(x15)	In	Single-phase System Clock Input.
CLKOUT	66(x13), 68(x15)	Out	Single-phase clock output from on-chip Clock Generator/Controller.
EV	58(x13), 67(x15)	In	Evaluator signal. When "1" is applied to this pin, IPC is put in Evaluation mode.

Note: For the Z84013/015, together with /BUSREQ, the EV signal puts the IPC into the evaluation mode. When this signal becomes active, the status of /M1, /HALT and /RFSH change to input. When using Z84013/015 as an evaluator chip, the CPU is electrically disconnected after one machine cycle is executed with the EV signal "1" and the /BUSREQ signal "0". It follows the instructions from the other CPU (of ICE). Upon receiving /BUSREQ; A15-A0, /MREQ, /IORQ, /RD and /WR are changed to input and D7-D0 changes its direction. /BUSACK is NOT 3-stated so it should be disconnected by an externally connected circuit. For details, please refer to "Functional Description" on EV mode.

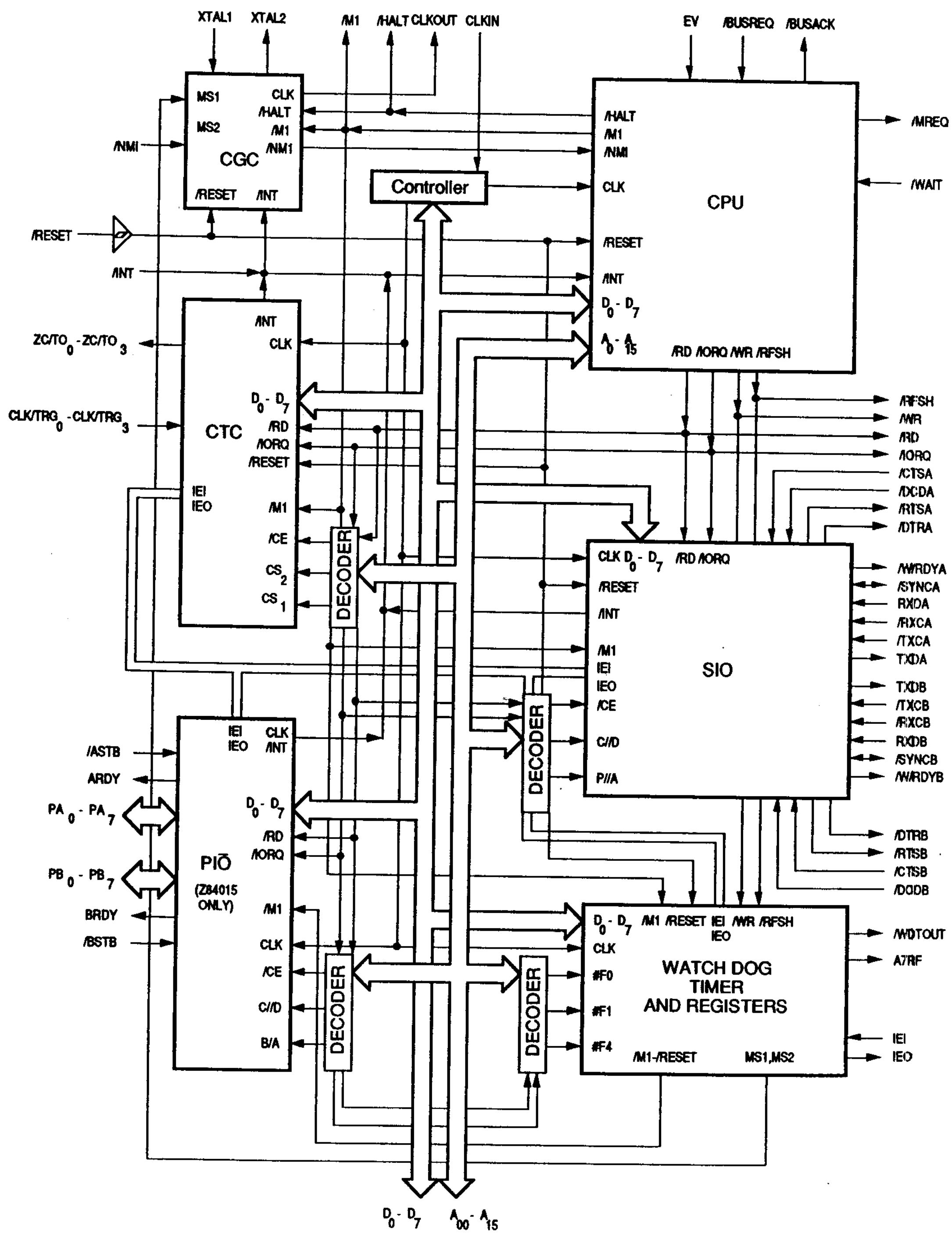


Figure 5(a). Block Diagram for 84013/015 IPC

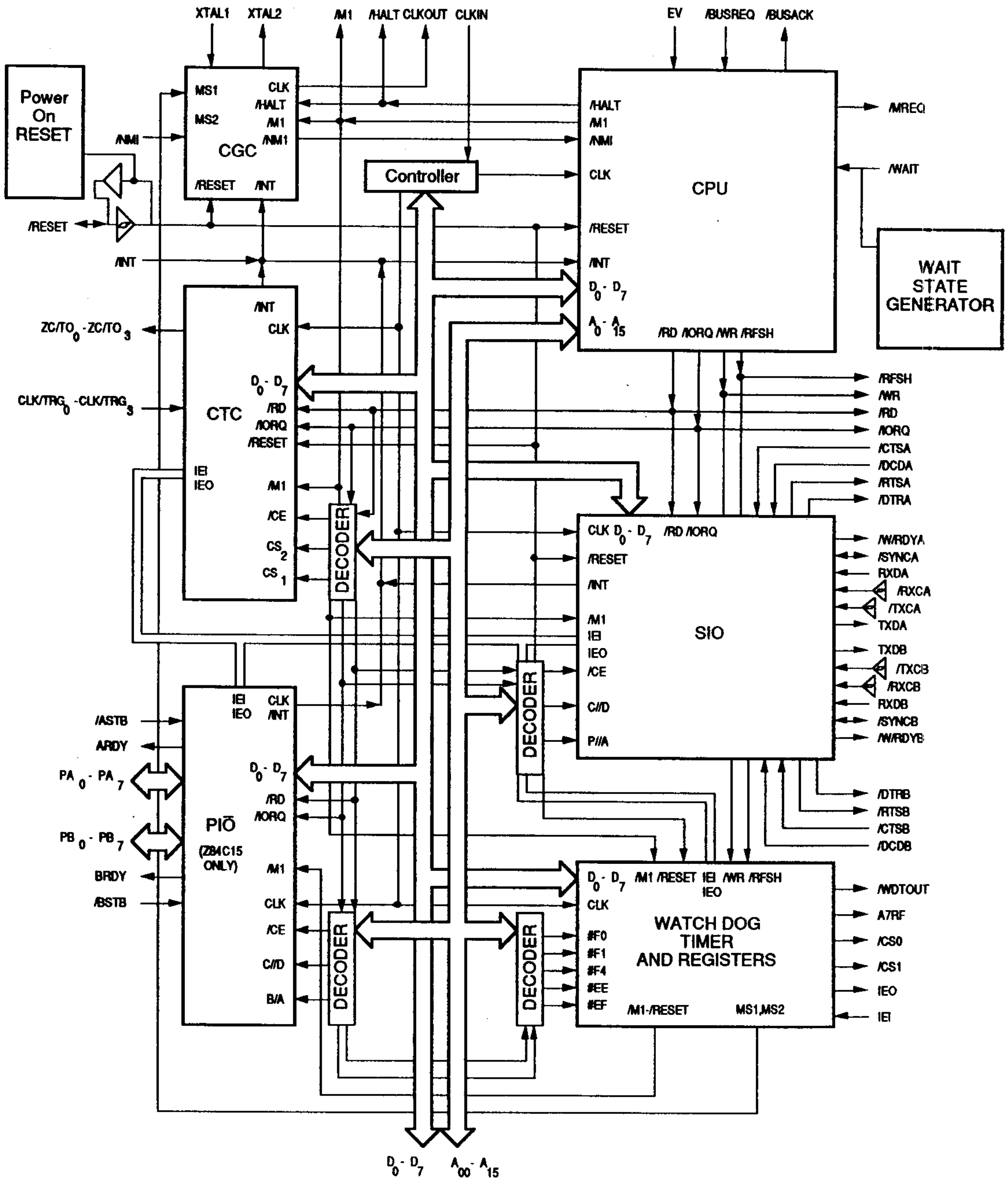


Figure 5(b). Block Diagram for 84C13/C15 IPC

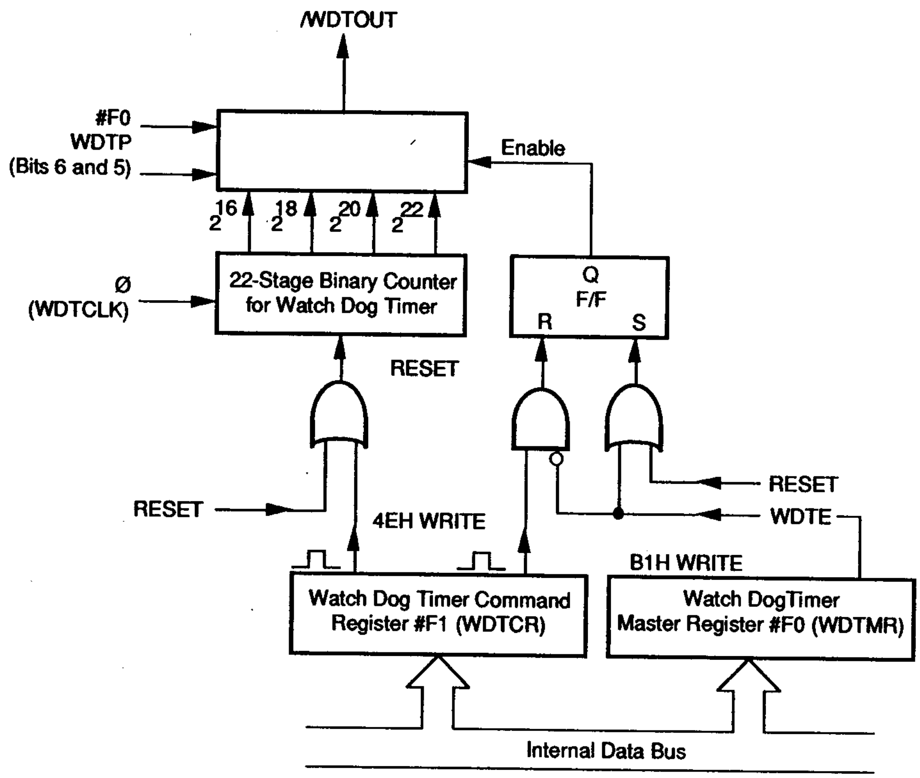


Figure 9. Block Diagram of Watch Dog Timer

Z84013/015 Only. If the system clock is provided on the CLKIN pin, none of the power-down mode (except RUN mode) is supported.

Z84C13/C15 Only. If the system clock is provided on the CLKIN pin, only the IDLE2 mode is applicable. In this mode, if the HALT instruction is executed, internal clock to the CTC is kept on "Continue", but the clock to the other components (CPU, PIO, SIO and Watch Dog Timer) are stopped. The divide-by-two circuit of the CGC unit can be skipped by programming bit D4 of the WDTMR (see "Programming" section). Upon Power-on Reset, it comes up in divide by two mode.

System Clock Generation

The IPC has a built-in oscillator circuit and the required clock can be easily generated by connecting a crystal to the external terminals (XTAL1, XTAL2). Clock output is the same frequency as half the speed of the crystal frequency. Example of oscillator connections are shown in Figure 10.

Z84C13/C15. Clock output is the same, or half, of the external frequency.

Z84X13/X15

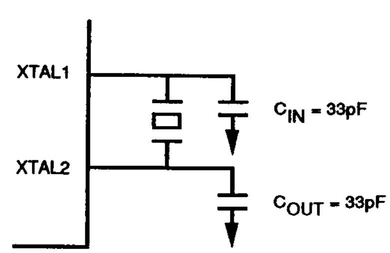


Figure 10. Circuit Configuration For Crystal

power-up, and boundary address is undefined. These features are controlled via the I/O control registers located at I/O address EEh and EFh. **Note that a glitch may be observed on these pins because address decode logic is decoding only A15-A12, without any control signals.** For more detail, please refer to the "Programming section."

Other functional features (Z84C13/C15 Only)
For more system design flexibility, the Z84C13/C15 has the following unique features. These features are controlled by MCR (Misc. Control Register) which is indirectly accessed via the System Control Register Pointer (SCRP, I/O address EEh), and System Control Data Port (SCDP, I/O address EFh). For more details, please refer to the "Programming" section.

- Clock Divide-by-one option
- Reset Output Disable
- 32-bit CRC Generation/Checking

Clock Divide-by-One Option. This feature is programmed through Bit D4 of MCR. Upon Power-On reset, the Clock from on-chip CGC is passed through a divide-by-two circuit. By setting this bit to one, the divide-by-two circuit is bypassed so the clock on the CLKOUT pin is equal to X'tal input. If the clock is applied to the CLKIN pin from external clock source, the status of this bit is ignored. Upon Power-on Reset, it is cleared to 0. For details, please refer to "Programming" section.

Reset Output Disable. This feature is programmed by Bit D3 of MCR. If this bit is cleared to "0", The /RESET pin becomes "Open-drain output" and is driven to "0" for 16-clock cycles from the falling edge of /RESET input. This feature is for the cases where /RESET is used to get out from the "HALT" state. If this bit is set to one, the on-chip reset circuit will not drive /RESET pin.

32-bit CRC Generation/Checking. This feature is programmed by Bit D2 of MCR. By setting this bit to one, Channel A of SIO is set to use the 32-bit CRC generator/checker instead of the original 16-bit CRC generator/checker in synchronous communication modes. The polynomial to be used in this mode is the one for the protocols such as V.42, and is (X32 + X26 + X23+ X22 + X16 + X12 + X11 + X10 + X8 + X7 + X5 + X4 + X2 + X + 1). Upon Power-on Reset, this bit is cleared to 0.

Evaluation Mode
The IPC has a built evaluation (or development) mode feature which allows the users to utilize standard Z80 development systems conveniently. This mode virtually replaces the on-chip Z80 CPU with the external CPU. In this mode, the on-chip CPU is electrically disconnected from internal bus and all 3-state signals (A15-0, D7-0, /MREQ, /IORQ, /RD, /WR, /HALT, /M1 and /RFSH; for C13/C15, /BUSREQ as well) are tri-stated, or changed to input. This allows the development system CPU to take over and use the internal I/O registers of the IPC exactly as if the CPU was on-chip.

Z84013/015 Only. When this signal is active,the /M1, /HALT and /RFSH pins are put in the high-impedance state. In using the Z84013/015 as an evaluator chip, the CPU is electrically disconnected (put in high-impedance state) after one machine cycle is executed with the EV signal being "1" and the /BUSREQ signal being "0". Then, on-chip resources can be accessed from the outside. /BUSACK is disconnected by an externally connected circuit.

Z84C13/C15 Only. If the EV pin is tied to Vcc on Power-up, the Z84C13/C15 enters into an evaluation mode. In this mode, the internal CPU is immediately disconnected from the internal bus and all 3-state signals mentioned above are tri-stated, or changed to input. Note that the /WAIT pin became the OUTPUT pin in EV mode, and the Wait State Generator generates wait states only as programmed. If the target application board has a separate wait state generator, modification of the target may be required. /BUSACK is 3-stated in this mode.

The Z84C13/C15 behaves similarly to the situation where in regular operation, the /BUSREQ signal is asserted by an external master causing all 3-state signals to be tri-stated by the Z84C13/C15 during T1 of the following machine cycle. The /BUSREQ approach was not used for the evaluation mode to avoid significant external circuitry to work around the time period before the external CPU uses the bus for Z84C13/C15 accesses.

PROGRAMMING

I/O address assignment
The IPC 's on-chip peripherals' I/O addresses are listed in Table 1. They are fully decoded from A7-A0 and have no image.The registers with Z84C13/C15 located at I/O Address EEh and EFh are the registers to control enhanced features to Z84013/015, and not assigned on Z84C013/015.

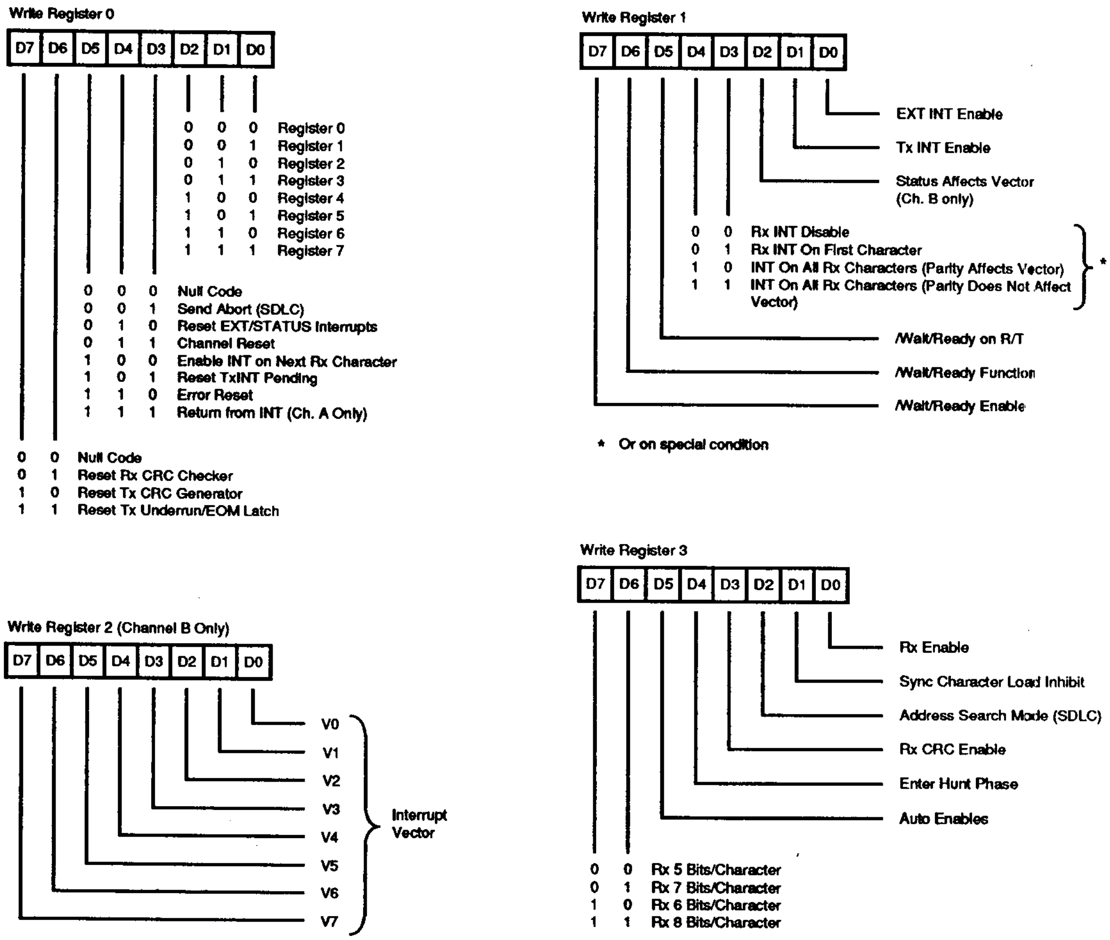


Figure 21. SIO Write Registers

INTERRUPT PRIORITY REGISTER
(INTPR; I/O address F4h)

This register (write only) is provided to determine the interrupt priority for the CTC, SIO and the PIO (Figure 24).

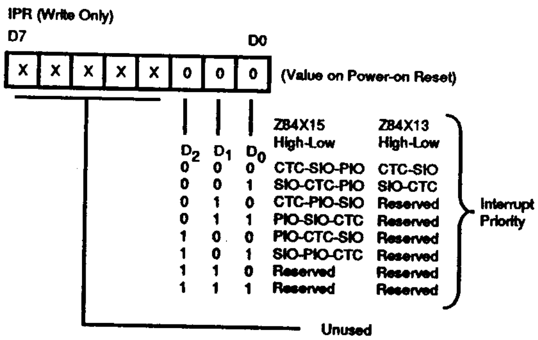


Figure 24. Interrupt Priority Register

Bit D7-D3. Unused

Bit D2-D0. This field specifies the order of the interrupt daisy chain. Upon Power-on Reset, this field is set to "000".

	Z84C15 High - Low	Z84C13 High - Low
000	CTC-SIO-PIO	CTC-SIO
001	SIO-CTC-PIO	SIO-CTC
010	CTC-PIO-SIO	Reserved
011	PIO-SIO-CTC	Reserved
100	PIO-CTC-SIO	Reserved
101	SIO-PIO-CTC	Reserved
110	Reserved	Reserved
111	Reserved	Reserved

REGISTERS FOR SYSTEM CONFIGURATION

(The following registers are not available on Z84013/015.) There are four indirectly accessible registers to determine System configuration with the Z84C13/C15. These indirectly accessible registers are: Wait State Control Register (WCR, Control Register 00h), Memory Wait Boundary Register (MWBR, Control Register 01h), Chip Select Boundary Register (CSBR, Control Register 02h) and Misc. Control Register (MCR, Control Register 03h). To access these registers, Z84C13/C15 writes "register number to be accessed" to the System Control Register Pointer (SCRP, I/O address EEh), and then accesses the target register through the System Control Data Port (SCDP, I/O address EFh). The pointer which writes into SCRP is kept until modified.

System Control Register Pointer (SCRP, I/O address EEh)
This register stores the pointer to access System Control Registers (WCR, MWBR, CSBR and MCR). This register is Read/Write and it holds the pointer value until modified. Upon Power-on Reset, all bits are cleared to zero. The pointer value, other than 00h to 03h is reserved and is not written. Upon Power-on Reset, this register is set to "00h" (Figure 25).

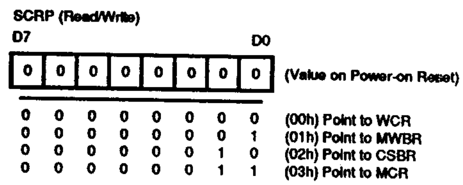


Figure 25. System Control Register Pointer

System Control Data Port (SCDP, I/O address EFh)
This register is to access WCR, MWBR, CSBR and MCR (Figure 26).

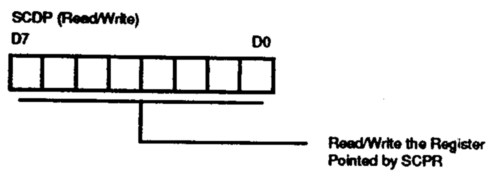


Figure 26. System Control Data Port

Wait State Control Register (WCR, Control Register 00h)
This register can be accessed through SCDP with the pointer value 00h in SCRP (Figure 27). To maintain compatibility with the Z84013/015, the Z84C13/C15 inserts the maximum number of wait states (set all bits of this register to one) for fifteen /M1 cycles after Power-on Reset. It automatically clears the contents of this register (move to no-wait state insertion) on the trailing edge of the 16th /M1 signal unless software has programmed a value. If automatic wait state insertion is needed, the wait state is programmed within this time period. A read to WCR during this period will return FFh, unless programmed.

Bit D3. *Reset Output Disable.* "0"-Reset output is enabled, "1"-Reset output is disabled. This bit controls the /RESET signal and is driven out when reset input is used to take the Z84C13/C15 out of the "Halt" state. The reset pulse is driven out for 16-clock cycles from the falling edge of /RESET input, unless this bit is set. Upon Power-on reset, this bit is cleared to 0.

Bit D2. *32-Bit CRC enable.* "0"-Normal mode (16-bit CRC) "1"-32-bit CRC generation/Checking is enabled on SIO Channel A. This bit determines if the 32-bit CRC feature is enabled on Channel A of the SIO. If this bit is 0, the SIO is in a normal mode of operation. If this bit is set to 1, a normal CRC generator/checker is replaced with a 32-bit CRC generator/checker. Upon Power-on Reset, this bit is clear to "0".

Bit D1. */CS1 Enable. "0"-Disable, "1"-Enable.* This bit enables /CS1 output. While this bit is "0", /CS1 is forced to "1". While this bit is "1", /CS1 carries the address range specified in the CSBR. Upon Power-on Reset, this bit is cleared to "0".

Bit D0. */CS0 Enable. "0"-Disable, "1"-Enable.* This bit enables /CS0 output. While this bit is "0", /CS1 pin is forced to "1". While this bit is "1", the /CS0 carries address range specified in the CSBR. Upon Power-on Reset, this bit is set to "1".

Operation modes

There are four kinds of operation modes available for the IPC in connection with clock generation; RUN Mode, IDLE1/2 Modes and STOP Mode.

The Operation mode is effective when the HALT instruction is executed. Restart of the MPU from the stopped state under IDLE1/2 Mode or STOP mode is affected by inputting either /RESET or interrupt (/NMI or /INT). The mode selection of these power-down modes is made by programming the HALTM field (Bit D4-3) of WDTMR.

Setting Halt Mode

Duplicate control is provided to prevent the stopping of the WDT operation caused by the halt mode setting an error due to program runaway. As described in the programming section, changing the Halt Mode field of WDTMR is in two steps. First, write "DBh" to WDTCR followed by a write to the WDTMR with the value in HALTM. Table 2 has descriptions of each mode, and Table 3 has device status in the Halt state.

Table 2. Power-down Modes
(When using on-chip CGC unit; CLKOUT and CLKIN are tied together)

Operation Mode	WDTMR Bit D4	Bit D3	Description at HALT State
RUN Mode	1	1	The IPC continues the operation and continuously supplies a clock to the outside.
IDLE1 Mode	0	0	The internal oscillator's operation is continued. Clock output (CLKOUT) as well as internal clock to the CPU, PIO, SIO, CTC and the Watch Dog Timer is stopped at "0" level of T4 state in the halt instruction operation code fetch cycle.
IDLE2 Mode	0	1	The internal oscillator and the CTC's operation continues and supplies clock to the outside on the CLKOUT pin continuously. But the internal clock to the CPU, PIO, SIO and the Watch Dog Timer is stopped at "0" level of T4 state in the halt instruction operation code fetch cycle.
STOP Mode	1	0	All operations of the internal oscillator, clock (CLK) output, internal clock to the CPU, PIO, CTC, SIO and the Watch Dog Timer are stopped at "0" level of T4 state in the halt instruction operation code fetch cycle.

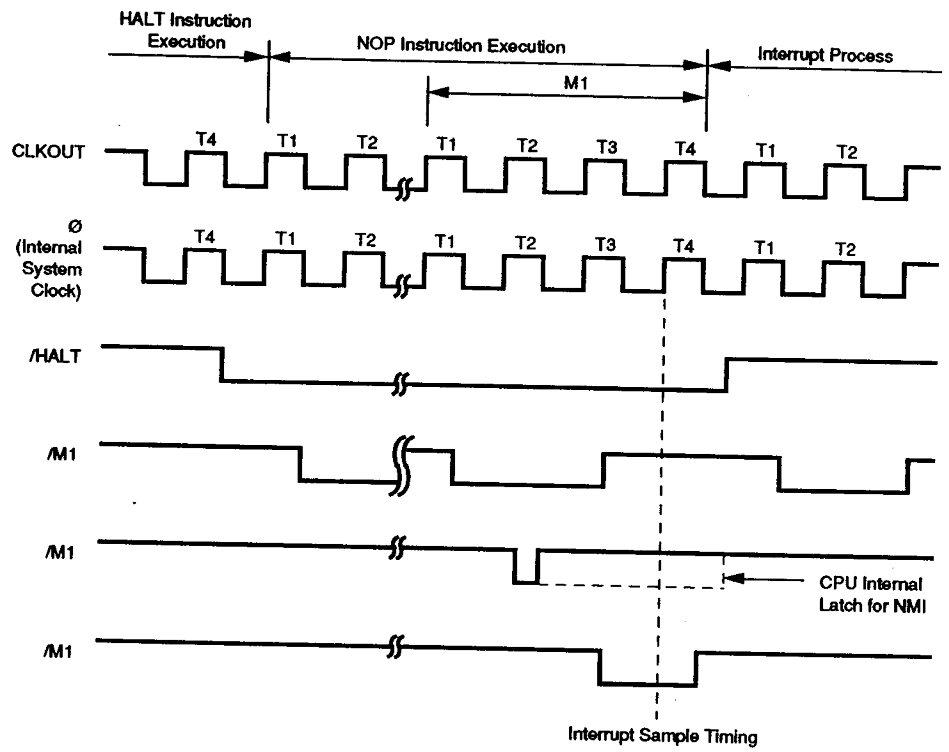


Figure 35. Halt Release Operation Timing By Interrupt Request Signal in RUN Mode

In RUN Mode the internal system clock is not stopped. If the interrupt signal is recognized on the rising clock edge of T4 of the continued NOP instruction, CPU will execute the interrupt process from the next cycle.

The halt release resets CPU in RUN Mode (Figure 36). After reset, CPU will execute an instruction starting from address 0000H. However, in order to reset the CPU it is necessary to keep /RESET signal at "0" for at least 3 system clock cycles. (For Z84C13/C15: 3 clock cycles if Reset output is disabled.) In addition, if /RESET signal becomes "1", after the dummy cycle for at least two T states, CPU executes an instruction from address 0000H.

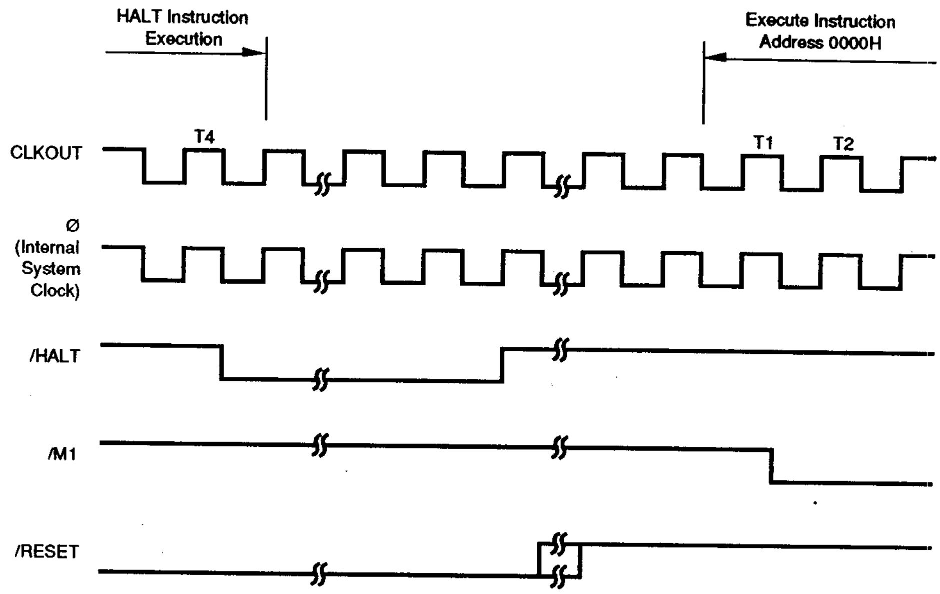


Figure 36. Halt Release Operation Timing By Reset in RUN Mode

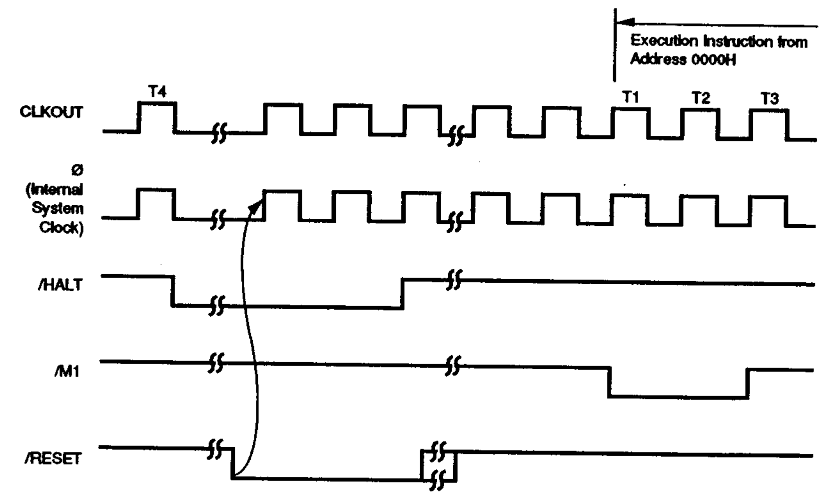
IDLE1 Mode (HALTM=00), IDLE2 Mode (HALTM=01). The halt release operation by interrupt signal in IDLE1 Mode is shown in Figure 37 (a) and in IDLE2 Mode in Figure 37 (b).

When receiving /NMI or /INT signals, the stopped internal system clock starts to feed. In IDLE1 Mode, the IPC starts clock output on CLKOUT at the same time.

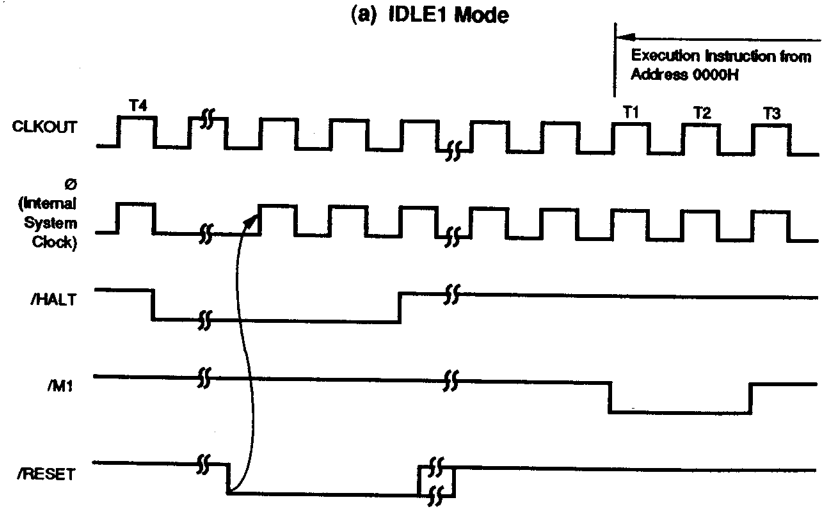
The operation stop of CPU in IDLE2 mode is taking place at "0" level during T4 state in the halt instruction op-code fetch cycle. Therefore, after being restarted by the interrupt signal, CPU executes one NOP instruction and samples an interrupt signal at the rise of T4 state during the execution of this NOP instruction, and executes the interrupt process from next cycle.

If no interrupt signal is accepted during the execution of the first NOP instruction after the internal system clock is restarted, CPU is not released from the halt state. It is placed in IDLE1/2 Mode again at "0" level during T4 state of the NOP instruction, stopping the internal system clock. If /INT signal is not at "0" level at the rise of T4 state, no interrupt request is accepted.

The halt release operation resets the IPC in IDLE1 Mode (Figure 38a) and in IDLE2 Mode (Figure 38b).



(a) IDLE1 Mode



(b) IDLE2 Mode

Figure 38. Halt Release Operation Timing By Reset In IDLE1/2 Mode

Instruction Op-code Fetch. The CPU places the contents of the Program Counter (PC) on the address bus at the start of the cycle (Figure 41). Approximately one-half clock cycle later, /MREQ goes active. When active, /RD indicates that the memory data can be enabled onto the CPU data bus.

The CPU samples the /WAIT input with the falling edge of clock state T2. During clock states T3 and T4 of an M1 cycle, dynamic RAM refresh can occur while the CPU starts decoding and executing the instruction.

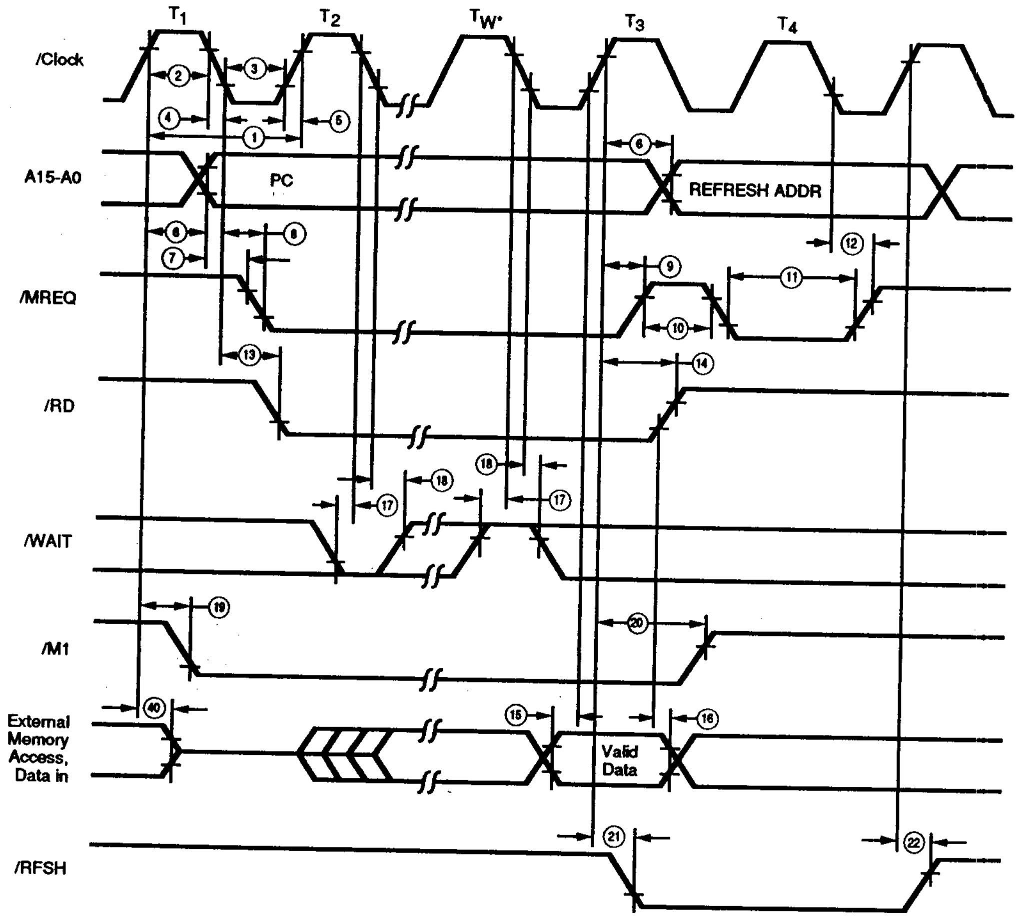
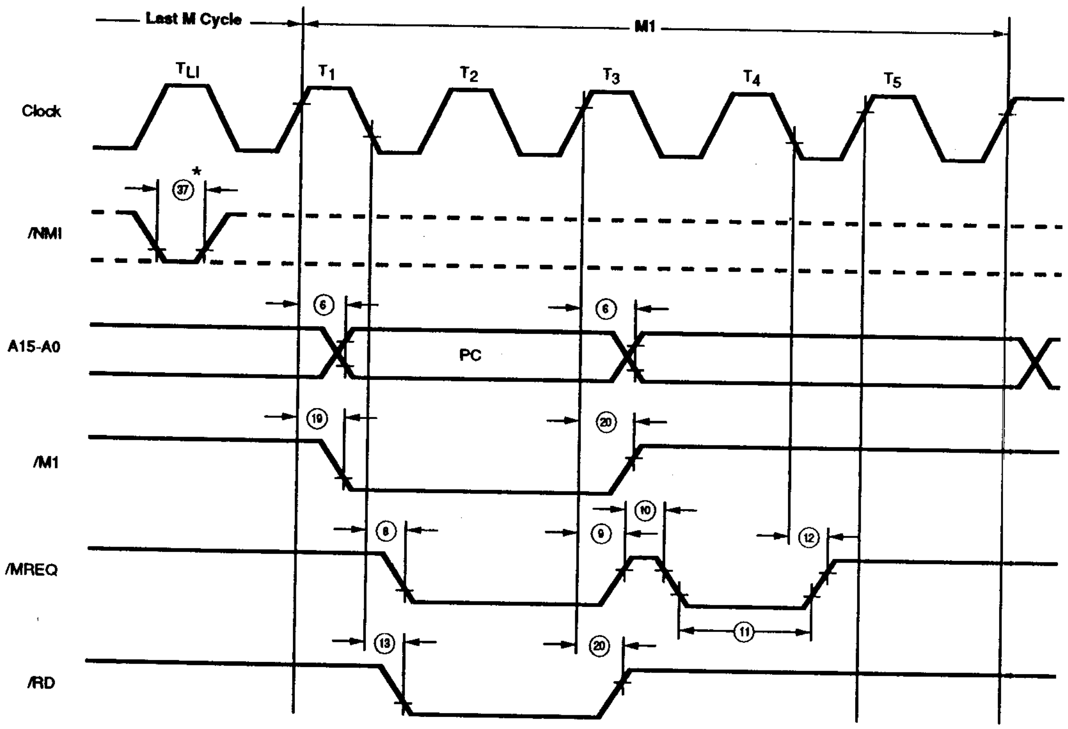


Figure 41. Instruction Op-code Fetch
(See Table A)

Non-Maskable Interrupt Request Cycle. /NMI is sampled at the same time as the maskable interrupt input /INT, but has higher priority and cannot be disabled under software control. The subsequent timing is similar to that of a normal memory read operation except that data put on the bus by the memory is ignored. The CPU instead executes a restart (RST) operation and jumps to the /NMI service routine located at the address 0066H (Figure 45).



* Although /NMI is an asynchronous input, to guarantee its being recognized on the following machine cycle, /NMI's falling edge must occur no later than the rising edge of the clock cycle preceding the last state of any instruction cycle (T_{LI}).

Figure 45. Non-Maskable Interrupt Request Operation
(See Table A)

Watch-Dog Timer Timing
Figure 57 shows the timing for Watch-dog Timer.

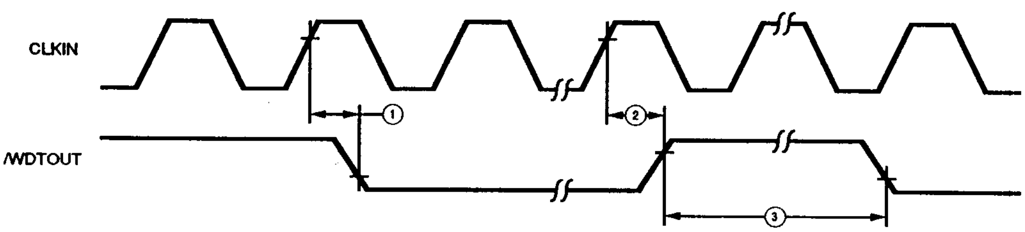


Figure 57. Watch-dog Timer Timing
(See Table H)

PRECAUTIONS

(1) To release the HALT state by /RESET signal in STOP Mode, hold the /RESET signal at "0" until the output from the internal oscillator stabilizes.

Z84013/015 Only. To reset MPU, it is necessary to hold /RESET signal input at "0" level for at least three clocks.

Z84C13/C15 Only. If Reset output is disabled, /RESET must be active for at least three clock cycles for the CPU to properly accept it. Otherwise, the on-chip reset circuit extends /RESET signal to at least a minimum of 16-clock cycles.

(2) Releasing the MPU from the HALT state by the interrupt signal in IDLE1/2 Mode and STOP Mode, depends upon the HALT state and the internal system clock. They will stop unless an interrupt signal is accepted during the execution of NOP instruction, even when the internal system clock is restarted by the interrupt signal input. In particular, care must be taken when /INT is used.

Other precautions are identical to those for the Z84C00. Refer to the data sheet for the Z84C00.

ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Voltage on Vcc with respect to Vss .... -0.3V to +7.0V
Voltages on all inputs
with respect to Vss .... -0.3V to Vcc+0.3V
Operating Ambient
Temperature .... See Ordering Information
Storage Temperature .... -65 °C to + 150 °C

Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; operation of the device at any condition above those indicated in the operational sections of these specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

STANDARD TEST CONDITIONS

The DC Characteristics and capacitance sections below apply for the following standard test conditions, unless otherwise noted. All voltages are referenced to GND (0V). Positive current flows into the referenced pin.

Available operating temperature range is:
E = -40°C to 100°C
Voltage Supply Range:
+4.50V ≤ Vcc ≤ + 5.50V

All AC parameters assume a load capacitance of 100 pf. Add 10 ns delay for each 50 pf increase in load up to a maximum of 150 pf for the data bus and 100 pf for address and control lines. AC timing measurements are referenced to 1.5 volts (except for clock, which is referenced to the 10% and 90% points). Maximum capacitive load for CLK is 125 pf.

The Ordering Information section lists temperature ranges and product numbers. Package drawings are in the Package Information section. Refer to the Literature List for additional documentation.

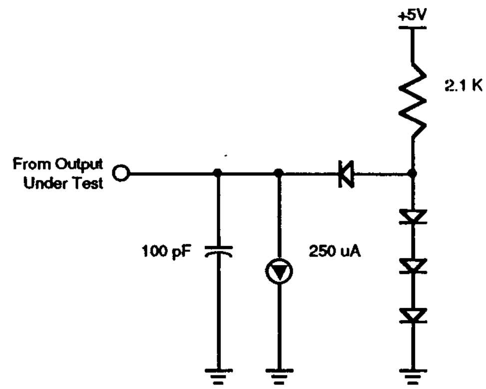


Figure 58. Standard Test Load

CAPACITANCE

Guaranteed by design and characterization

Symbol	Parameter	Min	Max	Unit
C_{CLOCK}	Clock Capacitance	35	pF	
C_{IN}	Input Capacitance	5	pF	
C_{OUT}	Output Capacitance	15	pF	

DC CHARACTERISTICS

V_{CC}=5.0V ± 10%, unless otherwise specified

Symbol	Parameter	Min	Max	Unit	Condition
V_{OLC}	Clock Output High Voltage	V_{CC}-0.6		V	-2.0mA
V_{OHC}	Clock Output Low Voltage		0.4	V	+2.0mA
V_{IHC}	Clock Input High Voltage	V_{CC}-0.6		V	
V_{ILC}	Clock Input Low Voltage		0.4	V	
V_{IH}	Input High Voltage	2.2	V_{CC}	V	
V_{IL}	Input Low Voltage	-0.3	0.8	V	
V_{OL}	Output Low Voltage		0.4 [5]	V	I_{LO}=2.0mA
V_{OH1}	Output High Voltage	2.4		V	I_{OH}=-1.6mA
V_{OH2}	Output High Voltage	V_{CC}-0.8 [5]		V	I_{OH}=-250μA
I_{CC1}	Power Supply Current				V_{CC}=5V
	XTALIN =10MHz		50	mA	V_{IH}=V_{CC}-0.2V
	XTALIN = 6MHz		30	mA	V_{IL}=0.2V
I_{CC2}	Power Supply Current (STOP Mode)		50	μA	V_{CC}=5V
I_{CC3}	Power Supply Current (IDLE1 Mode)				V_{CC}=5V
	XTALIN =10MHz		6	mA	V_{IH}=V_{CC}-0.2V
	XTALIN = 6MHz		4	mA	V_{IL}=0.2V
I_{CC4}	Power Supply Current (IDLE2 Mode)				V_{CC}=5V
	XTALIN =10MHz		TBD [1]	mA	V_{IH}=V_{CC}-0.2V
	XTALIN = 6MHz		TBD [1]	mA	V_{IL}=0.2V
I_{LI}	Input Leakage Current	-10	10 [4]	μA	V_{IN}=0.4V to V_{CC}
$I_{LI(SY)}$	SYNC pin Leakage Current	-40	10	μA	V_{OUT}=0.4V to V_{CC}
I_{LO}	3-state Output Leakage Current in Float	-10	10 [2]	μA	V_{OUT}=0.4V to V_{CC}
I_{OHD}	Darlington Drive Current				V_{OH}=1.5V
	(Port B and CTC ZC/TO)	-1.5		mA	REXT = 390 Ohms

Notes:

[1] Measurements made with outputs floating.
[2] A15-A0, D7-D0, /MREQ, /IORQ, /RD and /WR.
[3] I_{CC2} Standby Current is guaranteed when the /HALT pin is low in STOP mode.
[4] All Pins except XTALI, where I_{LI}=±25μA.
[5] A15-A0, D7-D0, /MREQ, /IORQ, /RD, /WR, /HALT, /M1 and /BUSACK.

No	Symbol	Parameter	Z84X1306 Z84X1506	Z84X1310 Z84X1510	Z84C1316* Z84C1516
1	TcC	TwCh + TwCl + TrC + TfC			
7	TdA(MREQf)	TwCh + TfC	-50	-50	-45
10	TwMREQh	TwCh + TfC	-20	-20	-20
11	TwMREQl	TcC	-30	-25	-25
26	TdA(IORQf)	TcC	-55	-50	-50
29	TdD(WRf)	TcC	-140	-60	-60
31	TwWR	TcC	-30	-25	-25
33	TdD(WRf)	TwCl + TrC	-140	-60	-60
35	TdWRr(D)	TwCl + TrC	-55	-40	-25
45	TdCTr(A)	TwCl + TrC	-50	-30	-30
50	TdM1f(IORQf)	2TcC + TwCh + TfC	-50	-30	-30

Table H. Footnote to Table A.

AC CHARACTERISTICS (Continued)

Table B. CGC Timing (See Figure 49 to 52)

No	Symbol	Parameter	Z84C1306 Z84C1506 Min	Max	Z84C1310 Z84C1510 Min	Max	Z84C1316* Z84C1516 Min	Max	Unit	Note
1	TRST(INT)S	Clock Restart Time by /INT (STOP Mode)	(Typ)2^{14}+2.5TcC		(Typ)2^{14}+2.5TcC		(Typ)2^{14}+2.5TcC		ns	
2	TRST(MNI)S	Clock Restart Time by /NMI (STOP Mode)	(Typ)2^{14}+2.5TcC		(Typ)2^{14}+2.5TcC		(Typ)2^{14}+2.5TcC		ns	
3	TRST(INT)I	Clock Restart Time by /INT (IDLE Mode)	2.5TcT		2.5TcT		2.5TcT		ns	
4	TRST(Nmi)I	Clock Restart Time by /NMI (IDLE Mode)	2.5TcT		2.5TcT		2.5TcT		ns	
5	TRST(RESET)I	Clock Restart Time by /RESET (IDLE Mode)	1TcC		1TcC		1TcC		ns	
6	TfCLKOUT	CLKOUT Rise Time		15		10		6	ns	
7	TrCLKOUT	CLKOUT Fall time		15		10		6	ns	
8	TcX1	XTAL1 Cycle Time (for External Clock Input on XTAL1)								
		Divide-by-Two Mode	81		50		31		ns	
		Divide-by-One Mode	162		100		61		ns	
9	TwlX1	XTAL1 Low Pulse Width (for External Clock Input on XTAL1)								
		Divide-by-Two Mode	35		15		10		ns	
		Divide-by-One Mode	65		40		25		ns	
10	TwhX1	XTAL1 High Pulse Width (for External Clock input on XTAL1)								
		Divide-by-Two mode	35		15		10		ns	
		Divide-by-One mode	65		40		25		ns	
11	TrX1	XTAL1 Rise Time (for External Clock Input on XTAL1)		25		25		15	ns	[B1]
12	TfX1	XTAL1 Fall Time (for External Clock Input on XTAL1)		25		25		15	ns	[B1]

Note:
[B1] If parameters 8 and 9 are not met, adjust parameters 11 and 12 to satisfy parameters 8 and 9.