

TMS7000 Programmer's Pocket Reference

**8-Bit Microcomputer
Family**



**TEXAS
INSTRUMENTS**

RTC HOTLINE NUMBERS

For assistance in using the TMS7000, call the TI Regional Technology Center nearest you. The centers are staffed with Applications Engineers ready to answer all your questions.

ATLANTA	(404) 452-4686
BOSTON	(617) 890-4271
CHICAGO	(312) 228-6008
DALLAS	(214) 680-5096
NORTHERN CALIFORNIA	(408) 980-0305
SOUTHERN CALIFORNIA	(714) 660-8164

TMS7000-ASSOCIATED DOCUMENTS

TMS7000 8-Bit Microcomputer Data Manual
Part No. MP008A

TMS7000 Assembly Language Programmer's Guide,
Part No. MP916A

TMS7000 Family Data Manual
Part No. SPND001

TMS7000 Family Microassembler,
Part No. MP457

TMS7000 Microprogrammer's Reference Card,
Part No. MP 459

**TMS7000/TMS7001/TMS7020/TMS7040,
TMS7041,TMS70120,SE70P161**

TABLE OF CONTENTS

RTC Hotline Numbers	Inside Front Cover
TMS7000 – Associated Documents	Inside Front Cover
TMS7000 Instruction Set	2
Reset, Interrupt and Trap Vector Locations	7
Peripheral File Memory Maps – All TMS7000 Devices	8
Peripheral File Registers	10
70X0 Memory Map	14
70X1 Memory Map	15
TMS70X1 Peripheral Memory Map	16
TMS7000 Block Diagram	17
TMS7001, TMS7041, SE70P161 Block Diagram	17
Pin Assignments – All TMS7000 Devices	18
Mode Select Conditions	20
Bit Flow for Rotate Instructions	20
ASCII Character Set	21
Status Bit Values for Conditional Jump Instructions	22
Status Register	22
Programmable Timer/Event Counters	23
Read/Write Cycle Timing	23
Pin Assignments – TMS7001 and TMS7041	24
Pin Assignments – TMS70X0 and TMS70CX0	24
The SE70P161 System Emulator	25
Pin Assignments – SE70P161 Only	25
Instruction – Opcode Set	26
Instruction Execution Times	28

TMS7000 INSTRUCTION SET

Single Operand Instructions

MNEMONIC	DEFINITION	STATUS BITS AFFECTED	ACTION
CLR	Clear Operand	C/Z/N	0 → Destination
DEC	Decrement	C/Z/N	Destination - 1 → Destination
DECD	Decrement Double	C/Z/N	Register Pair - 1 → Register Pair
INC	Increment	C/Z/N	Destination + 1 → Destination
INV	Invert	C/Z/N	Destination → Destination
POP	Pop From Stack	C/Z/N	Top of Stack → Destination, SP - 1 → SP
PUSH	Push On Stack	C/Z/N	SP + 1 → SP, Destination → Top of Stack
RL	Rotate Left	C/Z/N	bn → bn + 1, b7 → b0, b7 → C
RLC	Rotate Left Through Carry	C/Z/N	bn → bn + 1, C → b0, b7 → C
RR	Rotate Right	C/Z/N	bn + 1 → bn, b0 → b7, b0 → C
RRC	Rotate Right Through Carry	C/Z/N	bn + 1 → bn, C → b7, b0 → C
XCHB	Exchange With Register B	C/Z/N	B → Destination, Destination → B; Z, N set on Final Destination contents
Extended Instructions			
BR	Unconditional Branch	none	Destination → PC
CMPLA	Compare To A Register	C/Z/N	A-source computed but not stored bits set on result.
LDA	Load A Register	C/Z/N	Source → A
STA	Store A Register	C/Z/N	A → Destination

TMS7000 INSTRUCTION SET (Continued)

Dual Operand Instructions

MNEMONIC	DEFINITION	STATUS BITS AFFECTED	ACTION
ADC	Add With Carry	C/ZIN	Source + Destination + C → Destination
ADD	Add Bytes	C/ZIN	Source + Destination → Destination
AND	AND Bytes	C/ZIN	Source ANDed with Destination → Destination
ANDP	AND Peripheral File	C/ZIN	Source ANDed with PF → PF
CMP	Compare	C/ZIN	Destination - Source computed but not stored, ST bits set on result
DAC	Decimal Add With Carry	C/ZIN	Source + Destination + C → Destination (Decimal)
DSB	Decimal Subtract With Borrow	C/ZIN	Destination - Source - 1 + C → Destination (Decimal)
MOV	Move	C/ZIN	Source → Destination
MOVD	Move Double	C/ZIN	Register Pair → Register Pair
MOVP	Move Peripheral File	C/ZIN	Read/Write data to PF
MPY	Multiply	C/ZIN	Source x Destination → A & B Register Pair
OR	OR Bytes	C/ZIN	Source ORed with Destination → Destination
ORP	OR Peripheral File	C/ZIN	Source ORed with PF → PF
SBB	Subtract With Borrow	C/ZIN	Destination - Source - 1 + C → Destination
SUB	Subtract Bytes	C/ZIN	Destination - Source → Destination
XOR	Exclusive OR Bytes	C/ZIN	Source exclusive ORed with Destination → Destination
XORP	Exclusive OR Peripheral File	C/ZIN	Source exclusive ORed with PF → PF

TMS7000 INSTRUCTION SET (Continued)

JUMP Instructions

MNEMONIC	DEFINITION	STATUS BITS AFFECTED	ACTION
BTJO	Bit Test JUMP If One	C/Z/N	If source ANDed with Destination < > 0, JUMP
BTJOP	Bit Test JUMP If One, Peripheral File	C/Z/N	If source ANDed with PF < > 0, JUMP
BTJZ	Bit Test JUMP If Zero	C/Z/N	If source ANDed with Destination < > 0, JUMP
BTJZP	Bit Test JUMP If Zero, Peripheral File	C/Z/N	If source ANDed with PF < > 0, JUMP
DJNZ	Decrement Register JUMP If Non-zero	none	Destination - 1 → Destination, if Destination 0, JUMP
JMP	Unconditional JUMP	none	PC + offset → PC
JC/JHS	JUMP If Carry Set/JUMP If Higher Or Same	none	If C = 1, PC + offset → PC
JN	JUMP If Negative	none	If N = 1, PC + offset → PC
JNC/JL	JUMP If No Carry/JUMP If Lower	none	If C = 0, PC + offset → PC
JNZ/JNE	JUMP If Not Zero/JUMP If Not Equal	none	If Z = 0, PC + offset → PC
JP	JUMP If Positive	none	If N = 0, + Z = 0, PC + offset → PC
JPZ	JUMP If Positive Or Zero	none	If N = 0, PC + offset → PC
JZ/JEQ	JUMP If Zero/JUMP If Equal To	none	If Z = 1, PC + offset → PC

TMS7000 INSTRUCTION SET (Continued)

Control Instructions

MNEMONIC	DEFINITION	STATUS BITS AFFECTED	ACTION
CLRC	Clear Carry Bit	C/Z/N	0 - C,N,Z set from A register
DINT	Disable Interrupts	I/C/Z/N	0 - I, 0 - C, 0 - N, 0 - Z
EINT	Enable Interrupts	I/C/Z/N	1 - I, 1 - C, 1 - N, 1 - Z
IDLE	Idle Until Interrupt	none	Suspend until Interrupt
LDSP	Load Stack Pointer	none	B register → SP
NOP	No Operation	none	PC + 1 → PC
SETC	Set Carry	C/Z/N	1 - C, 0 - N, 1 - Z
STSP	Store Stack Pointer	none	SP → B register
SWAP	Swap Nibbles	C/Z/N	B7-B4 < - > B3-B0
TSTA	Test A Register	C/Z/N	0 - C,N,Z set from A register
TSTB	Test B Register	C/Z/N	0 - C,N,Z set from B register

TMS7000 INSTRUCTION SET (Concluded)

		Subroutine Instructions		
MNEMONIC	DEFINITION	STATUS BITS AFFECTED	ACTION	
CALL	Call Subroutine	none	SP+1 → SP, PC Hi byte → stack, SP+1 → SP, PC Lo byte → stack	
RETI	Return From Interrupt	loaded from stack	Operand (address) → PC Stack → PC Lo byte, SP-1 → SP, Stack → PC Hi byte, SP-1 → SP, Stack → ST, SP-1 → SP	
RETS	Return From Subroutine	none	Stack → PC Lo byte, SP-1 → SP, Stack → PC Hi byte, SP-1 → SP,	
TRAP0	Trap To Subroutine	none	SP+1 → SP, PC Hi byte → stack, SP+1 → SP, PC Lo byte → stack	
•				
•				
TRAP23	Trap To Subroutine	none	Entry vector → PC	

RESET, INTERRUPT, AND TRAP VECTOR LOCATIONS

ADDRESS LOCATIONS		TRAP LEVEL	INTERRUPT LEVEL	INTERRUPT SOURCE
MSB	LSB			
FFE	FFF	TRAP 0	RESET Highest Priority	External
FFC	FFD	TRAP 1	INT1	External
FFA	FFB	TRAP 2	INT2	Timer 1
FF8	FF9	TRAP 3	INT3	External
FF6	FF7	TRAP 4	• INT4	RXBUF, TXBUF, Timer 3
FF4	FF5	TRAP 5	• INT5 Lowest Priority	Timer 2
FF2	FF3	TRAP 6		
FF0	FF1	TRAP 7		
FFE	FFF	TRAP 8		
FFC	FFD	TRAP 9		
FFA	FFB	TRAP 10		
FF8	FF9	TRAP 11		
FF6	FF7	TRAP 12		
FF4	FF5	TRAP 13		
FF2	FF3	TRAP 14		
FE0	FE1	TRAP 15		
FE2	FE3	TRAP 16		
FE4	FE5	TRAP 17		
FE6	FE7	TRAP 18		
FE8	FE9	TRAP 19		
FEA	FEB	TRAP 20		
FE4	FE5	TRAP 21		
FE2	FE3	TRAP 22		
FE0	FE1	TRAP 23		

* Available on 7001/7041/70P161 only.

**PERIPHERAL FILE MEMORY MAPS
ALL TMS7000 DEVICES**

I/O PORT	MEMORY ADDRESS	I/O REGISTER	IN MODES:
P0	> 0100	I/O Control 0 (IOCNTLO)	All
P1	> 0101	Reserved	
P2	> 0102	Timer 1 Data (TIDATA)	All
P3	> 0103	Timer 1 Control (TICTRL)	All
P4	> 0104	Port A Data (APORT)	All
P5	> 0105	*Port A Data Direction (ADDR)	
P6	> 0106 B(0) - B(3)	Port B Data (BPORT)	All
P6	> 0106 B(4) - B(7)	Port B Data (BPORT)	SC
P7	> 0107	Peripheral File Expansion	PE, FE, MP
P8	> 0108	Reserved	
P9	> 0109	Port C Data (CPORT)	SC
		Peripheral File Expansion	PE, FE, MP
		Port C Data Dir (CDDR)	SC
		Peripheral File Expansion	PE, FE, MP
P10	> 010A	Port D Data (DPORT)	SC, PE
		Peripheral File Expansion	FE, MP

P11	> 010B	Port D Data Direc (DDDR)	SC, PE
P12-P15	> 010C – > 10F	Peripheral File Expansion Not Used	FE, MP SC
P16	> 0110	Peripheral File Expansion I/O Control 1 (IOCNTL1)	PE, FE, MP
P17	> 0111	Serial Mode (SMODE)	
		Serial Control 0 (SCTL0)	
		Status Register (SSTAT)	
		Timer 2 Data (T2DATA)	
P18	> 0112	Timer 2 Control (T2CTRL)	All
P19	> 0113	Timer 3 Data (T3DATA)	
P20	> 0114	Serial Control 1 (SCTL1)	
P21	> 0115	Receiver Buffer (RXBUF)	
P22	> 0116	Transmitter Buffer (TXBUF)	
P23	> 0117	Not Used	SC
P24-P255	> 0118 – > 01FF	Peripheral File Expansion	PE, FE, MP

**

NOTES:

*Available on 7041/7001/70P161 only.

**Available only on 7041/7001/70P161. For other devices, this is Peripheral file expansion in PE, FE, and MP modes. Not available in SC mode.

SC = Single Chip Mode

PE = Peripheral Expansion Mode

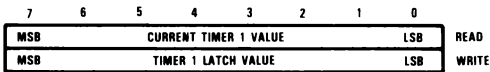
FE = Full Expansion Mode

MP = Microprocessor Mode

PERIPHERAL FILE REGISTERS

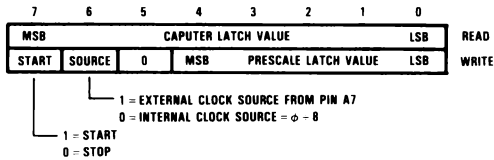
T1DATA: Timer 1 Data Register

PF NUMBER: P2
ADDRESS: >0102



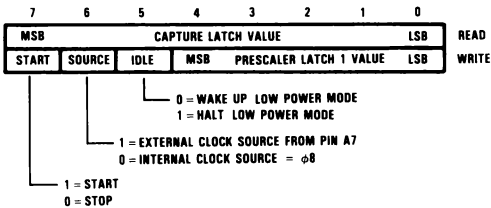
T1CTRL: Timer 1 Control Register (All Except CMOS Devices)

PF NUMBER: P3
ADDRESS: >0103



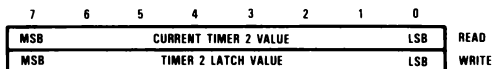
T1CTRL: Timer 1 Control Register (70C00, 70C20, 70C40 Only)

PF NUMBER: P3
ADDRESS: 0103



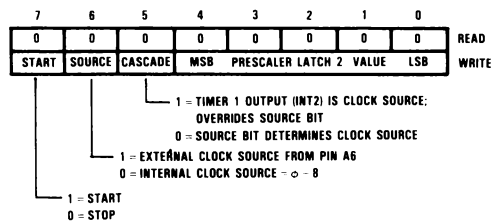
T2DATA: Timer 2 Data Register *

PF NUMBER: P18
ADDRESS: >0112



T2CTRL: Timer 2 Control Register *

PF NUMBER: P19
ADDRESS: >0113



T3DATA: Timer 3 Data Register *

PF NUMBER: P20
ADDRESS: >0114



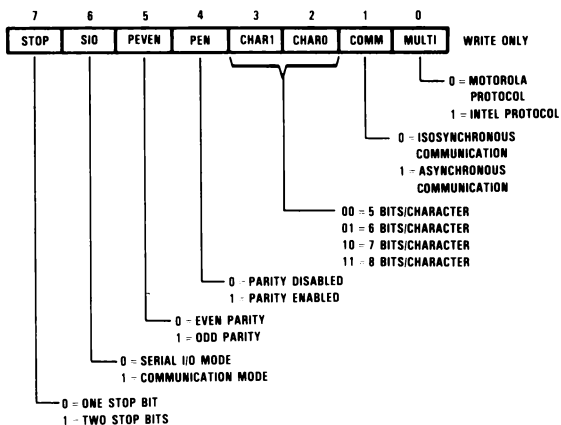
*Available on 7001/7041/70P161 only.

PERIPHERAL FILE REGISTERS (Cont.)

SMODE: Serial Mode Register (First Write After RESET) *

PF NUMBER: P17

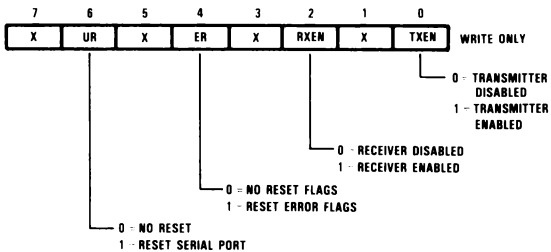
ADDRESS: >0111



SCTL0: Serial Control 0 Register *

PF NUMBER: P17

ADDRESS: >0111



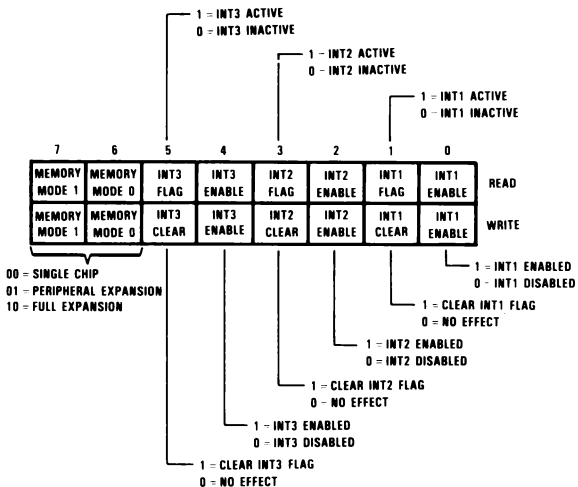
*Available on 7001/7041/70P161 only.

PERIPHERAL FILE REGISTERS (Cont.)

IOCNT0: I/O Control 0 Register (Cleared By RESET)

PF NUMBER: P0

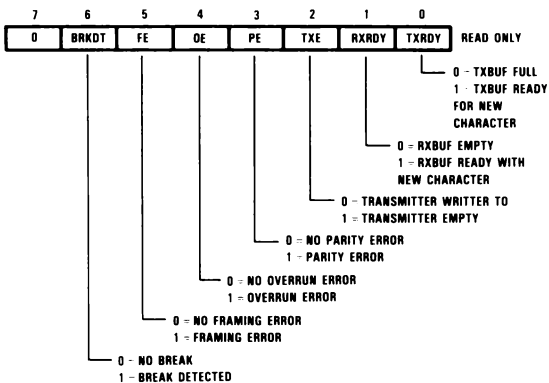
ADDRESS: >0100



SSTAT: Serial Port Status Register *

PF NUMBER: P17

ADDRESS: >0111



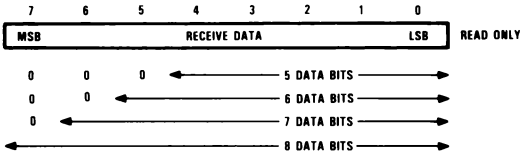
*AVAILABLE ON 7001/7041/70P161 only.

PERIPHERAL FILE REGISTERS (Cont.)

RXBUF: Receiver Buffer *

PF NUMBER: P22

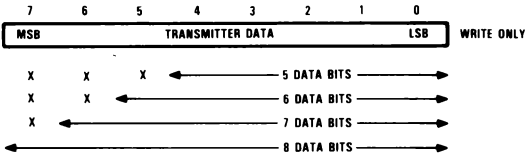
ADDRESS: >0116



TXBUF: Transmitter Buffer *

PF NUMBER: P23

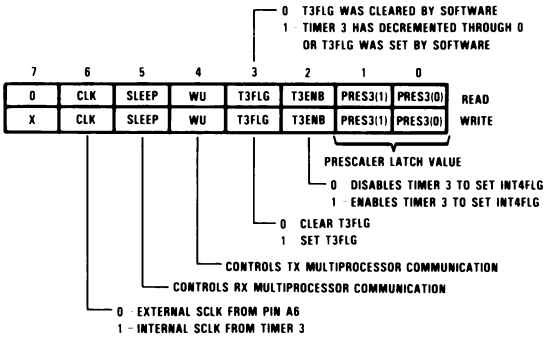
ADDRESS: >0117



SCTL1: Serial Control 1 Register *

PF NUMBER: P21

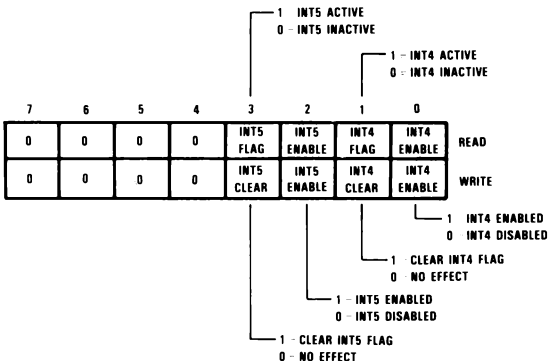
ADDRESS: >0115



IOCNT1: I/O Control Register (Not Cleared By RESET)*

PF NUMBER: P16

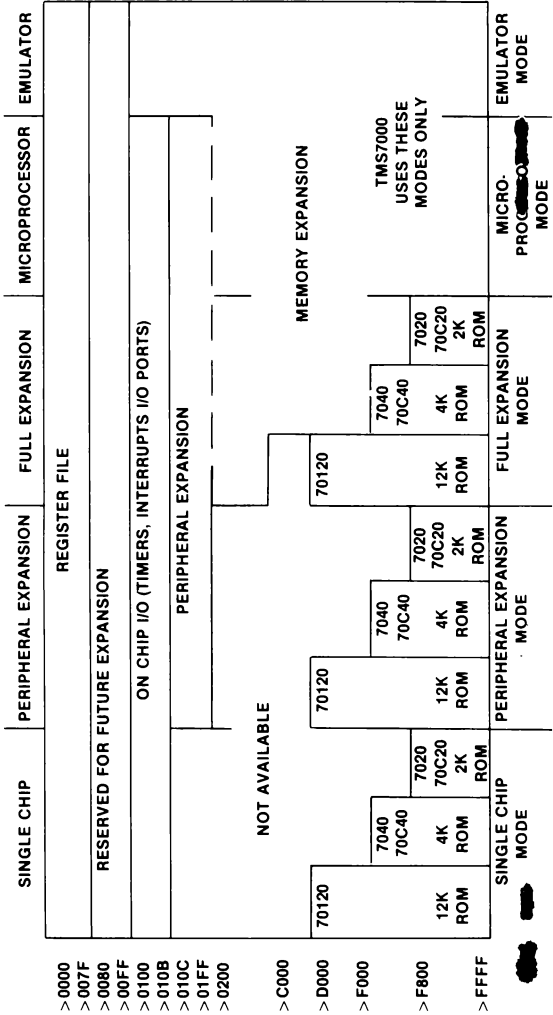
ADDRESS: >0110



*Available on 7001/7041/70P161 only.

MEMORY MAPS

70X0 MEMORY MAP



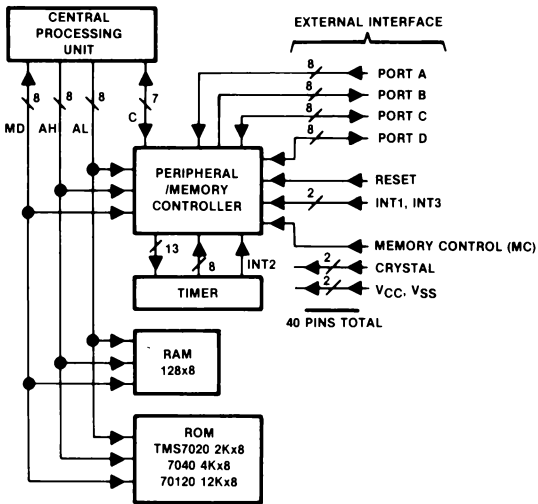
70X1 MEMORY MAP

	SINGLE CHIP	PERIPHERAL EXPANSION	FULL EXPANSION	MICROPROCESSOR	EMULATOR
> 0000 > 007F	REGISTER FILE				
> 0080 > 00FF	RESERVED FOR FUTURE EXPANSION				
> 0100 > 0117	ON CHIP I/O (TIMERS, INTERRUPTS I/O PORTS)				
> 0118 > 01FF > 0200	PERIPHERAL EXPANSION				
> F000	NOT AVAILABLE	MEMORY EXPANSION			
> FFFF	SINGLE CHIP MODE	PERIPHERAL EXPANSION MODE	FULL EXPANSION MODE	MICRO-PROCESSOR MODE	EMULATOR MODE

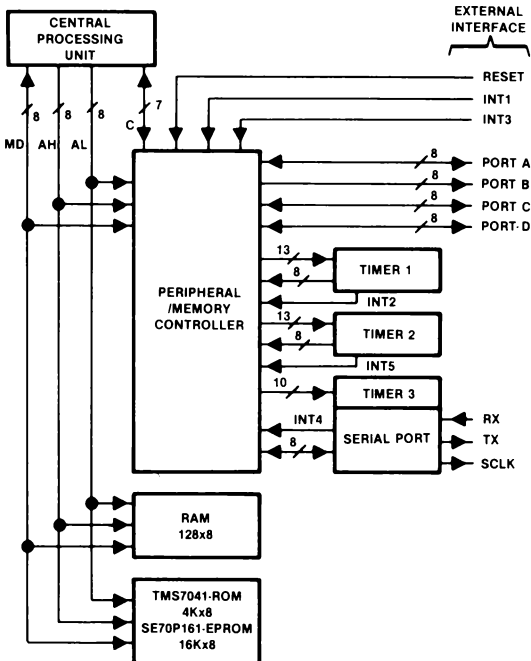
TMS70X1 PERIPHERAL MEMORY MAP

	SINGLE CHIP	PERIPHERAL EXPANSION	FULL EXPANSION	MICROPROCESSOR
>0100	I/O CONTROL REGISTER 0 (IOCNT0)			P0
>0101	RESERVED			P1
>0102	TIMER DATA (T1DATA)			P2
>0103	TIMER CONTROL (T1CNTL)			P3
>0104	PORT A DATA VALUE (APORT)			P4
>0105	PORT A DATA DIRECTION REGISTER (ADDR)			P5
>0106	(BITS 0-3) PORT B DATA VALUE (BPORT)			P5
>0106	PORT B DATA	PERIPHERAL EXPANSION (BITS 4-7)		P6
>0107	RESERVED			P7
>0108	PORT C DATA	PERIPHERAL EXPANSION		P8
>0109	C PORT DATA DIRECTION (CDDR)			P9
>010A	PORT D DATA VALUE (DPORT)			P10
>010B	D PORT DATA DIRECTION REGISTER	PERIPHERAL EXPANSION		P11
>010C	UNUSEABLE			P12
>010F				P15
>0110	I/O CONTROL REGISTER 1 (IOCNT1)			P16
>0111	FIRST WRITE SERIAL MODE (SMODE) WRITE SERIAL CONTROL 0 (SCTL0) READ STATUS REGISTER (SSTAT)			P17
>0112	TIMER 2 DATA (T2DATA)			P18
>0113	TIMER 2 CONTROL (T2CNTL)			P19
>0114	TIMER 3 DATA (T3DATA)			P20
>0115	SERIAL CONTROL (SCTL1)			P21
>0116	RECEIVER BUFFER (RXBUF)			P22
>0117	TRANSMITTER BUFFER (TXBUF)			P23
>0118	UNUSEABLE	PERIPHERAL EXPANSION		P24
>01FF	SINGLE CHIP	PERIPHERAL EXP.	FULL EXP.	P255

TMS7000 BLOCK DIAGRAM



TMS7001, TMS7041, SE70P161 BLOCK DIAGRAM



PIN ASSIGNMENTS ALL TMS7000 DEVICES

Signature	Pin	I/O	Description
A0 (LSB)	6	I/O	7001/7041/70P161 ONLY: A0-A4 and A7 can be individually selected in software as general-purpose input or output pins. A5 is a general-purpose input only pin, or also may function as a serial port input-only pin. A6 is a general-purpose input-only pin, or may also function as a serial port clock I/O or as clock input for Timer 2. A7 can also serve as a clock input for Timer 1.
A1	7	I/O	
A2	8	I/O	
A3	9	I/O	
A4	10	I/O	
A5 (RX)*	16	IN	
A6 (SCLK)*	15	I/O	
A7	11	I/O	All 70X0 DEVICES: A0-A7 are general-purpose input-only pins. A7 can also serve as clock input for the Timer.
B0 (LSB)	3	OUT	All 7000 DEVICES: B0-B7 are general-purpose output-only pins. B4-B7 become memory expansion control signals in Peripheral Expansion, Full Expansion, and Microprocessor modes. 7001/7041/70P161 ONLY: B3 also functions as a serial port output pin.
B1	4	OUT	
B2	5	OUT	
B3 (TX)*	37	OUT	
B4 (ALATCH)	38	OUT	
B5 (R/W)	1	OUT	
B6 (ENABLE)	39	OUT	
B7 (CLKOUT)	2	OUT	
C0 (LSB)	28	I/O	All 7000 DEVICES: C0-C7 can be individually selected in software as general-purpose input or output in Single Chip mode. C0-C7 become the LSB address Data Bus in Peripheral Expansion, Full expansion, and Microprocessor modes.
C1	29	I/O	
C2	30	I/O	
C3	31	I/O	
C4	32	I/O	

C5	33	I/O	All 7000 DEVICES: D0-D7 can be individually selected in software as general-purpose input or output pins in Single Chip or Peripheral Expansion modes. D0-D7 become the MSB Address Bus in Full Expansion and Microprocessor modes.
C6	34	I/O	
C7 (MSB)	35	I/O	
D0 (LSB)	27	I/O	
D1	26	I/O	
D2	24	I/O	
D3	23	I/O	
D4	22	I/O	
D5	21	I/O	
D6	20	I/O	
D7 (MSB)	19	I/O	
INT1	13	IN	Maskable interrupt, priority level 1. 7000 NMOS devices are latch- and level-triggered. CMOS devices are latched only.
INT3	12	IN	Maskable interrupt, priority level 3. All devices are latch- and level-triggered.
RESET	14	IN	Non-maskable system reset, priority level 0.
MC	36	IN	Mode control pin.
XTAL2/CLKIN	17	IN	External clock input. Crystal connect 2
XTAL1	18	IN	No-connect for external clock. Crystal connect 1.
VCC	25	IN	Supply voltage (+5V)
VSS	40	IN	Ground reference

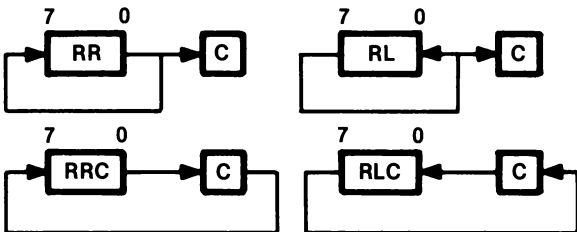
*Pins 15, 16, and 37 are SCLK, RX, and TX on 7001/7041/70P161 only.

MODE SELECT CONDITIONS

MODE	MODE SELECT CONDITIONS	
	MODE CNTL PIN	I/O CONTROL REG. BIT 7, 6
Single-Chip	0 V	0 0
Peripheral Expansion	0 V	0 1
Full Expansion	0 V	1 0
Microprocessor	V _{CC}	X X
System Emulator	+14 V	X X

X = Don't Care

BIT FLOW FOR ROTATE INSTRUCTIONS



ASCII CHARACTER SET

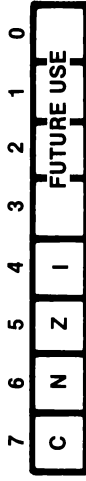
HEX	0	1	2	3	4	5	6	7	(High Byte)
(Low Byte)									
0	NUL 0	DLE 16	SP 32	0 48	@ 64	P 80	' 96	p 112	
1	SOH 1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	
2	STX 2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	
3	ETX 3	DC3 19	- 35	3 51	C 67	S 83	c 99	s 115	
4	EOT 4	DC4 20	\$ 36	4 52	D 68	T 84	d 100	t 116	
5	ENQ 5	NAK 21	% 37	5 53	E 69	U 85	e 101	u 117	
6	ACK 6	SYN 22	& 38	6 54	F 70	V 86	f 102	v 118	
7	BEL 7	ETB 23	' 39	7 55	G 71	W 87	g 103	w 119	
8	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	
9	HT 9	EM 25) 41	9 57	I 73	Y 89	i 105	y 121	
A	LF 10	SUB 26	* 42	: 58	J 74	Z 90	j 106	z 122	
B	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	
C	FF 12	FS 28	, 44	< 60	L 76	\ 92	l 108	: 124	
D	CR 13	GS 29	- 45	= 61	M 77] 93	m 109	} 125	
E	SO 14	RS 30	. 46	> 62	N 78	^ 94	n 110	~ 126	
F	SI 15	US 31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	

STATUS BIT VALUES FOR CONDITIONAL JUMP INSTRUCTIONS

MNEMONIC	INSTRUCTION	CONDITION ON WHICH JUMP IS TAKEN	STATUS BIT VALUES FOR JUMP:			SIGNED	UN-SIGNED
			C	N	Z		
JC/JHS	Jump If Carry/Jump If Higher Or same	(d)unsigned > = (s)	1	X	X	Y	Y
JNC/JL	Jump If No Carry/Jump If Lower	(d)unsigned < (s)	0	X	X	Y	Y
JZ/JEQ	Jump If Zero/Jump If Equal	(d) = (s)	X	X	1	Y	Y
JNZ/JNE	Jump If Non-zero/Jump If Not Equal	(d) < > (s)	X	X	0	Y	Y
JP	Jump If Positive	(d)-(s) = pos #	X	0	0	Y	N
JN	Jump If Negative	(d)-(s) = neg #	X	1	X	Y	N
JPZ	Jump If Positive or Zero	(d)-(s) = pos # or 0	X	0	X	Y	N

X = Don't care

STATUS REGISTER

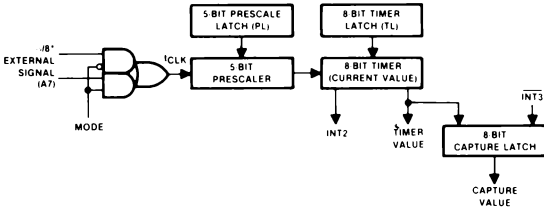


C - CARRY OUT (NO BORROW)
N - SIGN BIT
Z - ZERO
I - INTERRUPT ENABLE

(This register is CPU internal)

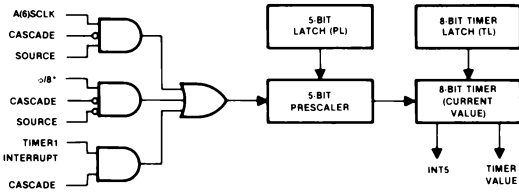
PROGRAMMABLE TIMER/EVENT COUNTERS

TIMER 1

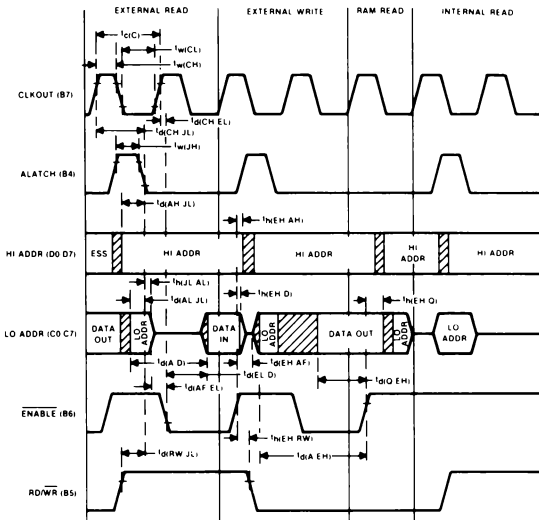


*NOTE: $\phi = f_{osc}/2$ for /2 clock option
 $\phi = f_{osc}/4$ for /4 clock option

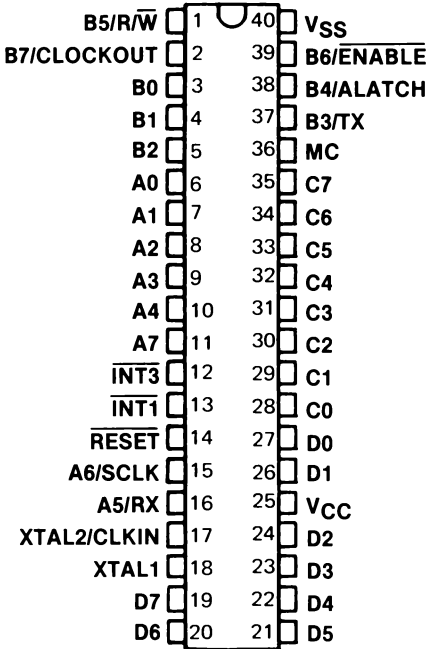
TIMER 2



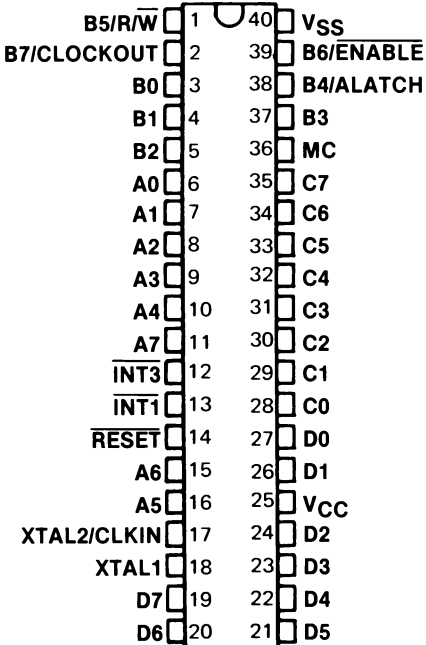
READ/WRITE CYCLE TIMING



**PIN ASSIGNMENTS
TMS7001 AND TMS7041**



**PIN ASSIGNMENTS
TMS70X0 AND TMS70CX0**



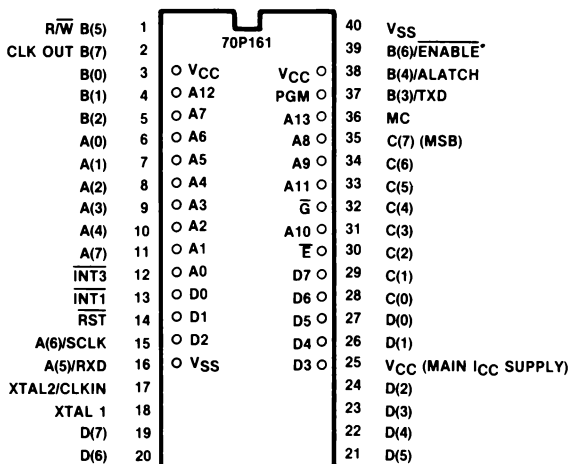
THE SE70P161 SYSTEM EMULATOR

EPROM Use (SE70P161 Only)

EPROM TYPE	70XX ROM SPACE	70XX * START ADDRESS	27XX START ADDRESS
27128	16K Bytes	> C006	> 0006
27128	12K Bytes	> D006	> 1006
2764	8K Bytes	> E006	> 0006
2764	4K Bytes	> F006	> 1006
2764	1K Bytes	> F806	> 1806

- * (1) Texas Instruments reserves the first 6 bytes of ROM.
- (2) All EPROM access times are not more than 250 ns.

PIN ASSIGNMENTS (SE70P161 Only)



* Pins low, EPROM always enabled.

INSTRUCTION – OPCODE SET

	SINGLE OPERAND			DUAL OPERAND									
	A	B	Rn	A,B	B,A	Rn,A	%n,A	Rn,B			%nRn	A,Rn	B,Rn
ADC					69	19	29	39	59	49	79		
ADD					68	18	28	38	58	48	78		
AND					63	13	23	33	53	43	73		
ANDP													
BTJO					66	16	26	36	56	46	76		
BTJOP													
BTJZ					67	17	27	37	57	47	77		
BTJZP													
BR													
CALL													
CLR	B5	C5	D5										
CLRC													
CMP					6D	1D	2D	3D	5D	4D	7D		
CMPA													
DAC					6E	1E	2E	3E	5E	4E	7E		
DEC	B2	C2	D2										
DECD	BB	CB	DB										
DINT													
DJNZ	BA	CA	DA										
DSB					6F	1F	2F	3F	5F	4F	7F		
EINT													
IDLE													
INC	B3	C3	D3										
INV	B4	C4	D4										
JMP													
JC/JHS													
JN/JLT													
JNC/JL													
JNZ/JNE													
JP/JGT													
JPZ/JGE													
JZ/JEQ													
LDA													
LDSP													
MOV				C0	62	12	22	32	52	42	72	D0	D1
MOVD													
MOVP													
MPY					6C	1C	2C	3C	5C	4C	7C		
NOP													
OR					64	14	24	34	54	44	74		
ORP													
POP	B9	C9	D9										
PUSH	B8	C8	D8										
RETI													
RETS													
RL	BE	CE	DE										
RLC	BF	CF	DF										
RR	BC	CC	DC										
RRC	BD	CD	DD										
SBB					6B	1B	2B	3B	5B	4B	7B		
SETC													
STA													
STSP													
SUB					6A	1A	2A	3A	5A	4A	7A		
SWAP	B7	C7	D7										
TSTA													
TSTB													
TRAP													
XCHB	B6		D6										
XOR					65	15	25	35	55	45	75		
XORP													

INSTRUCTION – OPCODE SET

PERIPHERAL					EXTENDED			OTH. ER	STATUS WORD		
A,Pn	Pn,A	B,Pn	Pn,B	%n,Pn	DIRECT	INDIRECT	INDEXED	OTHER	COND. BITS	INT. EN. BIT	
									X		ADC
									X		ADD
									X		AND
83	93			A3					X		ANDP
									X		BTJO
86	96			A6					X		BTJOP
									X		BTJZ
87	97			A7					X		BTJZP
					8C	9C	AC				BR
					8E	9E	AE				CALL
									X		CLR
								80	X		CLRC
									X		CMP
					8D	9D	AD		X		CMPA
									X		DAC
									X		DEC
									X		DECD
								06	X	X	DINT
									X		DJNZ
									X		DSB
								05	X	X	EINT
								01			IDLE
									X		INC
									X		INV
								E0			JMP
								E3			JC/JHS
								E1			JN/JLT
								E7			JNC/JL
								E6			JNZ/JNE
								E4			JP/JGT
								E5			JPZ/JGE
								E2			JZ/JEQ
					8A	9A	AA		X		LDA
								0D			LDSP
									X		MOV
					88	98	A8		X		MOVD
82	80	92	91	A2					X		MOVDP
									X		MPY
								00			NOP
									X		OR
84	94			A4					X		ORP
								08	X		POP
								0E	X		PUSH
								0B			RETI
								0A			RETS
									X		RL
									X		RLC
									X		RR
									X		RRC
									X		SBB
								07	X		SETC
					8B	9B	AB		X		STA
								09			STSP
									X		SUB
									X		SWAP
								B0	X		TSTA
								C1	X		TSTB
								E8-FF			TRAP
									X		XCHB
									X		XOR
85	95			A5					X		XORP

INSTRUCTION EXECUTION TIMES

OPERATION		ADDRESSING MODES							
		A	B	RF	PF	@ lab	* RF	@ lab (B)	OTHER
ADC	B, --	1/5							
	RF, --	2/8	2/8	3/10					
	%iop, --	2/7	2/7	3/9					
ADD	B, --	1/5							
	RF, --	2/8	2/8	3/10					
	%iop, --	2/7	2/7	3/9					
AND	B, --	1/5							
	RF, --	2/8	2/8	3/10					
	%iop, --	2/7	2/7	3/9					
ANDP	A, --				2/10				
	B, --				2/9				
	%iop, --				3/11				
BTJO ¹	B, --	2/7							
	RF, --	3/10	3/10	4/12					
	%iop, --	3/9	3/9	4/11					
BTJOP ¹	A, --				3/11				
	B, --				3/10				
	%iop, --				4/12				
BTJZ ¹	B, --	2/7							
	RF, --	3/10	3/10	4/12					
	%iop, --	3/9	3/9	4/11					
BTJZP ¹	A, --				3/11				
	B, --				3/10				
	%iop, --				4/12				
BR	--				3/10	2/9	3/12		
CALL	--				3/14	2/13	3/16		
CLR	--	1/5	1/5	2/7					
CLRC	--								1/6
CMP	B, --	1/5							
	RF, --	2/8	2/8	3/10					
	%iop, --	2/7	2/7	3/9					
CMPA	--				3/12	2/11	3/14		
DAC	B, --	1/7							
	RF, --	2/10	2/10	3/12					
	%iop, --	2/9	2/9	3/11					
DEC	--	1/5	1/5	2/7					
DECD	--	1/9	1/9	2/11					
DINT	--								1/5
DJNZ ¹	--	2/7	2/7	3/9					
DSB	B, --	1/7							
	RF, --	2/10	2/10	3/12					
	%iop, --	2/9	2/9	3/11					
EINT	--								1/5
IDLE	--								1/6 +
INC	--	1/5	1/5	2/7					
INV	--	1/5	1/5	2/7					
JMP	--								2/7
Jcnd ^{1,2}	lab								2/5
LDA	--				3/11	2/10	3/13		
LDSP	--								1/5
MOV	A, --		1/6	2/8					
	B, --	1/5		2/7					
	RF, --	2/8	2/8	3/10					
	%iop, --	2/7	2/7	3/9					
MOVD	%iop, --			4/15					
	%iop (B), --			4/17					
	RF, --			3/14					

¹Add 2 to cycle count if branch is taken.

²Conditional Jump Instructions (see Table 3-21 of TMS7000 Family Data Manual.)

NOTATION:

Data Form -- number of bytes/number of internal clock cycles.

- A A register
- B B register
- RF Register File number
- PF Peripheral File number
- lab Label
- lop immediate operand

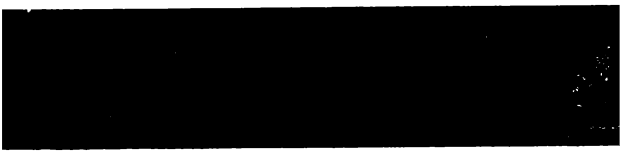
INSTRUCTION EXECUTION TIMES

OPERATION		ADDRESSING MODES							
		A	B	RF	PF	@ lab	* RF	@ lab (B)	OTHER
MOV _P	A, --				2/10				
	B, --				2/9				
	%lop, --				3/11				
MPY	PF, --	2/9	2/8						
	B, --	1/44							
	RF, --	2/47	2/47	3/49					
NOP	%lop, --	2/46	2/46	3/48					
	--								1/4
OR	B, --	1/5							
	RF, --	2/8	2/8	3/10					
	%lop, --	2/7	2/7	3/9					
ORP	A, --				2/10				
	B, --				2/9				
	%lop, --				3/11				
POP	--	1/6	1/6	2/8					
POP ST	--								1/6
PUSH	--	1/6	1/6	2/8					
PUSH ST	--								1/6
RETI	--								1/9
RETS	--								1/7
RL	--	1/5	1/5	2/7					
RLC	--	1/5	1/5	2/7					
RR	--	1/5	1/5	2/7					
RRC	--	1/5	1/5	2/7					
SBB	B, --	1/5							
	RF, --	2/8	2/8	3/10					
	%lop, --	2/7	2/7	3/9					
SETC	--								1/5
STA	--				3/11	2/10	3/13		
STSP	--								1/6
SUB	B, --	1/5							
	RF, --	2/8	2/8	3/10					
	%lop, --	2/7	2/7	3/9					
SWAP	--	1/8	1/8	2/10					
TSTA	--								1/6
TSTB	--								1/5
TRAP n	--								1/14
XCHB	--	1/6	1/6	2/8					
XOR	B, --	1/5							
	RF, --	2/8	2/8	3/10					
	%lop, --	2/7	2/7	3/9					
XORP	A, --				2/10				
	B, --				2/9				
	%lop, --				3/11				

NOTATION:

Data Form - number of bytes/number of internal clock cycles.

- A A register
- B B register
- RF Register File number
- PF Peripheral File number
- lab Label
- lop Immediate operand



**TEXAS
INSTRUMENTS**

February 1984

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