



Electronic  
components  
and materials

**PHILIPS**

**2650  
REFERENCE  
GUIDE**

**signetics**

**2650**  
**2650**  
**2650**  
**2650**





## NOTES

1. Condition code 'CC1, CC0': 01 if positive, 00 if zero, 10 if negative.
2. Condition code 'CC1, CC0': 01 if  $R0 > r$ , 00 if  $R0 = r$ , 10 if  $R0 < r$ .
3. Condition code 'CC1, CC0': 01 if  $r > V$ , 00 if  $r = V$ , 10 if  $r < V$ .
4. Condition code 'CC1, CC0': 00 if all selected bits are 1s, 10 if not all the selected bits are 1s.
5. Index register must be register 3 or 3'
6. Requires two additional cycles if indirection is specified.
7. Requires two additional cycles if indirection is specified and branch is taken.
8. Specify CC = 11 for unconditional branch.
9. RS, WC and COM bits in PSW are also affected.
10. CC assumes number in register is a binary number.

## ASSEMBLER FORMATS

Format No.	Format	Addressing Mode
1	OP	E
2	OP r	Z
3	OP, r/c	Z
4	OP v	$\Delta I$
5	OP, r v	I
6	OP [*] z	$\Delta R$
7	OP, r/c [*] d	R
8	OP, r/c [*] a	B
9	OP [*] a ,3	$\Delta B$
10	OP, r [*] p [,x] [,±]	A

Optional data enclosed in [ ]. Brackets are not part of syntax.

OP = operation code

r = register number (0-3)

c = condition code (0-3)

v = value (0-255)

\* indicates indirect addressing

z = zero page addresses (0-63, 8128-8191)

d = relative displacement addresses (-64 to +63)

a = addresses (0-32767)

p = page addresses (0-8191)

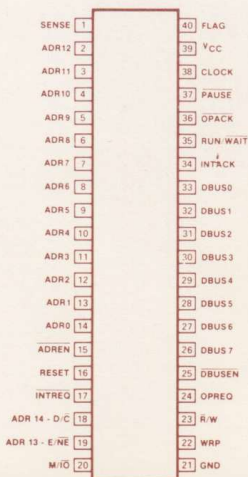
x = index register number (0-3)

+ = auto-increment

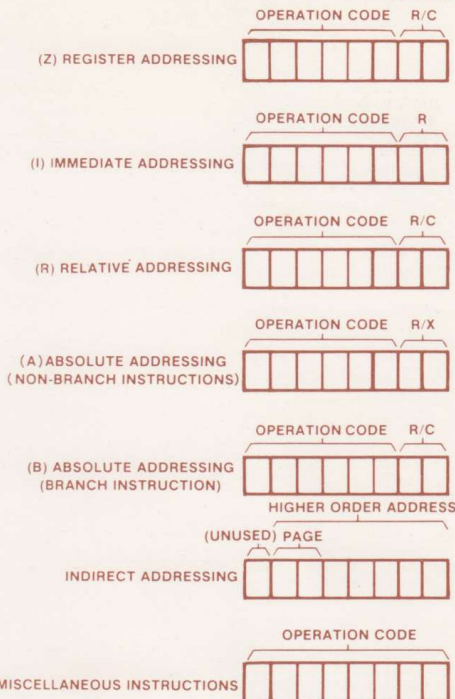
- = auto-decrement

$\Delta$  8-bit operation code (no r/c field required)

## PIN CONFIGURATION

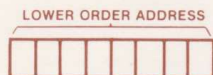
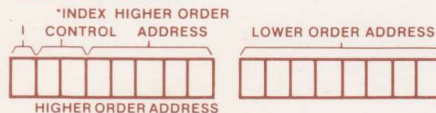
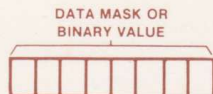


## ADDRESSING MODES



### SYMBOLS

R - Register number  
 V - Value  
 X - Index register number  
 I - Indirect bit  
 C - Condition Code



### \*INDEX CONTROL

00 - Non-indexed  
 01 - Indexed with auto-increment  
 10 - Indexed with auto-decrement  
 11 - Indexed only

## PROGRAM STATUS WORD

PSU

7	6	5	4	3	2	1	0
S	F	II	Not Used	Not Used	SP2	SP1	SP0

S Sense  
 F Flag  
 II Interrupt Inhibit  
 SP2 Stack Pointer Two  
 SP1 Stack Pointer One  
 SP0 Stack Pointer Zero

PSL

7	6	5	4	3	2	1	0
CC1	CC0	IDC	RS	WC	OVF	COM	C

CC1 Condition Code One  
 CC0 Condition Code Zero  
 IDC Interdigit Carry  
 RS Register Bank Select  
 WC With/Without Carry  
 OVF Overflow  
 COM Logical/Arith. Compare  
 C Carry/Borrow

### DIRECT RELATIVE ADDRESSING—SECOND BYTE

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
+	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
N																
-	7F	7E	7D	7C	7B	7A	79	78	77	76	75	74	73	72	71	
+	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
N	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
-	70	6F	6E	6D	6C	6B	6A	69	68	67	66	65	64	63	62	61
+	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
N	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
-	60	5F	5E	5D	5C	5B	5A	59	58	57	56	55	54	53	52	51
+	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
N	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
-	50	4F	4E	4D	4C	4B	4A	49	48	47	46	45	44	43	42	41
																40

INDIRECT RELATIVE ADDRESS: ADD (80)<sub>16</sub> TO DISPLACEMENT

## OPERATION CODES IN NUMERICAL ORDER\*

### 0 - 7F

00-03	LODZ	(1)
04-07	LODI	(2)
08-0B	LODR	(2)
0C-0F	LODA	(3)
10-11	----	
12	SPSU	(1)
13	SPSL	(1)
14-17	RETC	(1)
18-1B	BCTR	(2)
1C-1F	BCTA	(3)
20-23	EORZ	(1)
24-27	EORI	(2)
28-2B	EORR	(2)
2C-2F	EORA	(3)
30-33	REDC	(1)
34-37	RETE	(1)
38-3B	BSTR	(2)
3C-3F	BSTA	(3)
40	HALT	(1)
41-43	ANDZ	(1)
44-47	ANDI	(2)
48-4B	ANDR	(2)
4C-4F	ANDA	(3)
50-53	RRR	(1)
54-57	REDE	(2)
58-5B	BRNR	(2)
5C-5F	BRNA	(3)
60-63	IORZ	(1)
64-67	IORI	(2)
68-6B	IORR	(2)
6C-6F	IORA	(3)
70-73	REDD	(1)
74	CPSU	(2)
75	CPSL	(2)
76	PPSU	(2)
77	PPSL	(2)
78-7B	BSNR	(2)
7C-7F	BSNA	(3)

### 80 - FF

80-83	ADDZ	(1)
84-87	ADDI	(2)
88-8B	ADDR	(2)
8C-8F	ADDA	(3)
90-91	----	
92	LPSU	(1)
93	LPSL	(1)
94-97	DAR	(1)
98-9A	BCFR	(2)
9B	ZBRR	(2)
9C-9E	BCFA	(3)
9F	BXA	(3)
A0-A3	SUBZ	(1)
A4-A7	SUBI	(2)
A8-AB	SUBR	(2)
AC-AF	SUBA	(3)
B0-B3	WRTC	(1)
B4	TPSU	(2)
B5	TPSL	(2)
B6-B7	----	
B8-BA	BSFR	(2)
BB	ZBSR	(2)
BC-BE	BSFA	(3)
BF	BSXA	(3)
C0	NOP	(1)
C1-C3	STRZ	(1)
C4-C7	----	
C8-CB	STRB	(2)
CC-CF	STRA	(3)
D0-D3	RRL	(1)
D4-D7	WRTE	(2)
D8-DB	BIRR	(2)
DC-DF	BIRA	(3)
E0-E3	COMZ	(1)
E4-E7	COMI	(2)
E8-EB	COMR	(2)
EC-EF	COMA	(3)
F0-F3	WRTD	(1)
F4-F7	TMI	(2)
F8-FB	BDRR	(2)
FC-FF	BDRA	(3)

#### NOTE

\*The number enclosed in parentheses is the number of bytes in the instruction.

## HEXADECIMAL—DECIMAL CONVERSION

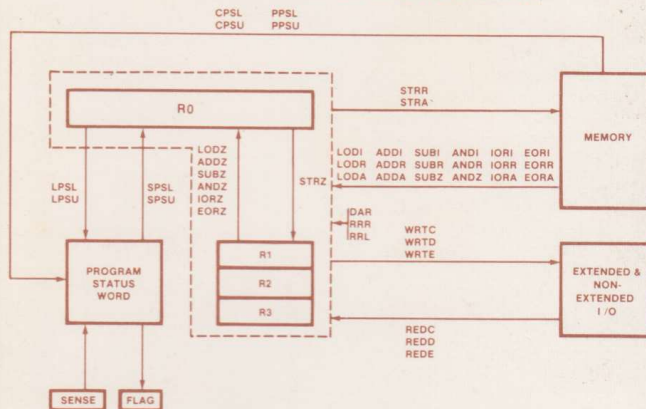
### Hexadecimal Columns

4		3		2		1	
HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
0	0	0	0	0	0	0	0
1	4,096	1	256	1	16	1	1
2	8,192	2	512	2	32	2	2
3	12,288	3	768	3	48	3	3
4	16,384	4	1,024	4	64	4	4
5	20,480	5	1,280	5	80	5	5
6	24,576	6	1,536	6	96	6	6
7	28,672	7	1,792	7	112	7	7
8	32,768	8	2,048	8	128	8	8
9	36,864	9	2,304	9	144	9	9
A	40,960	A	2,560	A	160	A	10
B	45,056	B	2,816	B	176	B	11
C	49,152	C	3,072	C	192	C	12
D	53,248	D	3,328	D	208	D	13
E	57,344	E	3,584	E	224	E	14
F	61,440	F	3,840	F	240	F	15

MOST SIGNIFICANT BYTE

LEAST SIGNIFICANT BYTE

## 2650 DATA TRANSFER INSTRUCTIONS



### MORE INFORMATION FROM:

**Austria:** ÖSTERREICHISCHE PHILIPS BAUELEMENTE

Industrie G.m.b.H., WIEN, Tel. 62 91 11.

**Belgium:** M.B.L.E., BRUXELLES, Tel. 523 00 00.

**Denmark:** MINIWATT A/S, KØBENHAVN, Tel. (01) 69 16 22.

**Finland:** OY PHILIPS AB, Elcoma Division, HELSINKI, Tel. 1 72 71.

**France:** R.T.C. LA RADIOTECHNIQUE-COMPELEC, PARIS, Tel. 355-44-99.

**Germany:** VALVO, UB Bauelemente der Philips G.m.b.H., HAMBURG, Tel. (040) 3296-1.

**Greece:** PHILIPS S.A. HELLENIQUE, Elcoma Division, ATHENS, Tel. 915 311.

**Ireland:** PHILIPS ELECTRICAL (IRELAND) LTD., DUBLIN, Tel. 69 33 55.

**Italy:** PHILIPS S.p.A., Sezione Elcoma, MILANO, Tel. 2-6994.

**Netherlands:** PHILIPS NEDERLAND B.V., EINDHOVEN, Tel. (040) 79 33 33.

**Norway:** NORSK A/S PHILIPS, Electronica Dept., OSLO, Tel. (02) 15 05 90.

**Portugal:** PHILIPS PORTUGESA S.A.R.L., LISBOA, Tel. 68 31 21.

**Spain:** COPRESA S.A., BARCELONA, Tel. 301 63 12.

**Sweden:** A.B. ELCOMA, STOCKHOLM, Tel. 08/67 97 80.

**Switzerland:** PHILIPS A.G., Elcoma Dept., ZÜRICH, Tel. 01/44 22 11.

**Turkey:** TÜRK PHILIPS TICARET A.S., EMET Dept., ISTANBUL, Tel. 43 59 10.

**United Kingdom:** MULLARD LTD., LONDON, Tel. 01-580 6633.