

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Curtiss-Wright / VMETRO / Micro Memory MM-6704* at our website: ***Click HERE***

MICRO MEMORY INC.
9540 VASSAR AVE.
CHATSWORTH, CALIF.
(818) 998-0070

MM6704c

USERs GUIDE

SEPT 1988

HIGH PERFORMANCE EXPANSION MEMORY MODULE for the VME BUS

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

SECTION I	GENERAL INFORMATION	PAGE
1.1	Introduction	1
1.2	General Description	1
1.2.1	Configuration	1
1.2.2	Operational Features	4
1.3	General Specifications	6
1.4	The Interface Signal Functions	7
1.5	Interface Timing	13
1.6	Memory Array Organization	14

SECTION II	INSTALLATION	PAGE
2.1	Introduction	16
2.2	Unpacking Instructions	16
2.3	Hardware Preparation	16
2.3.1	Handling Procedure	16
2.4	Operating Airflow and Cooling	17
2.5	Jumper & Switch Options	17
2.5.1	DTACK* Adjust Selections	17
2.5.2	Address Modifier Selection	18
2.5.3	Battery BACKUP jumpers	18
2.5.4	5 Volt Stand-By jumper option	18
2.5.5	SYSFAIL* System FAIL option	18
2.5.6	Write Protect Switches	18
2.6	Bank/Module Selection Configuration	19
2.7	Clock/Status Register Configuration	20
2.7.1	Status Register Definition	20
2.7.2	Clock/Calendar Definition	20
2.7.3	Clock/Calendar Selection	21

SECTION III	DEVICE CONFIGURATION	PAGE
3.1	Memory Device Configurations	38
3.2	Memory Device Sizing	38
3.3	Memory Device Selections	39
3.3.1	Device Socket Pin (1)	39
3.3.2	Device Socket Pin (3)	39
3.3.3	Device Socket Pin (30)	39
3.3.4	Device Socket Pin (32)	39
3.3.5	Device Socket Pin (29)	39

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

	TABLES	PAGE
Table 1.1	Memory Capacity Options	3
Table 1.2	Address Modifier Codes	4
Table 1.3	General Specifications	6
Table 1.4	P1 Connector Pin Assignments	10
Table 1.5	P2 Connector Pin Assignments	11
Table 1.6	P3 Connector Pin Assignments	12
Table 1.7	Static Device Locations for **MM6704c**	15
Table 1.8	Static Device Locations for **MM6705c**	15
Table 1.9	Static Device Locations for **MM6706c**	15
Table 2.1	Bank Address Selection (BLK E1)	22
Table 2.2	Module Selection (BLKs E5 & E6)	26
Table 2.3	Clock/Status Selection (BLK E3	34
Table 3.1	Memory Device Size Jumper (BLK E4)	38
Table 3.2	Configuration of KNOWN Devices	40

	FIGURES	PAGE
Figure 1.1	Functional Block Diagram	2
Figure 1.2	Jumper & Switch Locations	5
Figure 1.3	Interface Timing Diagram	13

	Miscellaneous	PAGE
	Assembly Listing of RTC routines	Appendix A
	DS1216C Specifications	Appendix B

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
Motorola M68020 ASM Version  1.10aSYS :1000.MM6704  .DS1216  .SA 05/03/88 07:59:20                PAGE   1

  1                       ds1216   IDNT     1,1                  Dallas Semiconductor DS1216 SMARTWatch routines
  2                       *
  3                       *        These routines control/read/write data to the Dallas Semiconductor
  4                       *        SMARTWatch DS1216 used on the Micro Memory Inc. MM6704 16Megabyte
  5                       *        NON-Volatile memory board.
  6                       *
  7
  8                       *
  9                       *        External Definitions
 10                       *
 11                               xdef     rd_rtc,wr_rtc
 12
 13                       *
 14                       *        Access data pattern
 15                       *
 16              00000000         section  0
 17 0 00000000 5CA33AC5   pat_dat  dc.b     $5c,$a3,$3a,$c5       ; Access data pattern for the DS1216
 18 0 00000004 5CA33AC5            dc.b     $5c,$a3,$3a,$c5
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Motorola M68020 ASM Version 1.10aSYS :1000.MM6704 .DS1216 .SA 05/03/88 07:59:20 PAGE 2

```
20                          *
21                          *       Read Real-Time-Clock
22                          *
23                          *       Entry:    move.l    #watchbyte,a0       ; address of Control byte
24                          *                 bsr       rd_rtc              ; read Real-Time-Clock
25                          *
26                          *       Return:   d0,d1 = 64 bit data pattern returned from DS1216
27                          *                 d0 = registers 7 -> 4 *** Note register order ***
28                          *                 d1 = registers 3 -> 0
29                          *
30 0 00000008 48E73000      rd_rtc    movem.l d2/d3,-(sp)           ; save the state
31
32 0 0000000C 6130                    bsr.s   ac_rtc                ; access the RTC
33
34 0 0000000E 363C003F                move.w  #63,d3                ; reset the loop count (64 bits total)
35
36 0 00000012 1410          rd_lp0    move.b  (a0),d2               ; get the watch byte
37 0 00000014 E212                    roxr.b  #1,d2                 ; move the ls bit out
38 0 00000016 E290                    roxr.l  #1,d0                 ; move the bit into the registers
39 0 00000018 E291                    roxr.l  #1,d1
40
41 0 0000001A 51CBFFF6                dbf     d3,rd_lp0             ; do until complete
42
43 0 0000001E 4CDF000C                movem.l (sp)+,d2/d3           ; restore the machine state
44
45 0 00000022 4E75                    rts
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
Motorola M68020 ASM Version  1.10aSYS :1000.MM6704  .DS1216  .SA 05/03/88 07:59:20                PAGE  3

 47                         *
 48                         *       Write Real-Time-Clock
 49                         *
 50                         *       Entry:    move.l    #watchbyte,a0        ; address of Control byte
 51                         *                 move.l    #MS32bits_of_data,d0 ; registers 7 -> 4
 52                         *                 move.l    #LS32bits_of_data,d1 ; registers 3 -> 0
 53                         *                 bsr       wr_rtc               ; write RTC routine
 54                         *
 55                         *       Return:   nothing
 56                         *
 57 0 00000024 48E7E000     wr_rtc    movem.l   d0/d1/d2,-(sp)       ; save the machine state
 58
 59 0 00000028 6114                   bsr.s     ac_rtc               ; access the RTC
 60
 61 0 0000002A 343C003F               move.w    #63,d2               ; reset the loop counter (64 bits total)
 62
 63 0 0000002E 1081         wr_lp0    move.b    d1,(a0)              ; output the ls bit
 64 0 00000030 E290                   roxr.l    #1,d0                ; shift the bits down one
 65 0 00000032 E291                   roxr.l    #1,d1
 66
 67 0 00000034 51CAFFF8               dbf       d2,wr_lp0            ; do all bits
 68
 69 0 00000038 4CDF0007               movem.l   (sp)+,d0/d1/d2       ; restore the machine state
 70
 71 0 0000003C 4E75                   rts
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
Motorola M68020 ASM Version  1.10aSYS :1000.MM6704  .DS1216  .SA 05/03/88 07:59:20                PAGE   4

 73                          *
 74                          *       Access the Real-Time-Clock (Dallas Semiconductor DS1216)
 75                          *
 76                          *       Entry:    a0 = Address of Watch Control byte
 77                          *
 78 0 0000003E 48E7E000      ac_rtc  movem.l  d0/d1/d2,-(sp)       ; save the state
 79
 80 0 00000042 203AFFBC              move.l   pat_dat(pc),d0       ; get the MS long word
 81 0 00000046 223AFFBC              move.l   pat_dat+4(pc),d1     ; get the LS long word
 82
 83 0 0000004A 1410                  move.b   (a0),d2              ; reset the access circuit
 84
 85 0 0000004C 343C003F              move.w   #63,d2               ; reset the bit count  (64 bits each)
 86
 87 0 00000050 1081          ac_lp0  move.b   d1,(a0)              ; write the ls bit out
 88 0 00000052 E290                  roxr.l   #1,d0                ; rotate the bits
 89 0 00000054 E291                  roxr.l   #1,d1
 90 0 00000056 51CAFFF8              dbf      d2,ac_lp0            ; do until all 64 sent
 91
 92 0 0000005A 4CDF0007              movem.l  (sp)+,d0/d1/d2       ; restore the state
 93
 94 0 0000005E 4E75                  rts
 95
 96                          *
 97                          *       End of RTC routines
 98                          *
 99                                  end

****** TOTAL ERRORS      0--
****** TOTAL WARNINGS    0--
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Motorola M68020 ASM Version 1.10aSYS :1000.MM6704 .DS1216 .SA 05/03/88 07:59:20 PAGE 5

SYMBOL TABLE LISTING

SYMBOL NAME	SECT	VALUE	SYMBOL NAME		SECT	VALUE
AC_LPO	0	00000050	RD_RTC	XDEF	0	00000008
AC_RTC	0	0000003E	WR_LPO		0	0000002E
PAT_DAT	0	00000000	WR_RTC	XDEF	0	00000024
RD_LPO	0	00000012				

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

This manual describes the elements of operation and installation procedures of the **MM6704c Static Memory Module** Random Access Memory Modules.

1.2 GENERAL DESCRIPTION

1.2.1 Configuration

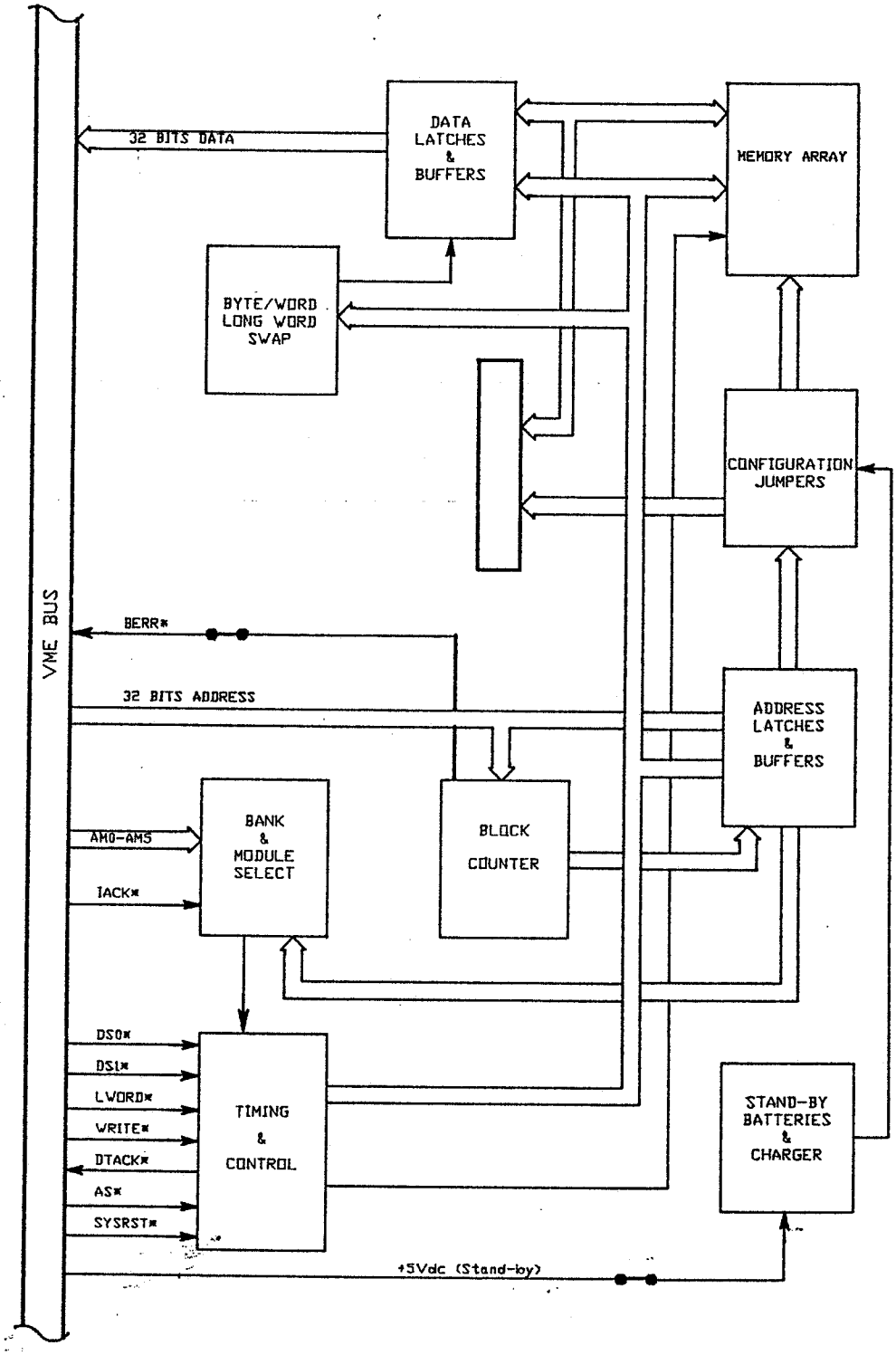
The **MM6704c** is compatible with **VMEbus** specifications (**C.1**). Inherent to the module are **VMEbus** options D32/D16/D08(EO) (32/16/8 bit data path widths) and A32/A24 (32/24 bit address path widths).

The memory array is addressable as 8 bit bytes, 16 bit words, or 32 bit longwords. The **MM6704c** can be configured for 1M, 2M or 4M bytes capacity by populating it with 32k, 64k, 128k X 8 industry standard CMOS Static RAMs or Eproms, such as the ######## devices.

The **MM6704c** is completely compatible with **VMEbus** Master Modules employing 680x0, 80x86, or N32xxx CPUs.

The **MM6704c** base memory module is available in several options depending on the capacity required. Table 1.1 lists the optional part numbers for ordering purposes, the total memory capacity provided by each version.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



FUNCTIONAL BLOCK DIAGRAM FIGURE 1.1

Artisan Technology Group.- Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1.1

Memory Capacity Options

Table 1.1 summarizes the options with respect to storage capacity, available to MM6210D user.

Option	Capacity
MM6704c/1M	1.0Megabytes
MM6704c/2M	2.0Megabytes
MM6704c/4M	4.0Megabytes

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.2.2 OPERATIONAL FEATURES

The **MM6704c** memory module contains its own address register and data buffers for total compatibility with the **VMEbus.**

Module selection for the **MM6704c** resides on any 64K (10000 hex) byte boundaries **(A24/A32).** The module may be mapped into one of the 16M byte banks, within the 4 G bytes of physical address space of the **VMEbus (A32).** The **MM6704c**'s memory array is addressable as 8 bit bytes **(D08(OE)),**16 bit words **(D16),** or as 32 bit longwords **(D32),** using conventional read/write transfers, or **HIGH Performance BLOCK Transfers (BLT).**

The **MM6704c** is configured to respond to various Address Modifier Codes (See Table 1.2). As shipped from the the factory the **MM6704c** responds to A32 addresses (using addresses A24-A31), or A24 addresses (ignoring addresses A24-A31). A32 ONLY addresses may be selected by removing the A24 Address Modifier Enable jumper (A24). Other combinations are available, (Contact the factory).

TABLE 1.2 Address Modifier Codes

Hex Code	Address Modifier 5	4	3	2	1	0	Function
09	L	L	H	L	L	H	Extended Non-Privileged Data Access (32 Addr)
0A	L	L	H	L	H	L	Extended Non-Privileged Program Access (32 Addr)
0B	L	L	H	L	H	H	Extended Non-Privileged Block Transfer (32 Addr)
0D	L	L	H	H	L	H	Extended Supervisory Data Access (32 Addr)
0E	L	L	H	H	H	L	Extended Supervisory Program Access (32 Addr)
0F	L	L	H	H	H	H	Extended Supervisory Block Transfer (32 Addr)
39	H	H	H	L	L	H	Standard Non-Privileged Data Access (24 Addr)
3A	H	H	H	L	H	L	Standard Non-Privileged Program Access (24 Addr)
3B	H	H	H	L	H	H	Standard Non-Privileged Block transfer (24 Addr)
3D	H	H	H	H	L	H	Standard Supervisory Data Access (24 Addr)
3E	H	H	H	H	H	L	Standard Supervisory Program Access (24 Addr)
3F	H	H	H	H	H	H	Standard Supervisory Block Transfer (24 Addr)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

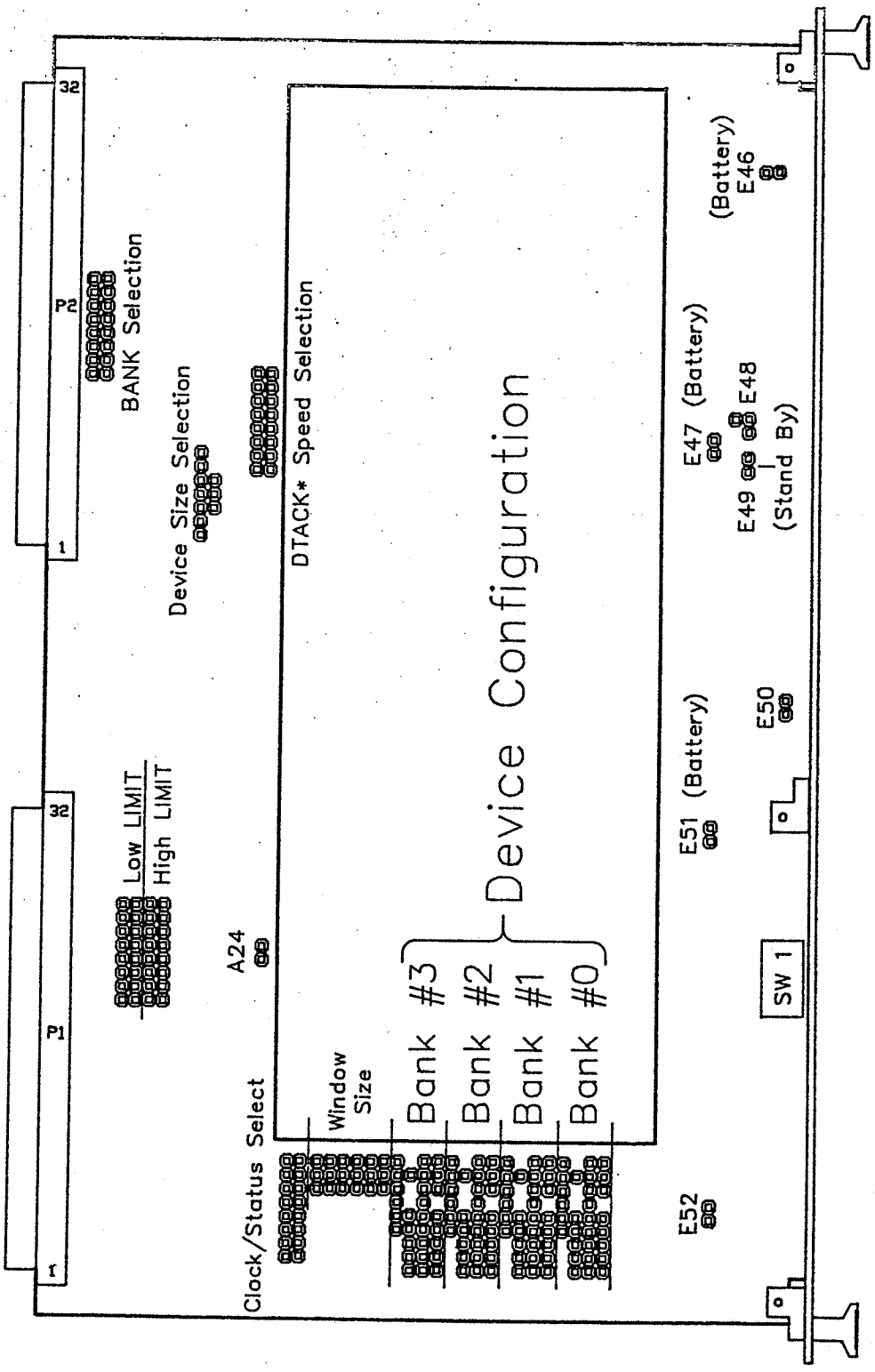


FIGURE 1.2 JUMPER & SWITCH LOCATIONS

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.3 GENERAL SPECIFICATIONS

Table 1.3 lists the general specifications for the **MM6704c Static Memory Module**

Table 1.3

Characteristics	Specifications		
Capacity	1/2/4Megabytes		
Access/Cycle Time	100,125,150,250 (Selectable on each of four (4) blocks)		
Address	32 bits A32/A24/A16/BLT/UAT		
Data In/Data Out	8/16/24/32 bits bidirectional with three-state output D08(OE)/D16/D32		
Modes of Operation	Read, Write, Read/Modify/Write (RMW), Block Transfers (BLT), Un-aligned (UAT)		
Module Selection	Memory selected on 64K byte (10000H) boundaries in any sixteen megabyte bank within a 4Gigabyte address space.		
Interface:			
Inputs	TTL-compatible		
Outputs	Three-state, voltage compatible		
Operating Temperature	0 to 60 degrees C		
Storage Temperature	-40 to +80 degrees C		
Relative Humidity	95% without condensation		
Power Requirements:	Operate	Stand-by	Max.
+5V (fully-populated)	1.8A	100uA.	2.1A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.4 THE VMEbus INTERFACE SIGNAL FUNCTIONS

SIGNAL MNEMONIC	SIGNAL TYPE	SIGNAL NAME and DESCRIPTION
ACFAIL*	O.C.	AC FAILURE - Indicates that the AC input to the power supply has been interrupted or that the necessary input voltage levels requirements are not being met.
AM0-AM5	3-S.	ADDRESS MODIFIER (bits 0-5) - Master provides additional information about the address bus, such as size, cycle type,and/or DTB master identification
AS*	3-S.	ADDRESS STROBE - Indicates that a valid address is on the address bus
A01-A31	3-S.	ADDRESS bus (bits 1-31) - Specific physical memory address.
BBSY*	O.C.	BUS BUSY - Generated by the current DTB master to indicate that it is using the bus.
BCLR*	3-S.	BUS CLEAR - Generated by the bus arbitrator to request release by the current DTB master for a higher level requesting master.
BERR*	O.C.	BUS ERROR - Generated by a slave to indicate that an unrecoverable error has occurred and that the bus cycle must be aborted.
BG0IN*-BG3IN*	3-S.	BUS GRANT (0-3) IN - Together with BUS GRANT (0-3) OUT forms a daisy-chained bus grant. The BGxIN* signal indicates to this board that it may become the next DTB master.
BG0OUT*-BG3OUT*	3-S.	BUS GRANT (0-3) OUT - Indicates to the next board in the daisy-chain that it may become the next master.
BR0*-BR3*	O.C.	BUS REQUEST (0-3) - indicates that a DTB master in the daisy-chain requires access to the (DTB) bus.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.4 THE VMEbus INTERFACE SIGNAL FUNCTIONS (continued)

SIGNAL MNEMONIC	SIGNAL TYPE	SIGNAL NAME and DESCRIPTION
DS0*	3-S.	DATA STROBE 0 - Indicates that odd byte data is valid on the VME data transfer bus (D00-D07/D16-D23).
DS1*	3-S.	DATA STROBE 1 - Indicates that even byte data is valid on the VME data transfer bus (D08-D15/D24-D31).
DTACK*	O.C.	DATA TRANSFER ACKNOWLEDGE - Generated by a DTB slave. The leading (falling) edge indicates that read cycle data is valid or that data has been accepted during a write cycle.
D00-D32	3-S.	DATA BUS (bits 0-32) - Bidirectional data lines that provide a data path between the DTB master and slave.
GND		GROUND
IACK*	3-S./O.C.	INTERRUPT ACKNOWLEDGE - Generated by any master processing an interrupt request.
IACKIN*	3-S.	INTERRUPT ACKNOWLEDGE IN - Together with IACKOUT* forms a daisy-chained acknowledge. The IACKIN* signal indicates to the VME board that an acknowledge cycle is in progress.
IACKOUT*	3-S.	INTERRUPT ACKNOWLEDGE OUT -Indicates to the next VME board in the daisy-chain that an acknowledge cycle is in progress.
IRQ1*-IRQ7*	O.C.	INTERRUPT REQUEST (1-7) - Prioritized request for interrupt service,level 7 is the highest level,1 is the lowest.
LWORD*	3-S.	LONG WORD - Indicates that the current data transfer is a 32 bit transfer.
SYSCLK	T.P.	SYSTEM CLOCK - A constant 16 MHz clock that is independent of processor speed or timing.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.4 THE VMEbus INTERFACE SIGNAL FUNCTIONS (continued)

SIGNAL MNEMONIC	SIGNAL TYPE	SIGNAL NAME and DESCRIPTION
SYSFAIL*	O.C.	SYSTEM FAIL - Generated by any module on the VMEbus to indicate that a failure has occured in the system.
SYSRESET*	O.C.	SYSTEM RESET - When driven low, will cause a hardware system reset.
WRITE	3-S.	WRITE - When low, inticates that the data transfer cycle in progress is a write operation. When high durring an address strobe, indicates a read operation is occuring.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1.4

P1 Connector Pin Assignments

PIN NUMBER	ROW A SIGNAL	ROW B SIGNAL	ROW C SIGNAL
1	D00	BBSY*	D08
2	D01	BCLR*	D09
3	D02	ACFAIL*	D10
4	D03	BGOIN*	D11
5	D04	BGOOUT*	D12
6	D05	BG1IN*	D13
7	D06	BG1OUT*	D14
8	D07	BG2IN*	D15
9	GROUND	BG2OUT*	GROUND
10	SYSCLK	BG3IN*	SYSFAIL*
11	GROUND	BG3OUT*	BERR*
12	DS1*	BR0*	SYSRESET*
13	DS0*	BR1*	LWORD*
14	WRITE*	BR2*	AM5
15	GROUND	BR3*	A23
16	DTACK*	AM0	A22
17	GROUND	AM1	A21
18	AS*	AM2	A20
19	GROUND	AM3	A19
20	IACK*	GROUND	A18
21	IACKIN*	SERCLK	A17
22	IACKOUT*	SERDAT	A16
23	AM4	GROUND	A15
24	A07	IRQ7*	A14
25	A06	IRQ6*	A13
26	A05	IRQ5*	A12
27	A04	IRQ4*	A11
28	A03	IRQ3*	A10
29	A02	IRQ2*	A09
30	A01	IRQ1*	A08
31	-12V	+5V STDBY	+12V
32	+5V	+5V	+5V

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1.5

P2 Connecter Pin Assignments

PIN NUMBER	ROW A SIGNAL	ROW B SIGNAL	ROW C SIGNAL
1	User I/O	+5 Volts	User I/O
2	User I/O	GND	User I/O
3	User I/O	RESERVED	User I/O
4	User I/O	A24	User I/O
5	User I/O	A25	User I/O
6	User I/O	A26	User I/O
7	User I/O	A27	User I/O
8	User I/O	A28	User I/O
9	User I/O	A29	User I/O
10	User I/O	A30	User I/O
11	User I/O	A31	User I/O
12	User I/O	GND	User I/O
13	User I/O	+5 Volts	User I/O
14	User I/O	D16	User I/O
15	User I/O	D17	User I/O
16	User I/O	D18	User I/O
17	User I/O	D19	User I/O
18	User I/O	D20	User I/O
19	User I/O	D21	User I/O
20	User I/O	D22	User I/O
21	User I/O	D23	User I/O
22	User I/O	GND	User I/O
23	User I/O	D24	User I/O
24	User I/O	D25	User I/O
25	User I/O	D26	User I/O
26	User I/O	D27	User I/O
27	User I/O	D28	User I/O
28	User I/O	D29	User I/O
29	User I/O	D30	User I/O
30	User I/O	D31	User I/O
31	User I/O	GND	User I/O
32	User I/O	+5 Volts	User I/O

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1.6

Mezzanine Memory Expansion, P3 Connector Pin Assignments

PIN NUMBER	ROW A SIGNAL	ROW B SIGNAL	ROW C SIGNAL
1	CS4*	GROUND	GROUND
2	CS5*	PIN-32 ARRAY 2	GROUND
3	CS6*	PIN-1 ARRAY 2	GROUND
4	CS7*	PIN-3 ARRAY 2	GROUND
5	MD0	PIN-30 ARRAY 2	GROUND
6	MD1	WE32* ARRAY 2	GROUND
7	MD2	WE22* ARRAY 2	+5 Vdc
8	MD3	WE12* ARRAY 2	+5 Vdc
9	MD4	WE02* ARRAY 2	+5 Vdc
10	MD5	PIN-32 ARRAY 3	+5 Vdc
11	MD6	PIN-1 ARRAY 3	----
12	MD7	PIN-3 ARRAY 3	----
13	MD8	PIN-30 ARRAY 3	----
14	MD9	WE33* ARRAY 3	----
15	MD10	WE23* ARRAY 3	----
16	MD11	WE13* ARRAY 3	----
17	MD12	WE03* ARRAY 3	----
18	MD13	OE3*	----
19	MD14	OE2*	----
20	MD15	OE1*	----
21	MD16	OE0*	----
22	MD17	M1A18	----
23	MD18	M1A17	----
24	MD19	M1A15	----
25	MD20	M1A14	----
26	MD21	M1A13	----
27	MD22	M1A12	----
28	MD23	M1A11	----
29	MD24	M1A10	----
30	MD25	M1A9	----
31	MD26	M1A8	----
32	MD27	M1A7	----
33	MD28	M1A6	----
34	MD29	M1A5	----
35	MD30	M1A4	----
36	MD31	M1A3	----
37	GROUND	M1A2	----

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.5 INTERFACE TIMING

The **MM6704c** memory modules are designed to accept Industry Standard 32k, 64k, 128k x 8 Static Random Access Memory Devices specified with an 100, 120, 150, 250nsec access/cycle delay Time (ie. #######).

The Interface Timing Diagram (figure 1.3), illustrates the timing relationships on the Data Transfer bus, for Read and Write Cycles. Access delay time is measured from the leading edge of the Data strobes at the **VMEbus**. (See Figure 1.3).

INTERFACE TIMING DIAGRAM FIGURE 1.3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.6 MEMORY ARRAY ORGANIZATION

The memory array is partitioned into eight (8) 32 bit segments. The minimum memory configuration would be (depending on the devices used) from 32k x 32 (using 256K bit devices), to 512k x 32 bits (using 4096K bit devices). This would translate to a minimum configuration of 128K bytes to 2 Megabytes for the **MM6704c Static Memory Module**. The 32 bits of data are divided into 4 bytes (8 bits each). While the memory reads and writes may be 8, 16 or 32 bits wide, the memory is organized as 32 bit wide locations with logic controlling which byte<s> the user is reading or writing.

If the contents of the first 8 locations in memory are $01 $23 $45 $67 $89 $AB $CD $EF, determining which bits constitute what byte may be somewhat confusing. This can be cleared up by seeing the same data in the various formats used in most systems (IE: Byte, Word, and Longword).

BYTE Format		WORD Format		LONGWORD Format	
Location	Data	Location	Data	Location	Data
$00000000	$01	$00000000	$0123	$00000000	$01234567
$00000001	$23	$00000002	$4567	$00000004	$89ABCDEF
$00000002	$45	$00000004	$89AB		
$00000003	$67	$00000006	$CDEF		
$00000004	$89				
$00000005	$AB				
$00000006	$CD				
$00000007	$EF				

BIT Organizations

```
                                LONGWORD
3               1 1               0 3               1 1               0
1...............6 5...............0 1...............6 5...............0
--------------------------------------------------------------------------

                                WORD
1               0 1               0 1               0 1               0
5...............0 5...............0 5...............0 5...............0
--------------------------------------------------------------------------


0       00      0 0       00      0 0       00      0 0       00      0
7......07......0 7......07......0 7......07......0 7......07......0

0000000100100011 0100010101100111 1000100110101011 1100110111101111
 $0  $1  $2  $3   $4  $5  $6  $7   $8  $9  $A  $B   $C  $D  $E  $F
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1.7

Static Device locations for the MM6704c

BLOCK	ARRAY BANK	DATA BITS 31 -> 24	23 -> 16	15 -> 8	7 -> 0
0	0	U41	U45	U49	U53
1	0	U40	U44	U48	U52
2	1	U39	U43	U47	U51
3	1	U38	U42	U46	U50

Table 1.8

Static Device locations for the MM6705c Expansion

BLOCK	ARRAY BANK	DATA BITS 31 -> 24	23 -> 16	15 -> 8	7 -> 0
4	2	U3	U7	U11	U15
5	2	U4	U8	U12	U16
6	3	U5	U9	U13	U17
7	3	U7	U10	U14	U18

Table 1.9

Static Device locations for the MM6706c Expansion

BLOCK	ARRAY BANK	DATA BITS 31 -> 24	23 -> 16	15 -> 8	7 -> 0
4-0	2	U20	U21	U28	U29
4-1	2	U19	U22	U27	U30
4-2	2	U18	U23	U26	U31
4-3	2	U17	U24	U25	U32
5-0	2	U4	U5	U12	U13
5-1	2	U3	U6	U11	U14
5-2	2	U2	U7	U10	U15
5-3	2	U1	U8	U9	U16
6-0	3	U52	U53	U60	U61
6-1	3	U51	U54	U59	U62
6-2	3	U50	U55	U58	U63
6-3	3	U49	U56	U57	U64
7-0	3	U36	U37	U44	U45
7-1	3	U35	U38	U43	U46
7-2	3	U34	U39	U42	U47
7-3	3	U33	U40	U41	U48

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION II

INSTALLATION

2.1 INTRODUCTION

This section details the step by step procedure to interface the **MM6704c Static Memory Module** with the **VMEbus.**

2.2 UNPACKING INSTRUCTIONS

Unpack module(s) from shipping carton. If carton is damaged upon receipt, request that the carrier's agent be present during unpacking and inspection of the equipment. Refer to packing list and verify that all items are present. Save packing material for storing or reshipping the equipment. For repairs or replacement of a board damaged during shipment, contact **Micro Memory Inc.** to obtain a Return Authorization number and further instructions.

2.3 HARDWARE PREPARATION

The **MM6704c** memory module should be inspected and prepared for jumper placement and switch settings prior to system installation. The following sections describe the proper jumper options and switch settings necessary for system operation. Figure 2.1 illustrates jumper and switch locations and should be referenced as necessary.

2.3.1 Handling Procedure

The **MM6704c** uses MOS components that are susceptible to damage if exposed to static electrical charges. To avoid damage of these components during handling, testing or operation, the following procedure should be used.

A. Device leads should contact conductive material to avoid building of any static charge, except during testing or operation.

B. Soldering iron tips, metal fixtures, tools, and handling facilities used in preparing the module for operation should be grounded.

C. Devices should never be removed or inserted while power is applied to the module because voltage transients may permanently damage the devices and/or module.

D. The memory module should never be plugged in or out of the cardcage while power is applied.

E. External signals should not be applied to device inputs while power is removed.

F. Any memory module removed from the system should be transferred to either non-conductive foam or an anti-static plastic bag for storage or shipment.

2.4 OPERATING AIRFLOW AND COOLING

An adequate airflow is required to maintain the operating temperature within specifications of the memory module.

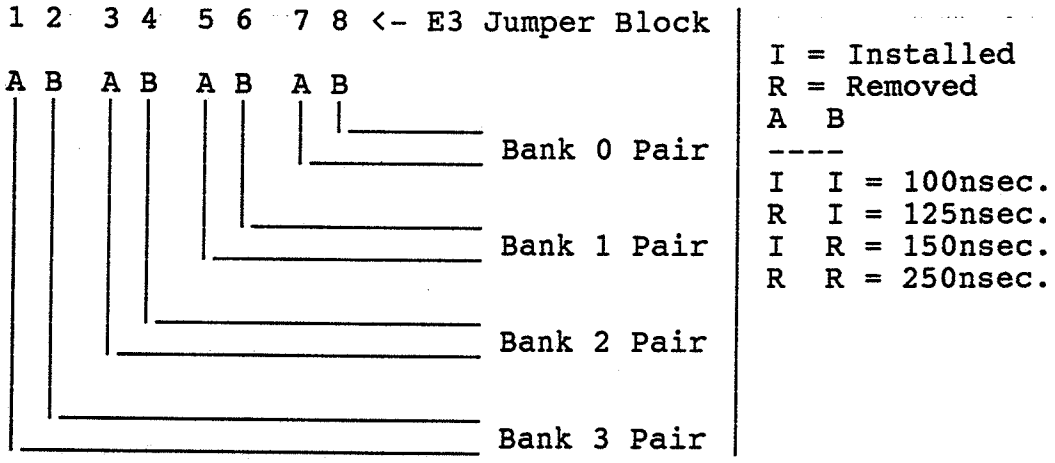
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.5 JUMPER & SWITCH OPTIONS

There are several jumper options attainable on the **MM6704c Static Memory Module** depending on the application. Most of the available options are selected by installing or removing mini-jumpers on wire-wrap pins at 0.100 inch centers. (See Figure 1.2 for jumper locations)

2.5.1 DTACK* ADJUST SELECTIONS (Default = As per installed devices)

The **MM6704c Static Memory Module** has four (4) contiguous equal sized banks of memory. Each of these banks may be independently configured for different speed devices. That is to say each of the four (4) banks, have an independent **DTACK*** speed adjustment. Jumper block **E3** consists of four (4) jumper pairs. Each pair controls one (1) bank of memory (See example below).



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.5.2 ADRESS MODIFIER SELECTION (A24, Default = INSTALLED)

As shipped from the factory, the **MM6704c Static Memory Module** may be be selected using either A32 or A24 Address Modifiers. However removing jumper A24, will prevent the **MM6704c Static Memory Module** from responding to A24 Address Modifiers.

2.5.3 BATTERY BACKUP JUMPERS (Default = E46, E47, E51 REMOVED. E48-2 TO E48-3)

To enable the battery BACKUP option of the **MM6704c Static Memory Module**, the BATTERY CONNECT Jumpers (E46, E47, & E51) **must be INSTALLED.** Jumper E48 selects between +5 Volts and the (Battery Bus) and is jumpered from E48-2 (Vbb) to E48-3 (Battery Bus) from the factory.

2.5.4 5 Volt STAND-BY JUMPER OPTION (E49, Default = REMOVED)

To allow for the ON-Board batteries to be used as "EMERGENCY USE ONLY" batteries, the **MM6704c Static Memory Module** may be configured to use the **VMEbus pin 5 Volt Stand-by** (P1-B31). Installing jumper E49 allows the user to supply an EXTERNAL (User supplied) regulated (5 Volt +0 -1 Volt @ 100uA) power supply. This would prevent any discharge of the ON-Board batteries, except in the event of a STAND-BY power failure. Giving the user a **Double Redundant** backup.

2.5.5 SYSFAIL* SYSTEM FAIL OPTION (E52, Default = REMOVED)

Jumper E52, if installed, will assert **SYSFAIL*** on the **VMEbus**, as a result of the **MM6704c Stati Memory Module** detecting less than 4.75 Volts on the ON-Board 5 Volt supply line.

2.5.6 WRITE PROTECT SWITCHES (Default = All positions OPEN)

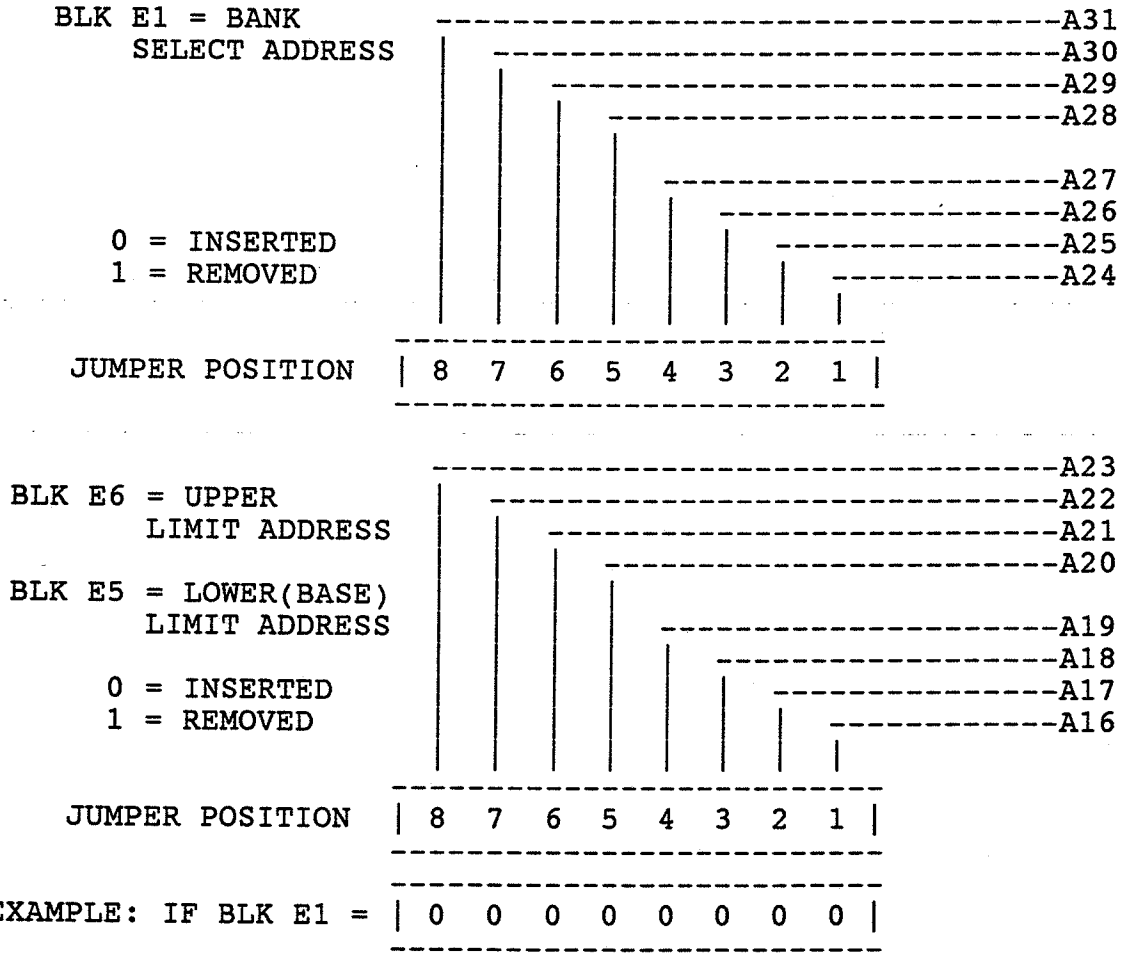
The **MM6704c Static Memory Module** may be WRITE Protected in four (4) equal sizes blocks, (block size depends on devices used). Switch SW1, allows each block to be write protected independant of the other blocks. Closing a switch position, protects the associated block from any writes to memory. Opening a switch position allows writing to that block.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.6 BANK/MODULE SELECTION CONFIGURATION

Before the **MM6704c Memory Module** can become truly operational, it must be mapped into an appropriate segment within the **VMEbus** (4G bytes) maximum address space. This can be accomplished by setting switches BLK E1 (bank select) &, BLK E6 (upper limit) & BLK E5 (lower limit) See example below.

BANK SELECTION EXAMPLE



THEN THE MODULE WILL BE SELECTED OR MAPPED WITHIN THE FIRST 16M BYTE BANK

("Bank Selection" Information, See Table 2.1)

IF BLK E5 = | 0 0 0 1 0 0 0 0 |

THEN THE LOWER LIMIT ADDRESS = 100000 hex

IF BLK E6 = | 0 0 0 1 1 1 1 1 |

THEN THE UPPER LIMIT ADDRESS = 1FFFFF hex

("Module Selection" Information, See Table 2.2)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.7 Clock/Status Register Configuration

The **MM6704c Static Memory Module** contains a board Status Register located in **VMEbus** A16 (I/O) space. The register contains information about the status of the **MM6704c Static Memory Module**'s ON-Board batteries, and also monitors the +5 Vdc power supply. A **Dallas Semiconductor DS1216C SMARTwatch** is installed on the board, which provides a Real-Time Clock/Calendar, while also providing the programmer with the potential area to store system variables (using a, USER SUPPLIED, 8K X 8 Low Power CMOS static ram). The Clock/Status Register occupies from 256 bytes to 16384 bytes of **VMEbus** A16 (I/O) space. The selected window size is determined by jumper blocks E8 through E13 (See Section 2.7.3)

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
DC	XX	XX	XX	XX	B3	B2	B1	--------- Clock / Calendar ----------							

2.7.1 Status Register Definition

The Status Register on the **MM6704c Static Memory Module** is a read only register, redundantly located at ALL EVEN addresses of the selected I/O location. Bit 15 reflects the current status of the +5Vdc power supply monitor (DCFAIL). Bit 15 is SET if the +5 Vdc supply is above 4.75 Vdc. Bits 10, 9 & 8 reflect the current battery status for batteries 3, 2, & 1 respectively. The corresponding bit will be SET if a battery's output falls below 3.3 Vdc. Bits 14, 13, 12, & 11 are indeterminate.

2.7.2 Clock/Calendar Definition

The **MM6704c Static Memory Module** contains a **DALLAS Semiconductor DS1216C** (U31) **SMARTwatch**, which serves two (2) purposes. First, it can serve as the system Clock/Calendar, using software routines (See Appendix A) to set/read the Clock/Calendar built into the socket. Second, having its own independent battery, it can be used to hold data in a USER Supplied LOW POWER CMOS static memory device (8K X 8). The **SMARTwatch** occupies ALL ODD addresses of the selected I/O location window (See Section 2.7.3). The **SMARTwatch** accessed by writing a unique 64 bit data pattern into any SINGLE ODD location ocuppied by the **SMARTwatch** in the selected **VMEbus** A16 I/O space. (See Appendix B)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.7.3 Clock/Status Register Selection

The Clock/Calendar/Status Register may be selected on any boundary, corresponding with the I/O window size (IE: 256, 1024, 2048, 4096, 8192, 16384 bytes). In selecting the Clock/Calendar Status Register, you must first determine the window size required. As shipped from the factory, the **MM6704c Static Memory Module** occupies the minimum window of 256 bytes (128 words). After determining the window size, the user then selects the starting address of the window for that size window (IE: 256 byte boundary for a window size of 256 bytes).

Clock Calendar Address Window Size

```
 256 bytes - E9, E8, E10, E11, E12, E13 jumpers are 1 to 2.

 512 bytes - E9, E8, E10, E11, E12 jumpers are 1 to 2.
           - E13 jumper is 2 to 3.

1024 bytes - E9, E8, E10, E11 jumpers are 1 to 2.
           - E12, E13 jumpers are 2 to 3.

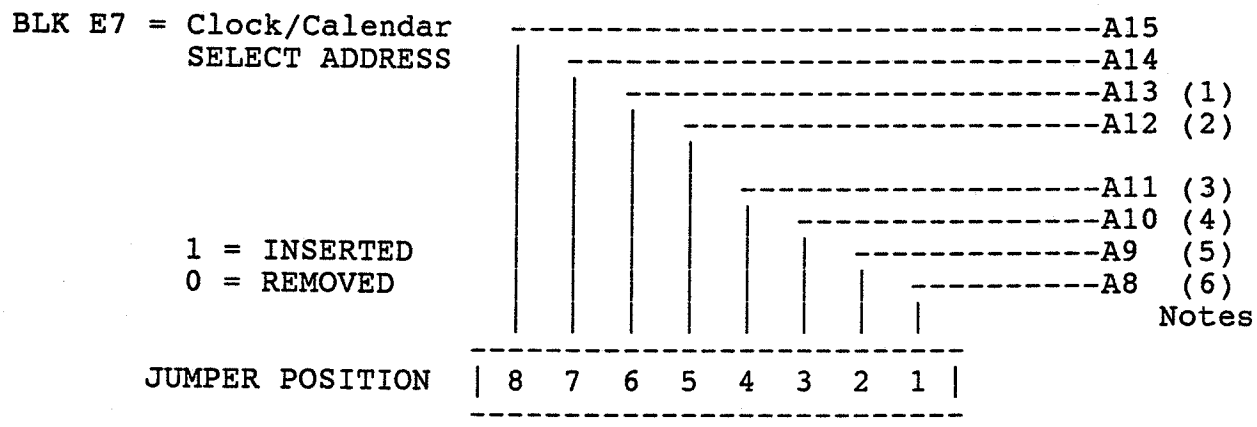
2048 bytes - E9, E8, E10 jumpers are 1 to 2.
           - E11, E12, E13 jumpers are 2 to 3.

4096 bytes - E9, E8 jumpers are 1 to 2.
           - E10, E11, E12, E13 jumpers are 2 to 3.

8192 bytes - E9 jumper is 1 to 2.
           - E8, E10, E11, E12, E13 jumpers are 2 to 3.

16384 bytes - E9, E8, E10, E11, E12, E13 jumpers are 2 to 3.
```

Clock Calendar Address Selection



NOTES:

1) **Position 6 must be INSTALLED, if E9 jumper is 2 to 3.**
2) **Position 5 must be INSTALLED, if E8 jumper is 2 to 3.**
3) **Position 4 must be INSTALLED, if E10 jumper is 2 to 3.**
4) **Position 3 must be INSTALLED, if E11 jumper is 2 to 3.**
5) **Position 2 must be INSTALLED, if E12 jumper is 2 to 3.**
6) **Position 1 must be INSTALLED, if E13 jumper is 2 to 3.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.1-1

BANK SELECTION
(A24 - A31)

1 = Removed
0 = Installed

BANK SELECTED	BLK E1 8	7	6	5	4	3	2	1
00yyyyyy	0	0	0	0	0	0	0	0
01yyyyyy	0	0	0	0	0	0	0	1
02yyyyyy	0	0	0	0	0	0	1	0
03yyyyyy	0	0	0	0	0	0	1	1
04yyyyyy	0	0	0	0	0	1	0	0
05yyyyyy	0	0	0	0	0	1	0	1
06yyyyyy	0	0	0	0	0	1	1	0
07yyyyyy	0	0	0	0	0	1	1	1
08yyyyyy	0	0	0	0	1	0	0	0
09yyyyyy	0	0	0	0	1	0	0	1
0Ayyyyyy	0	0	0	0	1	0	1	0
0Byyyyyy	0	0	0	0	1	0	1	1
0Cyyyyyy	0	0	0	0	1	1	0	0
0Dyyyyyy	0	0	0	0	1	1	0	1
0Eyyyyyy	0	0	0	0	1	1	1	0
0Fyyyyyy	0	0	0	0	1	1	1	1
1yyyyyyy	0	0	0	1	0	0	0	0
11yyyyyy	0	0	0	1	0	0	0	1
12yyyyyy	0	0	0	1	0	0	1	0
13yyyyyy	0	0	0	1	0	0	1	1
14yyyyyy	0	0	0	1	0	1	0	0
15yyyyyy	0	0	0	1	0	1	0	1
16yyyyyy	0	0	0	1	0	1	1	0
17yyyyyy	0	0	0	1	0	1	1	1
18yyyyyy	0	0	0	1	1	0	0	0
19yyyyyy	0	0	0	1	1	0	0	1
1Ayyyyyy	0	0	0	1	1	0	1	0
1Byyyyyy	0	0	0	1	1	0	1	1
1Cyyyyyy	0	0	0	1	1	1	0	0
1Dyyyyyy	0	0	0	1	1	1	0	1
1Eyyyyyy	0	0	0	1	1	1	1	0
1Fyyyyyy	0	0	0	1	1	1	1	1

BANK SELECTED	BLK E1 8	7	6	5	4	3	2	1
20yyyyyy	0	0	1	0	0	0	0	0
21yyyyyy	0	0	1	0	0	0	0	1
22yyyyyy	0	0	1	0	0	0	1	0
23yyyyyy	0	0	1	0	0	0	1	1
24yyyyyy	0	0	1	0	0	1	0	0
25yyyyyy	0	0	1	0	0	1	0	1
26yyyyyy	0	0	1	0	0	1	1	0
27yyyyyy	0	0	1	0	0	1	1	1
28yyyyyy	0	0	1	0	1	0	0	0
29yyyyyy	0	0	1	0	1	0	0	1
2Ayyyyyy	0	0	1	0	1	0	1	0
2Byyyyyy	0	0	1	0	1	0	1	1
2Cyyyyyy	0	0	1	0	1	1	0	0
2Dyyyyyy	0	0	1	0	1	1	0	1
2Eyyyyyy	0	0	1	0	1	1	1	0
2Fyyyyyy	0	0	1	0	1	1	1	1
30yyyyyy	0	0	1	1	0	0	0	0
31yyyyyy	0	0	1	1	0	0	0	1
32yyyyyy	0	0	1	1	0	0	1	0
33yyyyyy	0	0	1	1	0	0	1	1
34yyyyyy	0	0	1	1	0	1	0	0
35yyyyyy	0	0	1	1	0	1	0	1
36yyyyyy	0	0	1	1	0	1	1	0
37yyyyyy	0	0	1	1	0	1	1	1
38yyyyyy	0	0	1	1	1	0	0	0
39yyyyyy	0	0	1	1	1	0	0	1
3Ayyyyyy	0	0	1	1	1	0	1	0
3Byyyyyy	0	0	1	1	1	0	1	1
3Cyyyyyy	0	0	1	1	1	1	0	0
3Dyyyyyy	0	0	1	1	1	1	0	1
3Eyyyyyy	0	0	1	1	1	1	1	0
3Fyyyyyy	0	0	1	1	1	1	1	1

yyyyyy = Lower / Upper Limit Select Setting (BLKs E5/E6)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.1-2 (Continued)

BANK SELECTION
(A24 - A31)

1 = Removed
0 = Installed

BANK SELECTED	BLK E1 8	7	6	5	4	3	2	1
40yyyyyy	0	1	0	0	0	0	0	0
41yyyyyy	0	1	0	0	0	0	0	1
42yyyyyy	0	1	0	0	0	0	1	0
43yyyyyy	0	1	0	0	0	0	1	1
44yyyyyy	0	1	0	0	0	1	0	0
45yyyyyy	0	1	0	0	0	1	0	1
46yyyyyy	0	1	0	0	0	1	1	0
47yyyyyy	0	1	0	0	0	1	1	1
48yyyyyy	0	1	0	0	1	0	0	0
49yyyyyy	0	1	0	0	1	0	0	1
4Ayyyyyy	0	1	0	0	1	0	1	0
4Byyyyyy	0	1	0	0	1	0	1	1
4Cyyyyyy	0	1	0	0	1	1	0	0
4Dyyyyyy	0	1	0	0	1	1	0	1
4Eyyyyyy	0	1	0	0	1	1	1	0
4Fyyyyyy	0	1	0	0	1	1	1	1
50yyyyyy	0	1	0	1	0	0	0	0
51yyyyyy	0	1	0	1	0	0	0	1
52yyyyyy	0	1	0	1	0	0	1	0
53yyyyyy	0	1	0	1	0	0	1	1
54yyyyyy	0	1	0	1	0	1	0	0
55yyyyyy	0	1	0	1	0	1	0	1
56yyyyyy	0	1	0	1	0	1	1	0
57yyyyyy	0	1	0	1	0	1	1	1
58yyyyyy	0	1	0	1	1	0	0	0
59yyyyyy	0	1	0	1	1	0	0	1
5Ayyyyyy	0	1	0	1	1	0	1	0
5Byyyyyy	0	1	0	1	1	0	1	1
5Cyyyyyy	0	1	0	1	1	1	0	0
5Dyyyyyy	0	1	0	1	1	1	0	1
5Eyyyyyy	0	1	0	1	1	1	1	0
5Fyyyyyy	0	1	0	1	1	1	1	1

BANK SELECTED	BLK E1 8	7	6	5	4	3	2	1
60yyyyyy	0	1	1	0	0	0	0	0
61yyyyyy	0	1	1	0	0	0	0	1
62yyyyyy	0	1	1	0	0	0	1	0
63yyyyyy	0	1	1	0	0	0	1	1
64yyyyyy	0	1	1	0	0	1	0	0
65yyyyyy	0	1	1	0	0	1	0	1
66yyyyyy	0	1	1	0	0	1	1	0
67yyyyyy	0	1	1	0	0	1	1	1
68yyyyyy	0	1	1	0	1	0	0	0
69yyyyyy	0	1	1	0	1	0	0	1
6Ayyyyyy	0	1	1	0	1	0	1	0
6Byyyyyy	0	1	1	0	1	0	1	1
6Cyyyyyy	0	1	1	0	1	1	0	0
6Dyyyyyy	0	1	1	0	1	1	0	1
6Eyyyyyy	0	1	1	0	1	1	1	0
6Fyyyyyy	0	1	1	0	1	1	1	1
70yyyyyy	0	1	1	1	0	0	0	0
71yyyyyy	0	1	1	1	0	0	0	1
72yyyyyy	0	1	1	1	0	0	1	0
73yyyyyy	0	1	1	1	0	0	1	1
74yyyyyy	0	1	1	1	0	1	0	0
75yyyyyy	0	1	1	1	0	1	0	1
76yyyyyy	0	1	1	1	0	1	1	0
77yyyyyy	0	1	1	1	0	1	1	1
78yyyyyy	0	1	1	1	1	0	0	0
79yyyyyy	0	1	1	1	1	0	0	1
7Ayyyyyy	0	1	1	1	1	0	1	0
7Byyyyyy	0	1	1	1	1	0	1	1
7Cyyyyyy	0	1	1	1	1	1	0	0
7Dyyyyyy	0	1	1	1	1	1	0	1
7Eyyyyyy	0	1	1	1	1	1	1	0
7Fyyyyyy	0	1	1	1	1	1	1	1

yyyyyy = Lower / Upper Limit Select Setting (BLKs E5/E6)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.1-3 (Continued)

BANK SELECTION
(A24 - A31)

1 = Removed
0 = Installed

BANK SELECTED	BLK E1 8	7	6	5	4	3	2	1
80yyyyyy	1	0	0	0	0	0	0	0
81yyyyyy	1	0	0	0	0	0	0	1
82yyyyyy	1	0	0	0	0	0	1	0
83yyyyyy	1	0	0	0	0	0	1	1
84yyyyyy	1	0	0	0	0	1	0	0
85yyyyyy	1	0	0	0	0	1	0	1
86yyyyyy	1	0	0	0	0	1	1	0
87yyyyyy	1	0	0	0	0	1	1	1
88yyyyyy	1	0	0	0	1	0	0	0
89yyyyyy	1	0	0	0	1	0	0	1
8Ayyyyyy	1	0	0	0	1	0	1	0
8Byyyyyy	1	0	0	0	1	0	1	1
8Cyyyyyy	1	0	0	0	1	1	0	0
8Dyyyyyy	1	0	0	0	1	1	0	1
8Eyyyyyy	1	0	0	0	1	1	1	0
8Fyyyyyy	1	0	0	0	1	1	1	1
90yyyyyy	1	0	0	1	0	0	0	0
91yyyyyy	1	0	0	1	0	0	0	1
92yyyyyy	1	0	0	1	0	0	1	0
93yyyyyy	1	0	0	1	0	0	1	1
94yyyyyy	1	0	0	1	0	1	0	0
95yyyyyy	1	0	0	1	0	1	0	1
96yyyyyy	1	0	0	1	0	1	1	0
97yyyyyy	1	0	0	1	0	1	1	1
98yyyyyy	1	0	0	1	1	0	0	0
99yyyyyy	1	0	0	1	1	0	0	1
9Ayyyyyy	1	0	0	1	1	0	1	0
9Byyyyyy	1	0	0	1	1	0	1	1
9Cyyyyyy	1	0	0	1	1	1	0	0
9Dyyyyyy	1	0	0	1	1	1	0	1
9Eyyyyyy	1	0	0	1	1	1	1	0
9Fyyyyyy	1	0	0	1	1	1	1	1

BANK SELECTED	BLK E1 8	7	6	5	4	3	2	1
A0yyyyyy	1	0	1	0	0	0	0	0
A1yyyyyy	1	0	1	0	0	0	0	1
A2yyyyyy	1	0	1	0	0	0	1	0
A3yyyyyy	1	0	1	0	0	0	1	1
A4yyyyyy	1	0	1	0	0	1	0	0
A5yyyyyy	1	0	1	0	0	1	0	1
A6yyyyyy	1	0	1	0	0	1	1	0
A7yyyyyy	1	0	1	0	0	1	1	1
A8yyyyyy	1	0	1	0	1	0	0	0
A9yyyyyy	1	0	1	0	1	0	0	1
AAyyyyyy	1	0	1	0	1	0	1	0
AByyyyyy	1	0	1	0	1	0	1	1
ACyyyyyy	1	0	1	0	1	1	0	0
ADyyyyyy	1	0	1	0	1	1	0	1
AEyyyyyy	1	0	1	0	1	1	1	0
AFyyyyyy	1	0	1	0	1	1	1	1
B0yyyyyy	1	0	1	1	0	0	0	0
B1yyyyyy	1	0	1	1	0	0	0	1
B2yyyyyy	1	0	1	1	0	0	1	0
B3yyyyyy	1	0	1	1	0	0	1	1
B4yyyyyy	1	0	1	1	0	1	0	0
B5yyyyyy	1	0	1	1	0	1	0	1
B6yyyyyy	1	0	1	1	0	1	1	0
B7yyyyyy	1	0	1	1	0	1	1	1
B8yyyyyy	1	0	1	1	1	0	0	0
B9yyyyyy	1	0	1	1	1	0	0	1
B9yyyyyy	1	0	1	1	1	0	0	1
BByyyyyy	1	0	1	1	1	0	1	1
BCyyyyyy	1	0	1	1	1	1	0	0
BDyyyyyy	1	0	1	1	1	1	0	1
BEyyyyyy	1	0	1	1	1	1	1	0
BFyyyyyy	1	0	1	1	1	1	1	1

yyyyyy = Lower / Upper Limit Select Setting (BLKs E5/E6)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.1-4 (Continued)

BANK SELECTION
(A24 - A31)

1 = Removed
0 = Installed

BANK SELECTED	BLK E1 8	7	6	5	4	3	2	1
C0yyyyyy	1	1	0	0	0	0	0	0
C1yyyyyy	1	1	0	0	0	0	0	1
C2yyyyyy	1	1	0	0	0	0	1	0
C3yyyyyy	1	1	0	0	0	0	1	1
C4yyyyyy	1	1	0	0	0	1	0	0
C5yyyyyy	1	1	0	0	0	1	0	1
C6yyyyyy	1	1	0	0	0	1	1	0
C7yyyyyy	1	1	0	0	0	1	1	1
C8yyyyyy	1	1	0	0	1	0	0	0
C9yyyyyy	1	1	0	0	1	0	0	1
CAyyyyyy	1	1	0	0	1	0	1	0
CByyyyyy	1	1	0	0	1	0	1	1
CCyyyyyy	1	1	0	0	1	1	0	0
CDyyyyyy	1	1	0	0	1	1	0	1
CEyyyyyy	1	1	0	0	1	1	1	0
CFyyyyyy	1	1	0	0	1	1	1	1
D0yyyyyy	1	1	0	1	0	0	0	0
D1yyyyyy	1	1	0	1	0	0	0	1
D2yyyyyy	1	1	0	1	0	0	1	0
D3yyyyyy	1	1	0	1	0	0	1	1
D4yyyyyy	1	1	0	1	0	1	0	0
D5yyyyyy	1	1	0	1	0	1	0	1
D6yyyyyy	1	1	0	1	0	1	1	0
D7yyyyyy	1	1	0	1	0	1	1	1
D8yyyyyy	1	1	0	1	1	0	0	0
D9yyyyyy	1	1	0	1	1	0	0	1
DAyyyyyy	1	1	0	1	1	0	1	0
DByyyyyy	1	1	0	1	1	0	1	1
DCyyyyyy	1	1	0	1	1	1	0	0
DDyyyyyy	1	1	0	1	1	1	0	1
DEyyyyyy	1	1	0	1	1	1	1	0
DFyyyyyy	1	1	0	1	1	1	1	1

BANK SELECTED	BLK E1 8	7	6	5	4	3	2	1
E0yyyyyy	1	1	1	0	0	0	0	0
E1yyyyyy	1	1	1	0	0	0	0	1
E2yyyyyy	1	1	1	0	0	0	1	0
E3yyyyyy	1	1	1	0	0	0	1	1
E4yyyyyy	1	1	1	0	0	1	0	0
E5yyyyyy	1	1	1	0	0	1	0	1
E6yyyyyy	1	1	1	0	0	1	1	0
E7yyyyyy	1	1	1	0	0	1	1	1
E8yyyyyy	1	1	1	0	1	0	0	0
E9yyyyyy	1	1	1	0	1	0	0	1
EAyyyyyy	1	1	1	0	1	0	1	0
EByyyyyy	1	1	1	0	1	0	1	1
ECyyyyyy	1	1	1	0	1	1	0	0
EDyyyyyy	1	1	1	0	1	1	0	1
EEyyyyyy	1	1	1	0	1	1	1	0
EFyyyyyy	1	1	1	0	1	1	1	1
F0yyyyyy	1	1	1	1	0	0	0	0
F1yyyyyy	1	1	1	1	0	0	0	1
F2yyyyyy	1	1	1	1	0	0	1	0
F3yyyyyy	1	1	1	1	0	0	1	1
F4yyyyyy	1	1	1	1	0	1	0	0
F5yyyyyy	1	1	1	1	0	1	0	1
F6yyyyyy	1	1	1	1	0	1	1	0
F7yyyyyy	1	1	1	1	0	1	1	1
F8yyyyyy	1	1	1	1	1	0	0	0
F9yyyyyy	1	1	1	1	1	0	0	1
FAyyyyyy	1	1	1	1	1	0	1	0
FByyyyyy	1	1	1	1	1	0	1	1
FCyyyyyy	1	1	1	1	1	1	0	0
FDyyyyyy	1	1	1	1	1	1	0	1
FEyyyyyy	1	1	1	1	1	1	1	0
FFyyyyyy	1	1	1	1	1	1	1	1

yyyyyy = Lower / Upper Limit Select Setting (BLKs E5/E6)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.2-1

MODULE SELECTION
(A16 - A23)

1 = Removed
0 = Installed

LOWER LIMITS	BLK E5 8	7	6	5	4	3	2	1	UPPER LIMITS	BLK E6 8	7	6	5	4	3	2	1
xx000000	0	0	0	0	0	0	0	0	xx00FFFE	0	0	0	0	0	0	0	0
xx010000	0	0	0	0	0	0	0	1	xx01FFFE	0	0	0	0	0	0	0	1
xx020000	0	0	0	0	0	0	1	0	xx02FFFE	0	0	0	0	0	0	1	0
xx030000	0	0	0	0	0	0	1	1	xx03FFFE	0	0	0	0	0	0	1	1
xx040000	0	0	0	0	0	1	0	0	xx04FFFE	0	0	0	0	0	1	0	0
xx050000	0	0	0	0	0	1	0	1	xx05FFFE	0	0	0	0	0	1	0	1
xx060000	0	0	0	0	0	1	1	0	xx06FFFE	0	0	0	0	0	1	1	0
xx070000	0	0	0	0	0	1	1	1	xx07FFFE	0	0	0	0	0	1	1	1
xx080000	0	0	0	0	1	0	0	0	xx08FFFE	0	0	0	0	1	0	0	0
xx090000	0	0	0	0	1	0	0	1	xx09FFFE	0	0	0	0	1	0	0	1
xx0A0000	0	0	0	0	1	0	1	0	xx0AFFFE	0	0	0	0	1	0	1	0
xx0B0000	0	0	0	0	1	0	1	1	xx0BFFFE	0	0	0	0	1	0	1	1
xx0C0000	0	0	0	0	1	1	0	0	xx0CFFFE	0	0	0	0	1	1	0	0
xx0D0000	0	0	0	0	1	1	0	1	xx0DFFFE	0	0	0	0	1	1	0	1
xx0E0000	0	0	0	0	1	1	1	0	xx0EFFFE	0	0	0	0	1	1	1	0
xx0F0000	0	0	0	0	1	1	1	1	xx0FFFFE	0	0	0	0	1	1	1	1
xx100000	0	0	0	1	0	0	0	0	xx10FFFE	0	0	0	1	0	0	0	0
xx110000	0	0	0	1	0	0	0	1	xx11FFFE	0	0	0	1	0	0	0	1
xx120000	0	0	0	1	0	0	1	0	xx12FFFE	0	0	0	1	0	0	1	0
xx130000	0	0	0	1	0	0	1	1	xx13FFFE	0	0	0	1	0	0	1	1
xx140000	0	0	0	1	0	1	0	0	xx14FFFE	0	0	0	1	0	1	0	0
xx150000	0	0	0	1	0	1	0	1	xx15FFFE	0	0	0	1	0	1	0	1
xx160000	0	0	0	1	0	1	1	0	xx16FFFE	0	0	0	1	0	1	1	0
xx170000	0	0	0	1	0	1	1	1	xx17FFFE	0	0	0	1	0	1	1	1
xx180000	0	0	0	1	1	0	0	0	xx18FFFE	0	0	0	1	1	0	0	0
xx190000	0	0	0	1	1	0	0	1	xx19FFFE	0	0	0	1	1	0	0	1
xx1A0000	0	0	0	1	1	0	1	0	xx1AFFFE	0	0	0	1	1	0	1	0
xx1B0000	0	0	0	1	1	0	1	1	xx1BFFFE	0	0	0	1	1	0	1	1
xx1C0000	0	0	0	1	1	1	0	0	xx1CFFFE	0	0	0	1	1	1	0	0
xx1D0000	0	0	0	1	1	1	0	1	xx1DFFFE	0	0	0	1	1	1	0	1
xx1E0000	0	0	0	1	1	1	1	0	xx1EFFFE	0	0	0	1	1	1	1	0
xx1F0000	0	0	0	1	1	1	1	1	xx1FFFFE	0	0	0	1	1	1	1	1

xx = Bank Select Setting (BLK E1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.2-2 (Continued)

MODULE SELECTION
(A16 - A23)

1 = Removed
0 = Installed

LOWER LIMITS	BLK E5 8	7	6	5	4	3	2	1	UPPER LIMITS	BLK E6 8	7	6	5	4	3	2	1
xx200000	0	0	1	0	0	0	0	0	xx20FFFE	0	0	1	0	0	0	0	0
xx210000	0	0	1	0	0	0	0	1	xx21FFFE	0	0	1	0	0	0	0	1
xx220000	0	0	1	0	0	0	1	0	xx22FFFE	0	0	1	0	0	0	1	0
xx230000	0	0	1	0	0	0	1	1	xx23FFFE	0	0	1	0	0	0	1	1
xx240000	0	0	1	0	0	1	0	0	xx24FFFE	0	0	1	0	0	1	0	0
xx250000	0	0	1	0	0	1	0	1	xx25FFFE	0	0	1	0	0	1	0	1
xx260000	0	0	1	0	0	1	1	0	xx26FFFE	0	0	1	0	0	1	1	0
xx270000	0	0	1	0	0	1	1	1	xx27FFFE	0	0	1	0	0	1	1	1
xx280000	0	0	1	0	1	0	0	0	xx28FFFE	0	0	1	0	1	0	0	0
xx290000	0	0	1	0	1	0	0	1	xx29FFFE	0	0	1	0	1	0	0	1
xx2A0000	0	0	1	0	1	0	1	0	xx2AFFFE	0	0	1	0	1	0	1	0
xx2B0000	0	0	1	0	1	0	1	1	xx2BFFFE	0	0	1	0	1	0	1	1
xx2C0000	0	0	1	0	1	1	0	0	xx2CFFFE	0	0	1	0	1	1	0	0
xx2D0000	0	0	1	0	1	1	0	1	xx2DFFFE	0	0	1	0	1	1	0	1
xx2E0000	0	0	1	0	1	1	1	0	xx2EFFFE	0	0	1	0	1	1	1	0
xx2F0000	0	0	1	0	1	1	1	1	xx2FFFFE	0	0	1	0	1	1	1	1
xx300000	0	0	1	1	0	0	0	0	xx30FFFE	0	0	1	1	0	0	0	0
xx310000	0	0	1	1	0	0	0	1	xx31FFFE	0	0	1	1	0	0	0	1
xx320000	0	0	1	1	0	0	1	0	xx32FFFE	0	0	1	1	0	0	1	0
xx330000	0	0	1	1	0	0	1	1	xx33FFFE	0	0	1	1	0	0	1	1
xx340000	0	0	1	1	0	1	0	0	xx34FFFE	0	0	1	1	0	1	0	0
xx350000	0	0	1	1	0	1	0	1	xx35FFFE	0	0	1	1	0	1	0	1
xx360000	0	0	1	1	0	1	1	0	xx36FFFE	0	0	1	1	0	1	1	0
xx370000	0	0	1	1	0	1	1	1	xx37FFFE	0	0	1	1	0	1	1	1
xx380000	0	0	1	1	1	0	0	0	xx38FFFE	0	0	1	1	1	0	0	0
xx390000	0	0	1	1	1	0	0	1	xx39FFFE	0	0	1	1	1	0	0	1
xx3A0000	0	0	1	1	1	0	1	0	xx3AFFFE	0	0	1	1	1	0	1	0
xx3B0000	0	0	1	1	1	0	1	1	xx3BFFFE	0	0	1	1	1	0	1	1
xx3C0000	0	0	1	1	1	1	0	0	xx34FFFE	0	0	1	1	1	1	0	0
xx3D0000	0	0	1	1	1	1	0	1	xx3DFFFE	0	0	1	1	1	1	0	1
xx3E0000	0	0	1	1	1	1	1	0	xx3EFFFE	0	0	1	1	1	1	1	0
xx3F0000	0	0	1	1	1	1	1	1	xx3FFFFE	0	0	1	1	1	1	1	1

xx = Bank Select Setting (BLK E1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.2-3 (Continued)

MODULE SELECTION
(A16 - A23)

1 = Removed
0 = Installed

LOWER LIMITS	BLK E5 8	7	6	5	4	3	2	1	UPPER LIMITS	BLK E6 8	7	6	5	4	3	2	1
xx400000	0	1	0	0	0	0	0	0	xx40FFFE	0	1	0	0	0	0	0	0
xx410000	0	1	0	0	0	0	0	1	xx41FFFE	0	1	0	0	0	0	0	1
xx420000	0	1	0	0	0	0	1	0	xx42FFFE	0	1	0	0	0	0	1	0
xx430000	0	1	0	0	0	0	1	1	xx43FFFE	0	1	0	0	0	0	1	1
xx440000	0	1	0	0	0	1	0	0	xx44FFFE	0	1	0	0	0	1	0	0
xx450000	0	1	0	0	0	1	0	1	xx45FFFE	0	1	0	0	0	1	0	1
xx460000	0	1	0	0	0	1	1	0	xx46FFFE	0	1	0	0	0	1	1	0
xx470000	0	1	0	0	0	1	1	1	xx47FFFE	0	1	0	0	0	1	1	1
xx480000	0	1	0	0	1	0	0	0	xx48FFFE	0	1	0	0	1	0	0	0
xx490000	0	1	0	0	1	0	0	1	xx49FFFE	0	1	0	0	1	0	0	1
xx4A0000	0	1	0	0	1	0	1	0	xx4AFFFE	0	1	0	0	1	0	1	0
xx4B0000	0	1	0	0	1	0	1	1	xx4BFFFE	0	1	0	0	1	0	1	1
xx4C0000	0	1	0	0	1	1	0	0	xx4CFFFE	0	1	0	0	1	1	0	0
xx4D0000	0	1	0	0	1	1	0	1	xx4DFFFE	0	1	0	0	1	1	0	1
xx4E0000	0	1	0	0	1	1	1	0	xx4EFFFE	0	1	0	0	1	1	1	0
xx4F0000	0	1	0	0	1	1	1	1	xx4FFFFE	0	1	0	0	1	1	1	1
xx500000	0	1	0	1	0	0	0	0	xx50FFFE	0	1	0	1	0	0	0	0
xx510000	0	1	0	1	0	0	0	1	xx51FFFE	0	1	0	1	0	0	0	1
xx520000	0	1	0	1	0	0	1	0	xx52FFFE	0	1	0	1	0	0	1	0
xx530000	0	1	0	1	0	0	1	1	xx53FFFE	0	1	0	1	0	0	1	1
xx540000	0	1	0	1	0	1	0	0	xx54FFFE	0	1	0	1	0	1	0	0
xx550000	0	1	0	1	0	1	0	1	xx55FFFE	0	1	0	1	0	1	0	1
xx560000	0	1	0	1	0	1	1	0	xx56FFFE	0	1	0	1	0	1	1	0
xx570000	0	1	0	1	0	1	1	1	xx57FFFE	0	1	0	1	0	1	1	1
xx580000	0	1	0	1	1	0	0	0	xx58FFFE	0	1	0	1	1	0	0	0
xx590000	0	1	0	1	1	0	0	1	xx59FFFE	0	1	0	1	1	0	0	1
xx5A0000	0	1	0	1	1	0	1	0	xx5AFFFE	0	1	0	1	1	0	1	0
xx5B0000	0	1	0	1	1	0	1	1	xx5BFFFE	0	1	0	1	1	0	1	1
xx5C0000	0	1	0	1	1	1	0	0	xx5CFFFE	0	1	0	1	1	1	0	0
xx5D0000	0	1	0	1	1	1	0	1	xx5DFFFE	0	1	0	1	1	1	0	1
xx5E0000	0	1	0	1	1	1	1	0	xx5EFFFE	0	1	0	1	1	1	1	0
xx5F0000	0	1	0	1	1	1	1	1	xx5FFFFE	0	1	0	1	1	1	1	1

xx = Bank Select Setting (BLK E1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.2-4 (Continued)

MODULE SELECTION
(A16 - A23)

1 = Removed
0 = Installed

LOWER LIMITS	BLK E5 8	7	6	5	4	3	2	1	UPPER LIMITS	BLK E6 8	7	6	5	4	3	2	1
xx600000	0	1	1	0	0	0	0	0	xx60FFFE	0	1	1	0	0	0	0	0
xx610000	0	1	1	0	0	0	0	1	xx61FFFE	0	1	1	0	0	0	0	1
xx620000	0	1	1	0	0	0	1	0	xx62FFFE	0	1	1	0	0	0	1	0
xx630000	0	1	1	0	0	0	1	1	xx63FFFE	0	1	1	0	0	0	1	1
xx640000	0	1	1	0	0	1	0	0	xx64FFFE	0	1	1	0	0	1	0	0
xx650000	0	1	1	0	0	1	0	1	xx65FFFE	0	1	1	0	0	1	0	1
xx660000	0	1	1	0	0	1	1	0	xx66FFFE	0	1	1	0	0	1	1	0
xx670000	0	1	1	0	0	1	1	1	xx67FFFE	0	1	1	0	0	1	1	1
xx680000	0	1	1	0	1	0	0	0	xx68FFFE	0	1	1	0	1	0	0	0
xx690000	0	1	1	0	1	0	0	1	xx69FFFE	0	1	1	0	1	0	0	1
xx6A0000	0	1	1	0	1	0	1	0	xx6AFFFE	0	1	1	0	1	0	1	0
xx6B0000	0	1	1	0	1	0	1	1	xx6BFFFE	0	1	1	0	1	0	1	1
xx6C0000	0	1	1	0	1	1	0	0	xx6CFFFE	0	1	1	0	1	1	0	0
xx6D0000	0	1	1	0	1	1	0	1	xx6DFFFE	0	1	1	0	1	1	0	1
xx6E0000	0	1	1	0	1	1	1	0	xx6EFFFE	0	1	1	0	1	1	1	0
xx6F0000	0	1	1	0	1	1	1	1	xx6FFFFE	0	1	1	0	1	1	1	1
xx700000	0	1	1	1	0	0	0	0	xx70FFFE	0	1	1	1	0	0	0	0
xx710000	0	1	1	1	0	0	0	1	xx71FFFE	0	1	1	1	0	0	0	1
xx720000	0	1	1	1	0	0	1	0	xx72FFFE	0	1	1	1	0	0	1	0
xx730000	0	1	1	1	0	0	1	1	xx73FFFE	0	1	1	1	0	0	1	1
xx740000	0	1	1	1	0	1	0	0	xx74FFFE	0	1	1	1	0	1	0	0
xx750000	0	1	1	1	0	1	0	1	xx75FFFE	0	1	1	1	0	1	0	1
xx760000	0	1	1	1	0	1	1	0	xx76FFFE	0	1	1	1	0	1	1	0
xx770000	0	1	1	1	0	1	1	1	xx77FFFE	0	1	1	1	0	1	1	1
xx780000	0	1	1	1	1	0	0	0	xx78FFFE	0	1	1	1	1	0	0	0
xx790000	0	1	1	1	1	0	0	1	xx79FFFE	0	1	1	1	1	0	0	1
xx7A0000	0	1	1	1	1	0	1	0	xx7AFFFE	0	1	1	1	1	0	1	0
xx7B0000	0	1	1	1	1	0	1	1	xx7BFFFE	0	1	1	1	1	0	1	1
xx7C0000	0	1	1	1	1	1	0	0	xx7CFFFE	0	1	1	1	1	1	0	0
xx7D0000	0	1	1	1	1	1	0	1	xx7DFFFE	0	1	1	1	1	1	0	1
xx7E0000	0	1	1	1	1	1	1	0	xx7EFFFE	0	1	1	1	1	1	1	0
xx7F0000	0	1	1	1	1	1	1	1	xx7FFFFE	0	1	1	1	1	1	1	1

xx = Bank Select Setting (BLK E1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.2-5 (Continued)

MODULE SELECTION
(A16 - A23)

1 = Removed
0 = Installed

LOWER LIMITS	BLK E5 8	7	6	5	4	3	2	1	UPPER LIMITS	BLK E6 8	7	6	5	4	3	2	1
xx800000	1	0	0	0	0	0	0	0	xx80FFFE	1	0	0	0	0	0	0	0
xx810000	1	0	0	0	0	0	0	1	xx81FFFE	1	0	0	0	0	0	0	1
xx820000	1	0	0	0	0	0	1	0	xx82FFFE	1	0	0	0	0	0	1	0
xx830000	1	0	0	0	0	0	1	1	xx83FFFE	1	0	0	0	0	0	1	1
xx840000	1	0	0	0	0	1	0	0	xx84FFFE	1	0	0	0	0	1	0	0
xx850000	1	0	0	0	0	1	0	1	xx85FFFE	1	0	0	0	0	1	0	1
xx860000	1	0	0	0	0	1	1	0	xx86FFFE	1	0	0	0	0	1	1	0
xx870000	1	0	0	0	0	1	1	1	xx87FFFE	1	0	0	0	0	1	1	1
xx880000	1	0	0	0	1	0	0	0	xx88FFFE	1	0	0	0	1	0	0	0
xx890000	1	0	0	0	1	0	0	1	xx89FFFE	1	0	0	0	1	0	0	1
xx8A0000	1	0	0	0	1	0	1	0	xx8AFFFE	1	0	0	0	1	0	1	0
xx8B0000	1	0	0	0	1	0	1	1	xx8BFFFE	1	0	0	0	1	0	1	1
xx8C0000	1	0	0	0	1	1	0	0	xx8CFFFE	1	0	0	0	1	1	0	0
xx8D0000	1	0	0	0	1	1	0	1	xx8DFFFE	1	0	0	0	1	1	0	1
xx8E0000	1	0	0	0	1	1	1	0	xx8EFFFE	1	0	0	0	1	1	1	0
xx8F0000	1	0	0	0	1	1	1	1	xx8FFFFE	1	0	0	0	1	1	1	1
xx900000	1	0	0	1	0	0	0	0	xx90FFFE	1	0	0	1	0	0	0	0
xx910000	1	0	0	1	0	0	0	1	xx91FFFE	1	0	0	1	0	0	0	1
xx920000	1	0	0	1	0	0	1	0	xx92FFFE	1	0	0	1	0	0	1	0
xx930000	1	0	0	1	0	0	1	1	xx93FFFE	1	0	0	1	0	0	1	1
xx940000	1	0	0	1	0	1	0	0	xx94FFFE	1	0	0	1	0	1	0	0
xx950000	1	0	0	1	0	1	0	1	xx95FFFE	1	0	0	1	0	1	0	1
xx960000	1	0	0	1	0	1	1	0	xx96FFFE	1	0	0	1	0	1	1	0
xx970000	1	0	0	1	0	1	1	1	xx97FFFE	1	0	0	1	0	1	1	1
xx980000	1	0	0	1	1	0	0	0	xx98FFFE	1	0	0	1	1	0	0	0
xx990000	1	0	0	1	1	0	0	1	xx99FFFE	1	0	0	1	1	0	0	1
xx9A0000	1	0	0	1	1	0	1	0	xx9AFFFE	1	0	0	1	1	0	1	0
xx9B0000	1	0	0	1	1	0	1	1	xx9BFFFE	1	0	0	1	1	0	1	1
xx9C0000	1	0	0	1	1	1	0	0	xx9CFFFE	1	0	0	1	1	1	0	0
xx9D0000	1	0	0	1	1	1	0	1	xx9DFFFE	1	0	0	1	1	1	0	1
xx9E0000	1	0	0	1	1	1	1	0	xx9EFFFE	1	0	0	1	1	1	1	0
xx9F0000	1	0	0	1	1	1	1	1	xx9FFFFE	1	0	0	1	1	1	1	1

xx = Bank Select Setting (BLK E1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.2-6 (Continued)

MODULE SELECTION
(A16 - A23)

1 = Removed
0 = Installed

LOWER LIMITS	BLK E5 8	7	6	5	4	3	2	1	UPPER LIMITS	BLK E6 8	7	6	5	4	3	2	1
xxA00000	1	0	1	0	0	0	0	0	xxA0FFFE	1	0	1	0	0	0	0	0
xxA10000	1	0	1	0	0	0	0	1	xxA1FFFE	1	0	1	0	0	0	0	1
xxA20000	1	0	1	0	0	0	1	0	xxA2FFFE	1	0	1	0	0	0	1	0
xxA30000	1	0	1	0	0	0	1	1	xxA3FFFE	1	0	1	0	0	0	1	1
xxA40000	1	0	1	0	0	1	0	0	xxA4FFFE	1	0	1	0	0	1	0	0
xxA50000	1	0	1	0	0	1	0	1	xxA5FFFE	1	0	1	0	0	1	0	1
xxA60000	1	0	1	0	0	1	1	0	xxA6FFFE	1	0	1	0	0	1	1	0
xxA70000	1	0	1	0	0	1	1	1	xxA7FFFE	1	0	1	0	0	1	1	1
xxA80000	1	0	1	0	1	0	0	0	xxA8FFFE	1	0	1	0	1	0	0	0
xxA90000	1	0	1	0	1	0	0	1	xxA9FFFE	1	0	1	0	1	0	0	1
xxAA0000	1	0	1	0	1	0	1	0	xxAAFFFE	1	0	1	0	1	0	1	0
xxAB0000	1	0	1	0	1	0	1	1	xxABFFFE	1	0	1	0	1	0	1	1
xxAC0000	1	0	1	0	1	1	0	0	xxACFFFE	1	0	1	0	1	1	0	0
xxAD0000	1	0	1	0	1	1	0	1	xxADFFFE	1	0	1	0	1	1	0	1
xxAE0000	1	0	1	0	1	1	1	0	xxAEFFFE	1	0	1	0	1	1	1	0
xxAF0000	1	0	1	0	1	1	1	1	xxAFFFFE	1	0	1	0	1	1	1	1
xxB00000	1	0	1	1	0	0	0	0	xxB0FFFE	1	0	1	1	0	0	0	0
xxB10000	1	0	1	1	0	0	0	1	xxB1FFFE	1	0	1	1	0	0	0	1
xxB20000	1	0	1	1	0	0	1	0	xxB2FFFE	1	0	1	1	0	0	1	0
xxB30000	1	0	1	1	0	0	1	1	xxB3FFFE	1	0	1	1	0	0	1	1
xxB40000	1	0	1	1	0	1	0	0	xxB4FFFE	1	0	1	1	0	1	0	0
xxB50000	1	0	1	1	0	1	0	1	xxB5FFFE	1	0	1	1	0	1	0	1
xxB60000	1	0	1	1	0	1	1	0	xxB6FFFE	1	0	1	1	0	1	1	0
xxB70000	1	0	1	1	0	1	1	1	xxB7FFFE	1	0	1	1	0	1	1	1
xxB80000	1	0	1	1	1	0	0	0	xxB8FFFE	1	0	1	1	1	0	0	0
xxB90000	1	0	1	1	1	0	0	1	xxB9FFFE	1	0	1	1	1	0	0	1
xxBA0000	1	0	1	1	1	0	1	0	xxBAFFFE	1	0	1	1	1	0	1	0
xxBB0000	1	0	1	1	1	0	1	1	xxBBFFFE	1	0	1	1	1	0	1	1
xxBC0000	1	0	1	1	1	1	0	0	xxBCFFFE	1	0	1	1	1	1	0	0
xxBD0000	1	0	1	1	1	1	0	1	xxBDFFFE	1	0	1	1	1	1	0	1
xxBE0000	1	0	1	1	1	1	1	0	xxBEFFFE	1	0	1	1	1	1	1	0
xxBF0000	1	0	1	1	1	1	1	1	xxBFFFFE	1	0	1	1	1	1	1	1

xx = Bank Select Setting (BLK E1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.2-7 (Continued)

MODULE SELECTION
(A16 - A23)

1 = Removed
0 = Installed

LOWER LIMITS	BLK E5 8	7	6	5	4	3	2	1	UPPER LIMITS	BLK E6 8	7	6	5	4	3	2	1
xxC00000	1	1	0	0	0	0	0	0	xxC0FFFE	1	1	0	0	0	0	0	0
xxC10000	1	1	0	0	0	0	0	1	xxC1FFFE	1	1	0	0	0	0	0	1
xxC20000	1	1	0	0	0	0	1	0	xxC2FFFE	1	1	0	0	0	0	1	0
xxC30000	1	1	0	0	0	0	1	1	xxC3FFFE	1	1	0	0	0	0	1	1
xxC40000	1	1	0	0	0	1	0	0	xxC4FFFE	1	1	0	0	0	1	0	0
xxC50000	1	1	0	0	0	1	0	1	xxC5FFFE	1	1	0	0	0	1	0	1
xxC60000	1	1	0	0	0	1	1	0	xxC6FFFE	1	1	0	0	0	1	1	0
xxC70000	1	1	0	0	0	1	1	1	xxC7FFFE	1	1	0	0	0	1	1	1
xxC80000	1	1	0	0	1	0	0	0	xxC8FFFE	1	1	0	0	1	0	0	0
xxC90000	1	1	0	0	1	0	0	1	xxC9FFFE	1	1	0	0	1	0	0	1
xxCA0000	1	1	0	0	1	0	1	0	xxCAFFFE	1	1	0	0	1	0	1	0
xxCB0000	1	1	0	0	1	0	1	1	xxCBFFFE	1	1	0	0	1	0	1	1
xxCC0000	1	1	0	0	1	1	0	0	xxCCFFFE	1	1	0	0	1	1	0	0
xxCD0000	1	1	0	0	1	1	0	1	xxCDFFFE	1	1	0	0	1	1	0	1
xxCE0000	1	1	0	0	1	1	1	0	xxCEFFFE	1	1	0	0	1	1	1	0
xxCF0000	1	1	0	0	1	1	1	1	xxCFFFFE	1	1	0	0	1	1	1	1
xxD00000	1	1	0	1	0	0	0	0	xxD0FFFE	1	1	0	1	0	0	0	0
xxD10000	1	1	0	1	0	0	0	1	xxD1FFFE	1	1	0	1	0	0	0	1
xxD20000	1	1	0	1	0	0	1	0	xxD2FFFE	1	1	0	1	0	0	1	0
xxD30000	1	1	0	1	0	0	1	1	xxD3FFFE	1	1	0	1	0	0	1	1
xxD40000	1	1	0	1	0	1	0	0	xxD4FFFE	1	1	0	1	0	1	0	0
xxD50000	1	1	0	1	0	1	0	1	xxD5FFFE	1	1	0	1	0	1	0	1
xxD60000	1	1	0	1	0	1	1	0	xxD6FFFE	1	1	0	1	0	1	1	0
xxD70000	1	1	0	1	0	1	1	1	xxD7FFFE	1	1	0	1	0	1	1	1
xxD80000	1	1	0	1	1	0	0	0	xxD8FFFE	1	1	0	1	1	0	0	0
xxD90000	1	1	0	1	1	0	0	1	xxD9FFFE	1	1	0	1	1	0	0	1
xxDA0000	1	1	0	1	1	0	1	0	xxDAFFFE	1	1	0	1	1	0	1	0
xxDB0000	1	1	0	1	1	0	1	1	xxDBFFFE	1	1	0	1	1	0	1	1
xxDC0000	1	1	0	1	1	1	0	0	xxDCFFFE	1	1	0	1	1	1	0	0
xxDD0000	1	1	0	1	1	1	0	1	xxDDFFFE	1	1	0	1	1	1	0	1
xxDE0000	1	1	0	1	1	1	1	0	xxDEFFFE	1	1	0	1	1	1	1	0
xxDF0000	1	1	0	1	1	1	1	1	xxDFFFFE	1	1	0	1	1	1	1	1

xx = Bank Select Setting (BLK E1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.2-8 (Continued)

MODULE SELECTION
(A16 - A23)

1 = Removed
0 = Installed

LOWER LIMITS	BLK E5 8	7	6	5	4	3	2	1	UPPER LIMITS	BLK E6 8	7	6	5	4	3	2	1
xxE00000	1	1	1	0	0	0	0	0	xxE0FFFE	1	1	1	0	0	0	0	0
xxE10000	1	1	1	0	0	0	0	1	xxE1FFFE	1	1	1	0	0	0	0	1
xxE20000	1	1	1	0	0	0	1	0	xxE2FFFE	1	1	1	0	0	0	1	0
xxE30000	1	1	1	0	0	0	1	1	xxE3FFFE	1	1	1	0	0	0	1	1
xxE40000	1	1	1	0	0	1	0	0	xxE4FFFE	1	1	1	0	0	1	0	0
xxE50000	1	1	1	0	0	1	0	1	xxE5FFFE	1	1	1	0	0	1	0	1
xxE60000	1	1	1	0	0	1	1	0	xxE6FFFE	1	1	1	0	0	1	1	0
xxE70000	1	1	1	0	0	1	1	1	xxE7FFFE	1	1	1	0	0	1	1	1
xxE80000	1	1	1	0	1	0	0	0	xxE8FFFE	1	1	1	0	1	0	0	0
xxE90000	1	1	1	0	1	0	0	1	xxE9FFFE	1	1	1	0	1	0	0	1
xxEA0000	1	1	1	0	1	0	1	0	xxEAFFFE	1	1	1	0	1	0	1	0
xxEB0000	1	1	1	0	1	0	1	1	xxEBFFFE	1	1	1	0	1	0	1	1
xxEC0000	1	1	1	0	1	1	0	0	xxECFFFE	1	1	1	0	1	1	0	0
xxED0000	1	1	1	0	1	1	0	1	xxEDFFFE	1	1	1	0	1	1	0	1
xxEE0000	1	1	1	0	1	1	1	0	xxEEFFFE	1	1	1	0	1	1	1	0
xxEF0000	1	1	1	0	1	1	1	1	xxEFFFFE	1	1	1	0	1	1	1	1
xxF00000	1	1	1	1	0	0	0	0	xxF0FFFE	1	1	1	1	0	0	0	0
xxF10000	1	1	1	1	0	0	0	1	xxF1FFFE	1	1	1	1	0	0	0	1
xxF20000	1	1	1	1	0	0	1	0	xxF2FFFE	1	1	1	1	0	0	1	0
xxF30000	1	1	1	1	0	0	1	1	xxF3FFFE	1	1	1	1	0	0	1	1
xxF40000	1	1	1	1	0	1	0	0	xxF4FFFE	1	1	1	1	0	1	0	0
xxF50000	1	1	1	1	0	1	0	1	xxF5FFFE	1	1	1	1	0	1	0	1
xxF60000	1	1	1	1	0	1	1	0	xxF6FFFE	1	1	1	1	0	1	1	0
xxF70000	1	1	1	1	0	1	1	1	xxF7FFFE	1	1	1	1	0	1	1	1
xxF80000	1	1	1	1	1	0	0	0	xxF8FFFE	1	1	1	1	1	0	0	0
xxF90000	1	1	1	1	1	0	0	1	xxF9FFFE	1	1	1	1	1	0	0	1
xxFA0000	1	1	1	1	1	0	1	0	xxFAFFFE	1	1	1	1	1	0	1	0
xxFB0000	1	1	1	1	1	0	1	1	xxFBFFFE	1	1	1	1	1	0	1	1
xxFC0000	1	1	1	1	1	1	0	0	xxFCFFFE	1	1	1	1	1	1	0	0
xxFD0000	1	1	1	1	1	1	0	1	xxFDFFFE	1	1	1	1	1	1	0	1
xxFE0000	1	1	1	1	1	1	1	0	xxFEFFFE	1	1	1	1	1	1	1	0
xxFF0000	1	1	1	1	1	1	1	1	xxFFFFFE	1	1	1	1	1	1	1	1

xx = Bank Select Setting (BLK E1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.3-1

Clock/Status SELECTION

(A15 - A8)

1 = Installed
0 = Removed

Clock/Status SELECTED	BLK E3 8	7	6	5	4	3	2	1
00yy	0	0	0	0	0	0	0	0
01yy	0	0	0	0	0	0	0	1
02yy	0	0	0	0	0	0	1	0
03yy	0	0	0	0	0	0	1	1
04yy	0	0	0	0	0	1	0	0
05yy	0	0	0	0	0	1	0	1
06yy	0	0	0	0	0	1	1	0
07yy	0	0	0	0	0	1	1	1
08yy	0	0	0	0	1	0	0	0
09yy	0	0	0	0	1	0	0	1
0Ayy	0	0	0	0	1	0	1	0
0Byy	0	0	0	0	1	0	1	1
0Cyy	0	0	0	0	1	1	0	0
0Dyy	0	0	0	0	1	1	0	1
0Eyy	0	0	0	0	1	1	1	0
0Fyy	0	0	0	0	1	1	1	1
10yy	0	0	0	1	0	0	0	0
11yy	0	0	0	1	0	0	0	1
12yy	0	0	0	1	0	0	1	0
13yy	0	0	0	1	0	0	1	1
14yy	0	0	0	1	0	1	0	0
15yy	0	0	0	1	0	1	0	1
16yy	0	0	0	1	0	1	1	0
17yy	0	0	0	1	0	1	1	1
18yy	0	0	0	1	1	0	0	0
19yy	0	0	0	1	1	0	0	1
1Ayy	0	0	0	1	1	0	1	0
1Byy	0	0	0	1	1	0	1	1
1Cyy	0	0	0	1	1	1	0	0
1Dyy	0	0	0	1	1	1	0	1
1Eyy	0	0	0	1	1	1	1	0
1Fyy	0	0	0	1	1	1	1	1

Clock Status SELECTED	BLK E3 8	7	6	5	4	3	2	1
20yy	0	0	1	0	0	0	0	0
21yy	0	0	1	0	0	0	0	1
22yy	0	0	1	0	0	0	1	0
23yy	0	0	1	0	0	0	1	1
24yy	0	0	1	0	0	1	0	0
25yy	0	0	1	0	0	1	0	1
26yy	0	0	1	0	0	1	1	0
27yy	0	0	1	0	0	1	1	1
28yy	0	0	1	0	1	0	0	0
29yy	0	0	1	0	1	0	0	1
2Ayy	0	0	1	0	1	0	1	0
2Byy	0	0	1	0	1	0	1	1
2Cyy	0	0	1	0	1	1	0	0
2Dyy	0	0	1	0	1	1	0	1
2Eyy	0	0	1	0	1	1	1	0
2Fyy	0	0	1	0	1	1	1	1
30yy	0	0	1	1	0	0	0	0
31yy	0	0	1	1	0	0	0	1
32yy	0	0	1	1	0	0	1	0
33yy	0	0	1	1	0	0	1	1
34yy	0	0	1	1	0	1	0	0
35yy	0	0	1	1	0	1	0	1
36yy	0	0	1	1	0	1	1	0
37yy	0	0	1	1	0	1	1	1
38yy	0	0	1	1	1	0	0	0
39yy	0	0	1	1	1	0	0	1
3Ayy	0	0	1	1	1	0	1	0
3Byy	0	0	1	1	1	0	1	1
3Cyy	0	0	1	1	1	1	0	0
3Dyy	0	0	1	1	1	1	0	1
3Eyy	0	0	1	1	1	1	1	0
3Fyy	0	0	1	1	1	1	1	1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.3-2 (continued)

Clock/Status SELECTION

(A15 - A8) 1 = Installed
0 = Removed

Clock/Status SELECTED	BLK E3 8	7	6	5	4	3	2	1
40yy	0	1	0	0	0	0	0	0
41yy	0	1	0	0	0	0	0	1
42yy	0	1	0	0	0	0	1	0
43yy	0	1	0	0	0	0	1	1
44yy	0	1	0	0	0	1	0	0
45yy	0	1	0	0	0	1	0	1
46yy	0	1	0	0	0	1	1	0
47yy	0	1	0	0	0	1	1	1
48yy	0	1	0	0	1	0	0	0
49yy	0	1	0	0	1	0	0	1
4Ayy	0	1	0	0	1	0	1	0
4Byy	0	1	0	0	1	0	1	1
4Cyy	0	1	0	0	1	1	0	0
4Dyy	0	1	0	0	1	1	0	1
4Eyy	0	1	0	0	1	1	1	0
4Fyy	0	1	0	0	1	1	1	1
50yy	0	1	0	1	0	0	0	0
51yy	0	1	0	1	0	0	0	1
52yy	0	1	0	1	0	0	1	0
53yy	0	1	0	1	0	0	1	1
54yy	0	1	0	1	0	1	0	0
55yy	0	1	0	1	0	1	0	1
56yy	0	1	0	1	0	1	1	0
57yy	0	1	0	1	0	1	1	1
58yy	0	1	0	1	1	0	0	0
59yy	0	1	0	1	1	0	0	1
5Ayy	0	1	0	1	1	0	1	0
5Byy	0	1	0	1	1	0	1	1
5Cyy	0	1	0	1	1	1	0	0
5Dyy	0	1	0	1	1	1	0	1
5Eyy	0	1	0	1	1	1	1	0
5Fyy	0	1	0	1	1	1	1	1

Clock Status SELECTED	BLK E3 8	7	6	5	4	3	2	1
60yy	0	1	1	0	0	0	0	0
61yy	0	1	1	0	0	0	0	1
62yy	0	1	1	0	0	0	1	0
63yy	0	1	1	0	0	0	1	1
64yy	0	1	1	0	0	1	0	0
65yy	0	1	1	0	0	1	0	1
66yy	0	1	1	0	0	1	1	0
67yy	0	1	1	0	0	1	1	1
68yy	0	1	1	0	1	0	0	0
69yy	0	1	1	0	1	0	0	1
6Ayy	0	1	1	0	1	0	1	0
6Byy	0	1	1	0	1	0	1	1
6Cyy	0	1	1	0	1	1	0	0
6Dyy	0	1	1	0	1	1	0	1
6Eyy	0	1	1	0	1	1	1	0
6Fyy	0	1	1	0	1	1	1	1
70yy	0	1	1	1	0	0	0	0
71yy	0	1	1	1	0	0	0	1
72yy	0	1	1	1	0	0	1	0
73yy	0	1	1	1	0	0	1	1
74yy	0	1	1	1	0	1	0	0
75yy	0	1	1	1	0	1	0	1
76yy	0	1	1	1	0	1	1	0
77yy	0	1	1	1	0	1	1	1
78yy	0	1	1	1	1	0	0	0
79yy	0	1	1	1	1	0	0	1
7Ayy	0	1	1	1	1	0	1	0
7Byy	0	1	1	1	1	0	1	1
7Cyy	0	1	1	1	1	1	0	0
7Dyy	0	1	1	1	1	1	0	1
7Eyy	0	1	1	1	1	1	1	0
7Fyy	0	1	1	1	1	1	1	1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.3-3 (continued)

Clock/Status SELECTION

(A15 - A8)

1 = Installed
0 = Removed

Clock/Status SELECTED	BLK E3 8	7	6	5	4	3	2	1
80yy	1	0	0	0	0	0	0	0
81yy	1	0	0	0	0	0	0	1
82yy	1	0	0	0	0	0	1	0
83yy	1	0	0	0	0	0	1	1
84yy	1	0	0	0	0	1	0	0
85yy	1	0	0	0	0	1	0	1
86yy	1	0	0	0	0	1	1	0
87yy	1	0	0	0	0	1	1	1
88yy	1	0	0	0	1	0	0	0
89yy	1	0	0	0	1	0	0	1
8Ayy	1	0	0	0	1	0	1	0
8Byy	1	0	0	0	1	0	1	1
8Cyy	1	0	0	0	1	1	0	0
8Dyy	1	0	0	0	1	1	0	1
8Eyy	1	0	0	0	1	1	1	0
8Fyy	1	0	0	0	1	1	1	1
90yy	1	0	0	1	0	0	0	0
91yy	1	0	0	1	0	0	0	1
92yy	1	0	0	1	0	0	1	0
93yy	1	0	0	1	0	0	1	1
94yy	1	0	0	1	0	1	0	0
95yy	1	0	0	1	0	1	0	1
96yy	1	0	0	1	0	1	1	0
97yy	1	0	0	1	0	1	1	1
98yy	1	0	0	1	1	0	0	0
99yy	1	0	0	1	1	0	0	1
9Ayy	1	0	0	1	1	0	1	0
9Byy	1	0	0	1	1	0	1	1
9Cyy	1	0	0	1	1	1	0	0
9Dyy	1	0	0	1	1	1	0	1
9Eyy	1	0	0	1	1	1	1	0
9Fyy	1	0	0	1	1	1	1	1

Clock Status SELECTED	BLK E3 8	7	6	5	4	3	2	1
A0yy	1	0	1	0	0	0	0	0
A1yy	1	0	1	0	0	0	0	1
A2yy	1	0	1	0	0	0	1	0
A3yy	1	0	1	0	0	0	1	1
A4yy	1	0	1	0	0	1	0	0
A5yy	1	0	1	0	0	1	0	1
A6yy	1	0	1	0	0	1	1	0
A7yy	1	0	1	0	0	1	1	1
A8yy	1	0	1	0	1	0	0	0
A9yy	1	0	1	0	1	0	0	1
AAyy	1	0	1	0	1	0	1	0
AByy	1	0	1	0	1	0	1	1
ACyy	1	0	1	0	1	1	0	0
ADyy	1	0	1	0	1	1	0	1
AEyy	1	0	1	0	1	1	1	0
AFyy	1	0	1	0	1	1	1	1
B0yy	1	0	1	1	0	0	0	0
B1yy	1	0	1	1	0	0	0	1
B2yy	1	0	1	1	0	0	1	0
B3yy	1	0	1	1	0	0	1	1
B4yy	1	0	1	1	0	1	0	0
B5yy	1	0	1	1	0	1	0	1
B6yy	1	0	1	1	0	1	1	0
B7yy	1	0	1	1	0	1	1	1
B8yy	1	0	1	1	1	0	0	0
B9yy	1	0	1	1	1	0	0	1
B9yy	1	0	1	1	1	0	0	1
BByy	1	0	1	1	1	0	1	1
BCyy	1	0	1	1	1	1	0	0
BDyy	1	0	1	1	1	1	0	1
BEyy	1	0	1	1	1	1	1	0
BFyy	1	0	1	1	1	1	1	1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 2.3-4 (continued)

Clock/Status SELECTION

(A15 - A8)

1 = Installed
0 = Removed

Clock/Status SELECTED	BLK E3 8	7	6	5	4	3	2	1
C0yy	1	1	0	0	0	0	0	0
C1yy	1	1	0	0	0	0	0	1
C2yy	1	1	0	0	0	0	1	0
C3yy	1	1	0	0	0	0	1	1
C4yy	1	1	0	0	0	1	0	0
C5yy	1	1	0	0	0	1	0	1
C6yy	1	1	0	0	0	1	1	0
C7yy	1	1	0	0	0	1	1	1
C8yy	1	1	0	0	1	0	0	0
C9yy	1	1	0	0	1	0	0	1
CAyy	1	1	0	0	1	0	1	0
CByy	1	1	0	0	1	0	1	1
CCyy	1	1	0	0	1	1	0	0
CDyy	1	1	0	0	1	1	0	1
CEyy	1	1	0	0	1	1	1	0
CFyy	1	1	0	0	1	1	1	1
D0yy	1	1	0	1	0	0	0	0
D1yy	1	1	0	1	0	0	0	1
D2yy	1	1	0	1	0	0	1	0
D3yy	1	1	0	1	0	0	1	1
D4yy	1	1	0	1	0	1	0	0
D5yy	1	1	0	1	0	1	0	1
D6yy	1	1	0	1	0	1	1	0
D7yy	1	1	0	1	0	1	1	1
D8yy	1	1	0	1	1	0	0	0
D9yy	1	1	0	1	1	0	0	1
DAyy	1	1	0	1	1	0	1	0
DByy	1	1	0	1	1	0	1	1
DCyy	1	1	0	1	1	1	0	0
DDyy	1	1	0	1	1	1	0	1
DEyy	1	1	0	1	1	1	1	0
DFyy	1	1	0	1	1	1	1	1

Clock Status SELECTED	BLK E3 8	7	6	5	4	3	2	1
E0yy	1	1	1	0	0	0	0	0
E1yy	1	1	1	0	0	0	0	1
E2yy	1	1	1	0	0	0	1	0
E3yy	1	1	1	0	0	0	1	1
E4yy	1	1	1	0	0	1	0	0
E5yy	1	1	1	0	0	1	0	1
E6yy	1	1	1	0	0	1	1	0
E7yy	1	1	1	0	0	1	1	1
E8yy	1	1	1	0	1	0	0	0
E9yy	1	1	1	0	1	0	0	1
EAyy	1	1	1	0	1	0	1	0
EByy	1	1	1	0	1	0	1	1
ECyy	1	1	1	0	1	1	0	0
EDyy	1	1	1	0	1	1	0	1
EEyy	1	1	1	0	1	1	1	0
EFyy	1	1	1	0	1	1	1	1
F0yy	1	1	1	1	0	0	0	0
F1yy	1	1	1	1	0	0	0	1
F2yy	1	1	1	1	0	0	1	0
F3yy	1	1	1	1	0	0	1	1
F4yy	1	1	1	1	0	1	0	0
F5yy	1	1	1	1	0	1	0	1
F6yy	1	1	1	1	0	1	1	0
F7yy	1	1	1	1	0	1	1	1
F8yy	1	1	1	1	1	0	0	0
F9yy	1	1	1	1	1	0	0	1
FAyy	1	1	1	1	1	0	1	0
FByy	1	1	1	1	1	0	1	1
FCyy	1	1	1	1	1	1	0	0
FDyy	1	1	1	1	1	1	0	1
FEyy	1	1	1	1	1	1	1	0
FFyy	1	1	1	1	1	1	1	1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION III

3.1 Memory Device Configurations

The **MM6704c Static Memory Module** was designed with the FUTURE in mind. As such, it was designed to accept various types of devices available today, and for devices in the future. The **MM6704c Static Memory Module** can be configured for CMOS Static RAMS and EProms of various sizes. For Example: 32K X 8, 64K X 8, 128K X 8, 256K X 8, 512K X 8 Devices. To accomplish this, the **MM6704c Static Memory Module** contains, a jumper block (E4), which allows device size selection of **ALL** BANKS of memory (all BANKS will be the same size), four (4) configuration jumper blocks, to allow for types of devices. Each jumper block is associated with a BANK of memory. Each BANK controlling eight (8) 32pin devices.

3.2 Memory Device Sizing

As shipped from the factory, the **MM6704c Static Memory Module** is SIZED to conform to the devices used. Jumper block **E4** is used to change the sizing of the **MM6704c Static Memory Module.** (See Table 3.1)

Table 3.1

Memory Device Size jumper block E4

32K X 8 Devices	E4-8 to E4-1
	E4-9 to E4-2
	E4-10 to E4-3
64K X 8 Devices	E4-8 to E4-2
	E4-9 to E4-3
	E4-10 to E4-4
128K X 8 Devices	E4-8 to E4-3
	E4-9 to E4-4
	E4-10 to E4-5
256K X 8 Devices	E4-8 to E4-4
	E4-9 to E4-5
	E4-10 to E4-6
512K X 8 Devices	E4-8 to E4-5
	E4-9 to E4-6
	E4-10 to E4-7

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.3 Memory Device Selection

As with the **DTACK*** speed selection (See Section 2.5.2), each BANK of the **MM6704c Static Memory Module** can be configured for different **TYPES** of devices (IE: RAMS, ROMS, EProms) To accomplish this, the **MM6704c Static Memory Module**, contains a SET of jumper blocks to control various pins of the device sockets. A table of device configurations KNOWN as of the date of printing is contained in Table 3.2 (pg. ##). However, for future devices, the following text will attemp to explain each of the configurable pins.

3.3.1 Device Socket Pin (1)

Pin 1 is controlled by jumper blocks E38, E30, E22 & E14, corresponding with BANKS 0, 1, 2 & 3. It may be connected to either:

```
2 to 1 = A20 (Address Bit 20)
2 to 3 = A19 (Address Bit 19)
2 to 4 = Ground
```

3.3.2 Device Socket Pin (3)

Pin 3 is controlled by jumper blocks E41, E33, E25 & E17. It may be connected to either:

```
1 to 2 = +5Vdc
1 to 3 = A17 (Address Bit 17)
1 to 4 = A16 (Address Bit 16)
```

3.3.3 Device Socket Pin (30)

Pin 30 is controlled by jumper blocks E40, E32, E24 & E16. It may be connected to either:

```
1 to 2 = Vbb (Battery Power Bus)
1 to 3 = +5Vdc
1 to 4 = A16 (Address Bit 20)
1 to 5 = A16 (Address Bit 19)
```

3.3.4 Device Socket Pin (32)

Pin 32 is controlled by jumper blocks E39, E31, E23 & E15. It may be connected to either:

```
2 to 1 = Vbb (Battery Power Bus)
2 to 3 = +5Vd
```

3.3.5 Device Socket Pin (29)

Pin 29 is controlled by jumper blocks E42, E43, E44 & E45, for BANK 0. Jumper blocks E34, E35, E36, E37, for BANK 1. Jumper blocks E26, E27, E28, E29, for BANK 3. Jumper blocks E18, E19, E20, E21, for BANK 3. They may be connected to either:

```
2 to 1 = A16 (Address Bit 16)
2 to 3 = WE* (Write Enable)
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3.2

Jumper Configuration for KNOWN Devices

To Be Supplied

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

an internal lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent loss of watch and RAM data.

Using the SmartWatch saves PC board space since the combination of SmartWatch and the mated RAM take up no more area than the memory alone. The SmartWatch uses pins 28, 27, 26, 22, 20, 11, and 1 for RAM and watch control. All other pins are passed straight through to the socket receptacle.

The SmartWatch provides time keeping information including hundredths of seconds, seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with less than 31 days, including correction for leap years. The SmartWatch operates in either 24 hour or 12 hour format with an AM/PM indicator.

OPERATION

Communication with the SmartWatch is established by pattern recognition of a serial bit stream of 64 bits which must be matched by executing 64 consecutive write cycles containing the proper data on DQ0. All accesses which occur prior to recognition of the 64 bit pattern are directed to memory.

After recognition is established, the next 64 read or write cycles either extract or update data in the SmartWatch and memory access is inhibited.

Data transfer to and from the timekeeping function is accomplished with a serial bit stream under control of chip enable ($\overline{CE}$), output enable ($\overline{OE}$), and write enable ($\overline{WE}$). Initially, a read cycle to any memory location using the $\overline{CE}$ and $\overline{OE}$ control of the SmartWatch starts the pattern recognition sequence by moving a pointer to the first bit of the 64 bit comparison register. Next, 64 consecutive write cycles are executed using the $\overline{CE}$ and $\overline{WE}$ control of the SmartWatch. These 64 write cycles are used only to gain access to the SmartWatch, therefore, any address to the memory in the socket is acceptable. However, the write cycles generated to gain access to the SmartWatch are also writing data to a location in the mated RAM. The preferred way to manage this requirement is to set aside just one address location in RAM as a SmartWatch scratch pad. When the first write cycle is executed, it is compared to bit 1 of the 64 bit comparison register. If a match is found, the pointer increments to the next location of the comparison register and awaits the next write cycle. If a match is not found, the pointer does not advance and all subsequent write cycles are ignored. If a read cycle occurs at any time during pattern recognition, the present sequence is aborted and the comparison register pointer is reset. Pattern recognition continues for a total of 64 write cycles as described above until all the bits in the comparison register have been matched (this bit pattern is shown in Figure 1). With a correct match for 64 bits, the SmartWatch is enabled and data transfer to or from the timekeeping registers may proceed. The next 64 cycles will cause the SmartWatch to either receive or transmit data on DQ0, depending on the level of the $\overline{OE}$ pin or the $\overline{WE}$ pin. Cycles to other locations outside the memory block can be interleaved with $\overline{CE}$ cycles without interrupting the pattern recognition sequence or data transfer sequence to the SmartWatch.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SmartWatch REGISTER INFORMATION

The SmartWatch information is contained in 8 registers of 8 bits each which are sequentially accessed one bit at a time after the 64 bit pattern recognition sequence has been completed. When updating the SmartWatch registers, each must be handled in groups of 8 bits. Writing and reading individual bits within a register could produce erroneous results. These read/write registers are defined in Figure 2.

Data contained in the SmartWatch registers are in binary coded decimal format (BCD). Reading and writing the registers is always accomplished by stepping through all 8 registers, starting with bit 0 of register 0 and ending with bit 7 of register 7.

AM-PM/12/24 MODE

Bit 7 of the hours register is defined as the 12 or 24 hour mode select bit. When high, the 12 hour mode is selected. In the 12 hour mode, bit 5 is the AM/PM bit with logic high being PM. In the 24 hour mode, bit 5 is the second 10 hour bit (20-23 hours).

OSCILLATOR AND RESET BITS

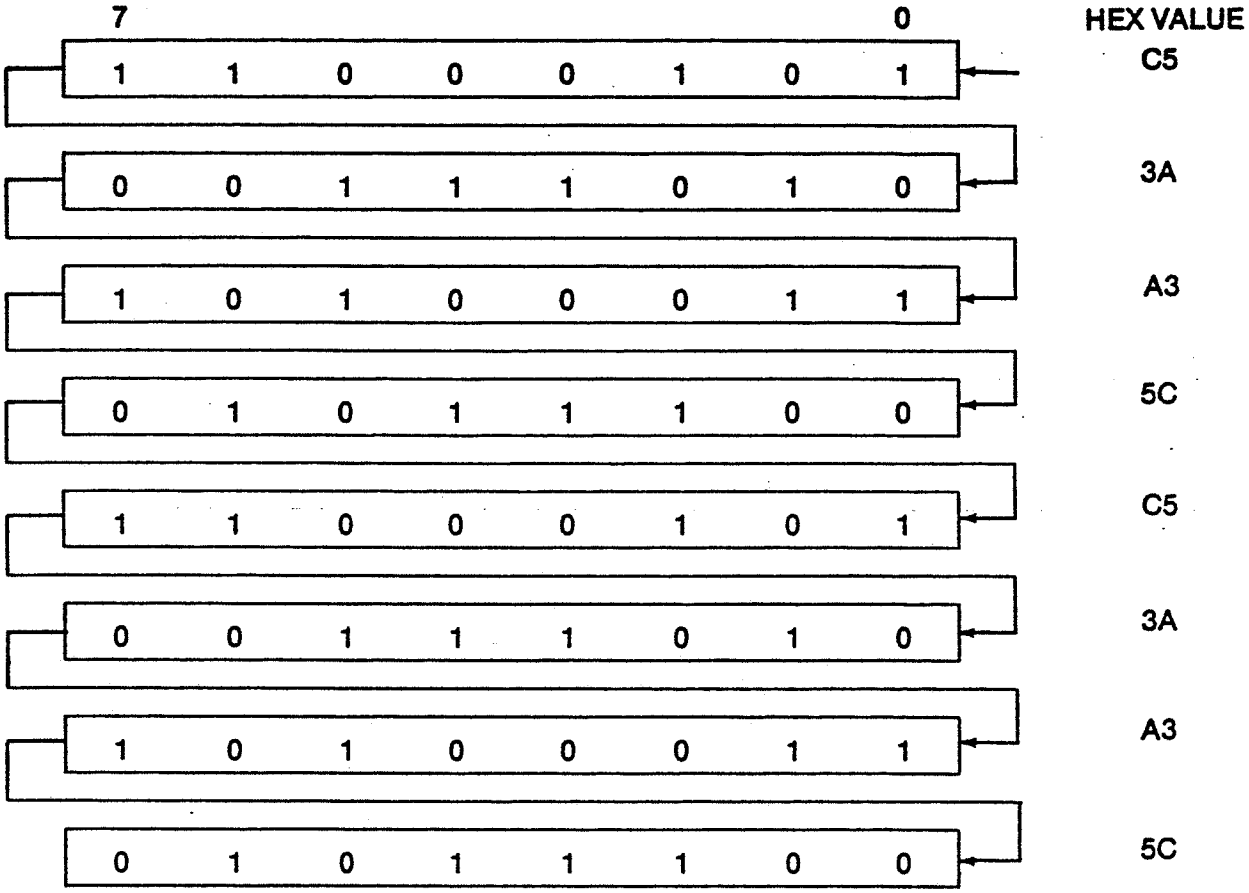
Bits 4 and 5 of the day register are used to control the reset and oscillator functions.Bit 4 controls the reset (pin 1). When the reset bit is set to logical 1, the reset input pin is ignored. When the reset bit is set to logical 0, a low input on the reset pin will cause the SmartWatch to abort data transfer without changing data in the watch registers. Bit 5 controls the oscillator. This bit is shipped from Dallas Semiconductor set to logical 1, which turns the oscillator off. When set to logical 0, the oscillator turns on and the watch becomes operational.

ZERO BITS

Registers 1, 2, 3, 4, 5, and 6 contain one or more bits which will always read logical 0. When writing these locations, either a logical 1 or 0 is acceptable.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FIGURE 1 — SMARTWATCH COMPARISON REGISTER DEFINITION



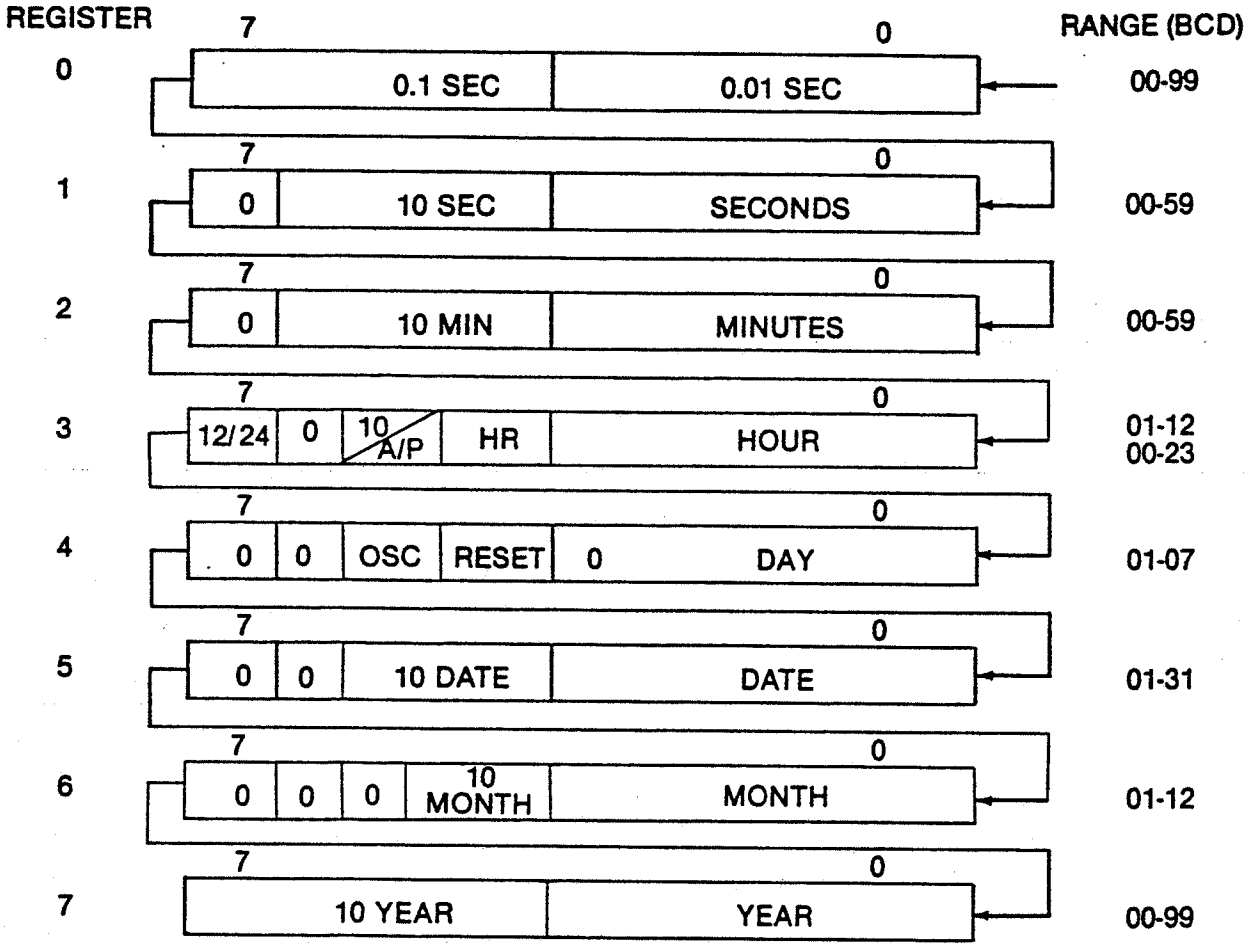
NOTE:
THE PATTERN RECOGNITION IN HEX IS C5, 3A, A3, 5C, C5, 3A, A3, 5C. THE ODDS OF THIS PATTERN ACCIDENTALLY OCCURRING AND CAUSING INADVERTENT ENTRY TO THE SMARTWATCH ARE LESS THAN 1 IN 10^{19}.

NONVOLATILE CONTROLLER OPERATION

The DS1216 SmartWatch performs circuit functions required to make a CMOS RAM nonvolatile. First, a switch is provided to direct power from the battery or V_{CC} supply, depending on which voltage is greater. This switch has a voltage drop of less than 0.2 volts. The second function provides power fail detection. Power fail detection occurs at typically 4.25 volts. The DS1216 constantly monitors the V_{CC} supply. When V_{CC} goes out of tolerance, a comparator outputs a power fail signal to the chip enable logic. The third function accomplishes write protection by holding the chip enable signal to the memory within 0.2 volts of V_{CC} or battery. During nominal power supply conditions the memory chip enable signal will track the chip enable signal sent to the socket with a maximum propagation delay of 20 ns.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FIGURE 2 - SmartWatch REGISTER DEFINITION



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ABSOLUTE MAXIMUM RATINGS*

VOLTAGE ON ANY PIN RELATIVE TO GROUND	—	−1.0V to +7V
OPERATING TEMPERATURE	—	0°C to 70°
STORAGE TEMPERATURE	—	−40°C to 70°C
SOLDERING TEMPERATURE	—	260°C for 10 Sec

*This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

RECOMMENDED D.C. OPERATING CONDITIONS

(0°C to 70°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
PIN 26L, PIN 28L Supply Voltage	V_{CC}	4.5	5.0	5.5	V	1, 3
Logic 1	V_{IH}	2.2		$V_{CC}+0.3$	V	1, 10
Logic 0	V_{IL}	−0.3		+0.8	V	1, 10

D.C. ELECTRICAL CHARACTERISTICS

(0°C to 70°C, V_{CC} = 4.5 to 5.5V)

PIN 26L, PIN 28L Supply	I_{CCI}			5	mA	3, 4, 5
PIN 26U, PIN 28U Supply Voltage	V_{CCO}	$V_{CC}-0.2$			V	3, 8
PIN 26U, PIN 28U Supply Current	I_{CCO}			80	mA	3, 8
Input Leakage	I_{IL}	−1.0		+1.0	μA	4, 10
Output @ 2.4V	I_{OH}	−1.0			mA	2
Output @ 0.4V	I_{OL}			4.0	mA	2

(0°C to 70°, V_{CC} < 4.5V)

PIN 20U Output	V_{OHL}	$V_{CC}-0.2$ $V_{BAT}-0.2$			V	3
PIN 26U, PIN 28U Battery Current	I_{BAT}			1	μA	3, 6
Pin 26U, PIN 28U Battery Voltage	V_{BAT}	2	3	3.6	V	3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CAPACITANCE (t_A = 25°)

PARAMETER	SYMBOL	MIN	UNITS	NOTES
Input Capacitance	C_{IN}	5	pF	
Output Capacitance	C_{OUT}	7	pF	

A.C. ELECTRICAL CHARACTERISTICS (0°C to 70°C, V_{CC} = 4.5 to 5.5V)

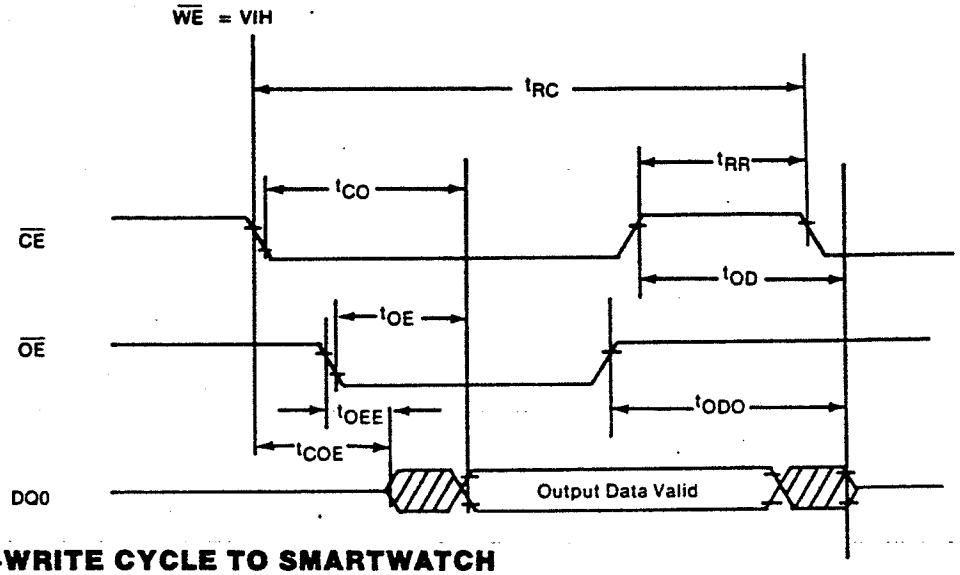
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Read Cycle Time	t_{RC}	250			ns	
$\overline{CE}$ Access Time	t_{CO}			200	ns	
$\overline{OE}$ Access Time	t_{OE}			100	ns	
$\overline{CE}$ To Output Low Z	t_{COE}	10			ns	
$\overline{OE}$ To Output Low Z	t_{OEE}	10			ns	
$\overline{CE}$ To Output High Z	t_{OD}			100	ns	
$\overline{OE}$ To Output High Z	t_{ODO}			100	ns	
Read Recovery	t_{RR}	50			ns	
Write Cycle Time	t_{WC}	250			ns	
Write Pulse Width	t_{WP}	170			ns	
Write Recovery	t_{WR}	50			ns	11
Data Set Up Time	t_{DS}	100			ns	11
Data Hold Time	t_{DH}	0			ns	12
$\overline{CE}$ Pulse Width	t_{CW}	170			ns	
Reset Pulse Width	t_{RST}	200			ns	
$\overline{CE}$ Propagation Delay	t_{PD}	5	10	20	ns	2, 9
$\overline{CE}$ High to Power Fail	t_{PF}			0	ns	

(0°C to 70°C, V_{CC} < 4.5V)

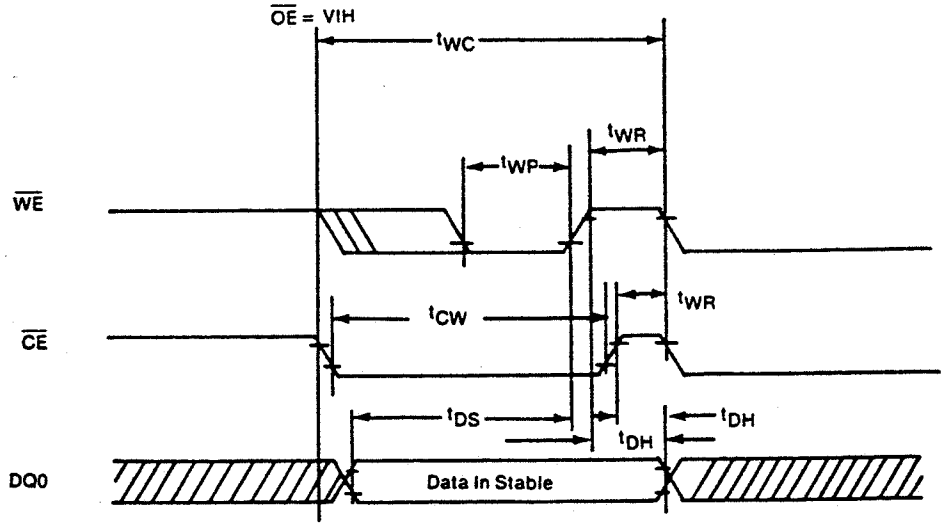
Recovery at Power Up	t_{REC}	2	5	10	ms	
V_{CC} Slew Rate 4.5 - 3V	t_F	300			μs	
$\overline{CE}$ Pulse Width	t_{CE}			1.5	μs	7

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

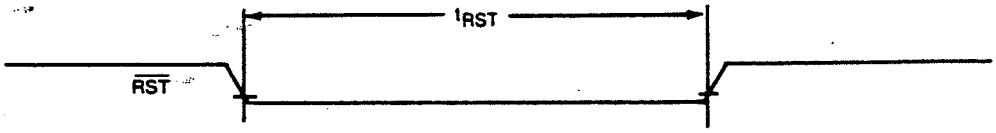
TIMING DIAGRAM—READ CYCLE TO SMARTWATCH



TIMING DIAGRAM—WRITE CYCLE TO SMARTWATCH

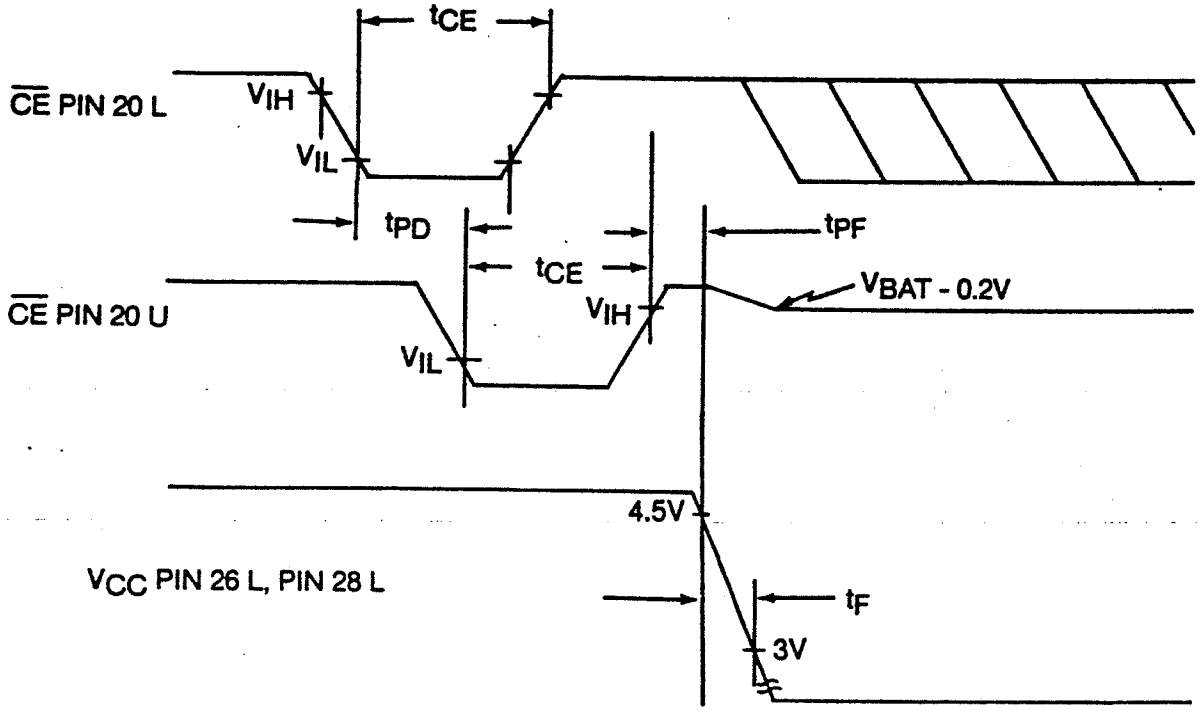


TIMING DIAGRAM—RESET FOR SMARTWATCH

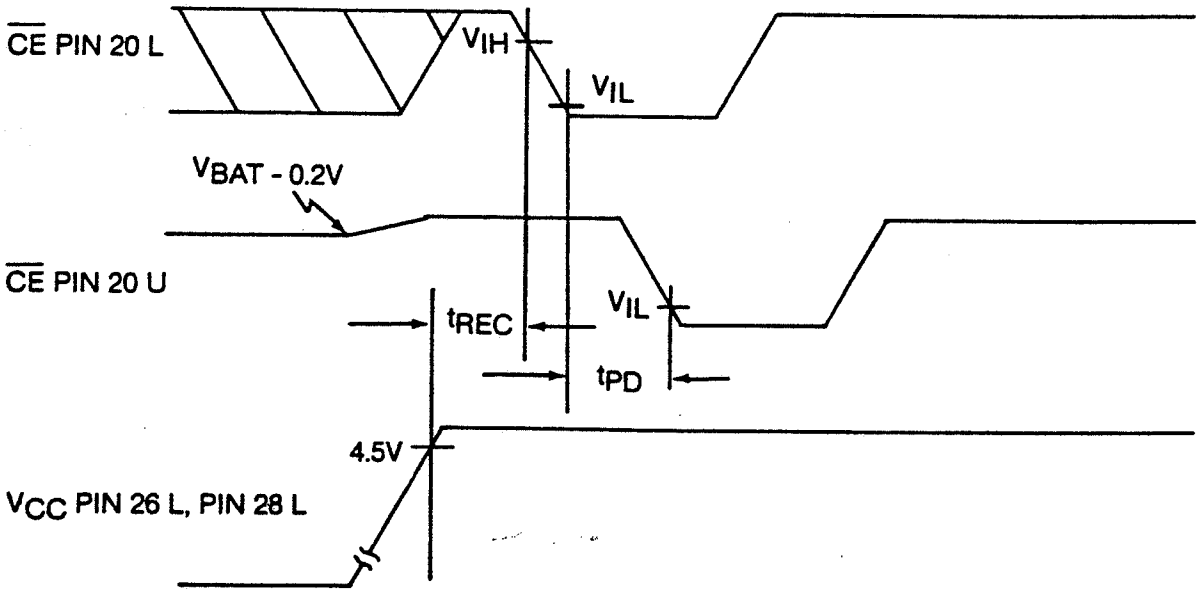


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TIMING DIAGRAM — POWER DOWN



TIMING DIAGRAM — POWER UP

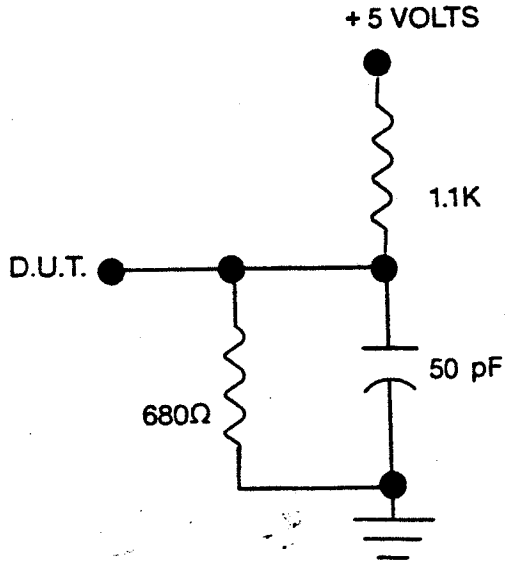


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTES

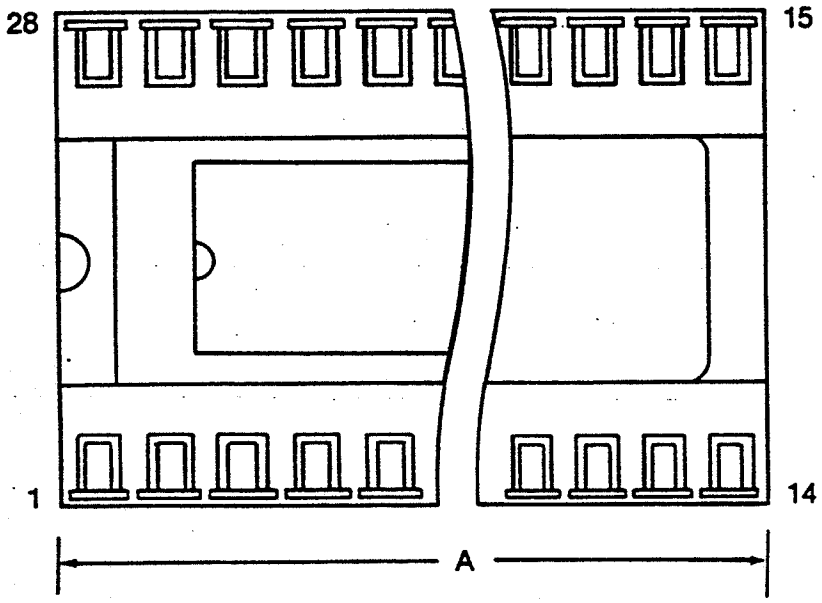
1. All voltages are referenced to ground.
2. Measured with a load as shown in Figure 3.
3. PIN locations are designated "U" when a parameter definition refers to the socket receptacle and "L" when a parameter definition refers to the socket pin.
4. No memory inserted in the socket.
5. PIN 26 L may be connected to V_{CC} or left disconnected at the P C board.
6. I_{BAT} is the maximum current which a correctly installed memory can use in the data retention mode and meet data retention expectations of more than 10 years at 25 °C.
7. t_{CE} max must be met to insure data integrity on power loss.
8. V_{CC} is within nominal limits and a memory is installed in the socket.
9. Input pulse rise and fall times equal 10 ns.
10. Applies to Pins 1 L, 11 L, 20 L, 22 L, and 27 L.
11. t_{WR} is a function of the latter occurring edge of $\overline{WE}$ or $\overline{CE}$.
12. t_{DH} and t_{DS} are a function of the first occurring edge of $\overline{WE}$ or $\overline{CE}$.

Output Load
Figure 3

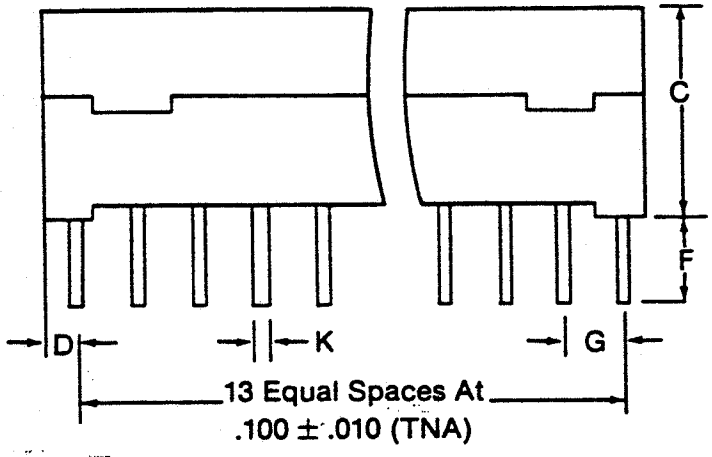


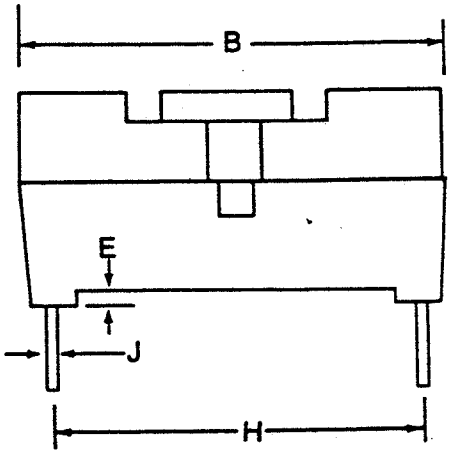
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DS1216
SmartWatch



DIM.	INCHES	
	MIN.	MAX.
A	1.390	1.420
B	.695	.705
C	.350	.370
D	.035	.065
E	.025	.035
F	.120	.160
G	.090	.110
H	.590	.625
J	.008	.012
K	.015	.021





Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dallas Semiconductor

SmartWatch

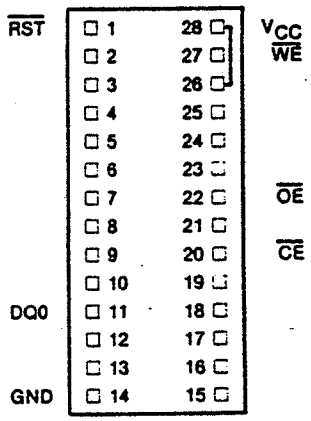
PRELIMINARY

DS1216

FEATURES

- SmartWatch keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years
- Converts standard 2K × 8 and 8K × 8 CMOS static RAMs into nonvolatile memory
- Embedded lithium energy cell maintains watch information and retains RAM data
- Watch function is transparent to RAM operation
- Month and year determine the number of days in each month
- Proven gas-tight socket contacts
- Full 10% operating range
- Operating temperature range 0°C to 70°C

PIN CONNECTIONS



PIN DEFINITIONS

All Pins Pass Through Except
20, 26, 28
Pin 20 Conditioned Chip Enable
Pin 26 Switched V_{CC} for 24 Pin RAM
Pin 28 Switched V_{CC} for 28 Pin RAM
Pin 1 Reset
Pin 22 Output Enable
Pin 27 Write Enable
Pin 11 Data Input/Output 0
Pin 14 Ground

DESCRIPTION

The DS1216 is a 28 pin 0.6 inch wide DIP socket with a built-in CMOS watch function, a nonvolatile RAM controller circuit, and an embedded lithium energy source. It accepts either a 24 pin 2K × 8 or a 28 pin 8K × 8 JEDEC Bytewide CMOS static RAM. When the socket is mated with a CMOS RAM, it provides a complete solution to problems associated with memory volatility and uses a common energy source to maintain time and date. A key feature of the SmartWatch is that the watch function remains transparent to the RAM. The SmartWatch monitors V_{CC} for an out of tolerance condition. When such a condition occurs,

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP