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ICC-8/30

Intelligent 8 Channel Serial Controller
VMEbus Module

REFERENCE MANUAL

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TABLE OF CONTENTS

1. GENERAL DESCRIPTION 1

1.1 SPECIFICATIONS 1

2. FUNCTIONAL DESCRIPTION 3

2.1 MEMORY 3
2.1.1 RAM 3
2.1.2 EPROM 3
2.2 PROCESSOR 3
2.3 SERIAL INTERFACES 3
2.3.1 SCC DESCRIPTION 4
2.3.2 RS-232 INTERFACE 5
2.3.3 OPTION 1 RS232C 5
2.3.4 OPTION 2 RS232C 5
2.4 RS422/RS485 6
2.4.1 OPTION 1 RS422 6
2.4.2 OPTION 2 RS422 6
2.4.3 OPTION 3 RS485 7
2.5 OPTION 4 RS485 7
2.6 PARALLEL INTERFACE AND TIMER 8
2.6.1 VIA DESCRIPTION 8
2.6.2 CONNECTOR P2 SIGNALS 8
2.7 REAL-TIME CLOCK 9
2.8 VME INTERFACE P1 / P2 10
2.9 RESET AND WATCHDOG 11
2.10 ADDRESS MAP 12
2.11 CONTROL REGISTER 13
2.12 STATUS REGISTER 14
2.13 FRONT PANEL 14
2.13.1 RESET SWITCH 14 **Error! I**
2.13.2 STATUS INDICATOR 15

3. HARDWARE PREPARATION 15

3.1 INTRODUCTION 15
3.2 HARDWARE CONFIGURATION 15
3.2.1 DEFAULT CONFIGURATION 15
3.2.2 SYSRESET 16
3.2.3 WATCHDOG SELECTION 16
3.2.4 VMEBUS REQUESTER SELECTION 16
3.2.5 VME ARBITER SELECTION 17

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3.2.6 VME INTERRUPT SELECTION 17
3.2.7 CLOCK SELECTION 18
3.2.8 BATTERY BACKUP ENABLE 18
3.2.9 EPROM TYPE SELECTION 18
3.2.10 SOFTWARE SELECTION JUMPERS 19

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1. GENERAL DESCRIPTION

ULTRA LOW POWER 68030

The ICC8, is a intelligent communication controller based on a 68030 processor board with 8 RS232/422/485 serial ports. This product is optimized for applications requiring a high performance general purpose CPU with low power consumption or dissipation. Exclusive use of CMOS components guaranties not only low overall power use but also the absence of “hot-points”. This allows the ICC8 module to be put in an airtight box that will fit the most trying environment; therefore protecting against dust or other contaminants.

The resources already available on the board will fit most applications. However, if additional resources are needed, the board standard VME interface allows the user to tap the wealth of available VMEbus modules to complete the system.

* 68EC030 Microprocessor running at 25 MHZ (33 MHz optional)
* 68881/68882 coprocessor (optional)
* Up to 4 Mbyte of SRAM with battery back up
* Up to 8 Mbytes of EPROM (4 sockets)
* 8 RS232/RS485 serial interface with Z85C30 SCC
* Supports async and synchronous bit and character oriented protocols
* Two 8 bit parallel interfaces with handshake lines (P2 connector)
* Two independent 16-bit counter/timers with access lines on P2 connector
* Time-of-day clock with battery backup
* Independent watchdog timer
* Fully VMEbus Rev C compatible
* Single level VMEbus arbiter
* Sysclk driver
* Supports ACFAIL* and SYSFAIL* interrupts
* CMOS for low power

1.1 SPECIFICATIONS

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Processor: 68EC030 @ 25 MHz

SRAM: Static, up to 4 M Bytes with battery backup (8 sockets)

EPROM: up to 4 M Byte (4 sockets)

Comm: 8 serial channels (RS232C/485)

Data Rate: up to 2 Mbps

Modem 1 in / 1 out per channel

RTC MK48TO2 Option

VME Interface

Compatible VMEbus Rev C. Master Mode

Address A32, A24, A16
Data D32, D16, D8

Int. Level IRQ1* to IRQ7*

Bus Controller Selectable

Electrical

Power Req.
+5 Vdc, 0.65A typ (25MHz)
+12Vdc, 0. 1 A max
- 12Vdc, 0. 1 A max

Environmental

Operating Temp.
0° to 60°C

Relative Humidity
0% to 90%
Altitude
Operating Sea-level to 10,000 ft.

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2. FUNCTIONAL DESCRIPTION

2.1 MEMORY

2.1.1 RAM

The ICC8 module has 8 x 32-pin JEDEC sockets that can receive either 128Kx8, OR 512KX8 static RAM chips.

The ICC8 memory is backed by a lithium battery. Using low-power memories (1pA typical), the battery will be able to maintain the data for 5 years (typical) in the absence of any external source of power. Disconnecting the jumper W08 will stop the battery backup and will prevent the battery from discharging. Thus, allowing for a longer storage period.
The reset circuitry automatically disables the memory chip select if the VCC voltage drops below 4.5V. This mechanism protects the memory content in case of a power failure.

2.1.2 EPROM

The ICC8 module has 4 x 32 Pin sockets allowing up to 2 Mbytes of EPROM. EPROMs supported range from the 8Kx8 2764 to the 512Kx8. The jumper area W7 selects the type of EPROM. Table 2.1 shows the different EPROMs supported and the corresponding jumper configuration.

EPROM	W7
27128	3-5,4-6,8-10
27256	3-5,2-4,8-10
27512	1-3,2-4, 8-10
27C101	1-3, 2-4, 5-7, 8-10,.13-14
2 Mbit	1-3, 2-4, 5-7,10-12,.13-14
4 Mbit	1-3,.2-4, 5-7,10-12,.11-13

Table 2-1 EPROM Type Selection

2.2 PROCESSOR

The ICC8 module supports the 68EC030 at 25Mhz.

2.3 Serial Interfaces

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Eight serial channels are installed on the ICC8. All eight channels are controlled by four Zilog Z85C30 Serial Communication Controllers (SCC). The SCC supports many synchronous and asynchronous protocols. All eight ports are accessible on the front panel.

2.3.1 SCC Description

The board uses four on board Z85C30s as serial interfaces. This controller can be configured by software to satisfy a wide variety of serial communication applications. The Z85C30 contains a variety of sophisticated internal functions including on-chip baud rate generators, digital phase-locked loops, and crystal oscillators. It handles asynchronous formats and synchronous byte-oriented protocols such as HDLC and SDLC. It can generate and check CRC codes in any synchronous mode and can be programmed to check data integrity in various modes. The clock signal PCLK is generated by a 7.372 MHz crystal oscillator.

Address	Register
$F30201C3	Channel H Command Register
$F30201C7	Channel H Data Register
$F30201CB	Channel G Command Register
$F30201CF	Channel G Data Register
$F3020183	Channel F Command Register
$F3020187	Channel F Data Register
$F302018B	Channel E Command Register
$F302018F	Channel E Data Register
$F3020143	Channel D Command Register
$F3020147	Channel D Data Register
$F302014B	Channel C Command Register
$F302014F	Channel C Data Register
$F3020103	Channel B Command Register
$F3020107	Channel B Data Register
$F302010B	Channel A Command Register
$F302010F	Channel A Data Register

Table 2-2 SCC address map

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2.3.2 RS-232 Interface

The eight serial connections are available at the front panel connectors. The levels are RS232 compatible.

2.3.3 Option 1 RS232C

Signals	Description	Pin	Input/Output	Note
TxD	Transmit Data	4	Output	
RxD	Receive Data	5	Input	
RTS	Request To Send	2	Output	
CTS	Clear To Send	7	Input	
DTR	DataTerminal Ready	8	Output	Need jumper between pin 1-2 (factory set)
GND	Ground	6	Input	
GND	Ground	3	Input	
RXCLK	Receive clock for 85C30	1	Input	Need jumper between pin 1-2 if external CLK else jumper between 2-3 (Factory set)

2.3.4 Option 2 RS232C

Signals	Description	Pin	Input/Output	Note
TxD	Transmit Data	4	Output	
RxD	Receive Data	5	Input	
RTS	Request To Send	2	Output	
CTS	Clear To Send	7	Input	
TXCLK	Transmit Clock	8	Output	Need Jumper between pin 2-3
GND	Ground	6	Input	
GND	Ground	3	Input	
RXCLK	Receive clock for 85C30	1	Input	Need jumper between pin 1-2 if external CLK else jumper between 2-3 (Factory set)

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2.4 RS422/RS485

2.4.1 Option 1 RS422

Jumper TTJP1 is not installed. This jumper maintains the output buffer enable.

Signals	Description	Pin	Note
TxD+	Positive Transmit Data	1	
TxD-	Negative Transmit Data	2	
RxD+	Positive receive Data	3	
RxD-	Negative Receive Data	6	
TxC+	Positive Transmit Clock	4	Jumper TJP2 installed (factory set)
TxC-	Negative Transmit Clock	5	
RxC+	Positive Receive Clock	7	Jumper TJP2 installed
RxC-	Negative Receive Clock	8	

2.4.2 Option 2 RS422

Jumper TTJP1 is not installed. This jumper maintains the output buffer enable.

Signals	Description	Pin	Note
TxD+	Positive Transmit Data	1	
TxD-	Negative Transmit Data	2	
RxD+	Positive receive Data	3	
RxD-	Negative Receive Data	6	
RTS+	Positive Request to Send	4	Jumper TJP2 none
RTS-	Negative Request to Send	5	
CTS+	Positive Control to Send	7	Jumper TJP2 none
CTS-	Negative Control to Send	8	

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2.4.3 Option 3 RS485

Jumper TTJP1 is installed. This jumper when installed enable output buffer with RTS active low.

Signals	Description	Pin	Note
TxD+	Positive Transmit Data	1	
TxD-	Negative Transmit Data	2	
RxD+	Positive receive Data	3	
RxD-	Negative Receive Data	6	
TxC+	Positive Transmit Clock	4	Jumper TJP2 installed
TxC-	Negative Transmit Clock	5	
RxC+	Positive Receive Clock	7	Jumper TJP2 installed
RxC-	Negative Receive Clock	8	

2.5 Option 4 RS485

Jumper TTJP1 is installed. This jumper when installed enable output buffer with RTS active low.

Signals	Description	Pin	Note
TxD+	Positive Transmit Data	1	
TxD-	Negative Transmit Data	2	
RxD+	Positive receive Data	3	
RxD-	Negative Receive Data	6	
RTS+	Positive Request to Send	4	Jumper TJP2 none
RTS-	Negative Request to Send	5	
CTS+	Positive Control to Send	7	Jumper TJP2 none
CTS-	Negative Control to Send	8	

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2.6 PARALLEL INTERFACE AND TIMER

2.6.1 VIA Description

The parallel interface features a 65C22 VIA device. Two program-controlled 8-bit bidirectional peripheral I/ 0 ports allow direct interfacing between the microprocessor and selected peripheral devices. Two programmable Data Direction Registers (A and B) allow selection of data direction (input versus output) on an individual line-by line basis. Also provided are two programmable 16-bit counter/timers with latches. Application versatility is further increased by various control registers, including an interrupt flag register, an interrupt enable register, and two function control registers. Resistors on the board limit current on some of the I/0 lines thereby protecting the VIA when the board is turned off.

2.6.2 Connector P2 signals

The row C of the connector P2 is used for VIA connections.

Table 2-3 Parallel Interface Pinout

Signal	Connector P2
CA1	A01
CA2	A02
CB1	A03
CB2	A04
PA0	A05
PA1	A06
PA2	A07
PA3	A08
PA4	A09
PA5	A10
PA6	A11
PA7	A12
PBO	C05
PBl	C06
PB2	C07
PB3	C08
PB4	C09
PB5	C10
PB6	C11
PB7	C12

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2.7 REAL-TIME CLOCK

The on-board real-time clock uses a Mostek chip MM5827c.

Address	Function
$F301000	CONTROL REG.
$F301001	TENTHS OF SEC.
$F301002	SECONDS
$F301003	TENS OF SECONDS
$F301004	MINUTES
$F301005	TENS OF MINUTES
$F301006	HOURS
$F301007	TENS OF HOURS
$F301008	DAYS
$F301009	TENS OF DAYS
$F30100A	MONTHS
$F30100B	TENS OF MONTH
$F30100C	YEARS
$F30100D	TENS OF YEARS
$F30100E	DAY OF WEEK
$F30100F	CLOCK SETTING
	INTERRUPT

Table 2-4 Real-Time Clock Address Map

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2.8 VME INTERFACE P1 / P2

Pin	P1 /A	P1 /B	P1 /C	P2 / B
1	D00	BBSY*	D08	+5
2	D01	N. C.	D09	GND
3	D02	ACFAIL*	D10	
4	D03	BG0IN*	D11	A24
5	D04	BG0OUT	D12	A25
6	D05	BG1 IN*	D13	A26
7	D06	BG10UT*	D14	A27
8	D07	BG2IN*	D15	A28
9	GND	BG20UT*	GND	A29
10	SYSCLK	BG3IN*	SYSFAIL*	A30
11	GND	BG30UT*	BERR*	A31
12	DS1 *	BR0*	SYSRST*	GND
13	DS0*	BR1 *	LWORD*	+5
14	WRITE*	BR2*	AM5	D16
15	GND*	BR3*	A23	D17
16	DTACK*	AM0	A22	D18
17	GND	AM1	A21	D19
18	AS*	AM2	A20	D20
19	GND	N. C.	A19	D21
20	IACK*	GND	A18	D22
21	IACKIN*	N. C.	A17	D23
22	IACKOUT*	N. C.	A16	GND
23	AM4	GND	A15	D24
24	A07	IR07*	A14	D25
25	A06	IR06*	A13	D26
26	A05	IR05*	A12	D27
27	A04	IR04*	Al 1	D28
28	A03	IR03*	A10	D29
29	A02	IR02*	A09	D30
30	A01	IR01 *	A08	D31
31	-12V	+5VSTBY	+12V	GND
32	+5V	+5V	+5V	+5

Table 2-5 VMEbus Interface signals

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2.9 RESET AND WATCHDOG

The ICC8 module reset and watchdog cicuit has been designed to guarantee the board reliable function in a variety of conditions.

When power is off, the module resets the CPU as soon as the power voltage drops below 4.5V. This operation also prevents accidental corruption of the data in the battery backup RAM. The optional real-time clock has its own circuitry protecting it on power-down.

On power-on or when the user activates the front panel reset push-button, the reset circuitry asserts the internal RESET* signal for a minimum of 200 mS after VCC has risen above 4.75V.

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2.10 ADDRESS MAP

On reset, the bit CR5 of the control register is set to 0, selecting the alternate address map. This allows the 68030 to fetch the reset vectors in the EPROM. This bit should be set to 1 by the initialization routine to allow RAM accesses at the address 0. On request, Alphi can provide the user with the information to customize the address map if necessary.

The following tables show the different address map depending on the decoding PAL and the value of the bit CR5 of the control register.

Table 2.7: Standard Address Map

Address	Function
$00000000-$00FFFFFF	Local RAM
$01000000-$7FFFFFFF	VME A32/D32
$80000000-$EFFFFFFF	VME A32/D16
$F0000000-$F0FFFFFF	VME A24/D16
$F1000000-$F100FFFF	VME A16/D16
$F3000000-$F300FFFF	6522 VIA
$F301000-$F301FFFF	RTC
$F3020040	Control Register
$F3020050	Output port C
$F3020103-$f302013F	Serial Controller 1
$F3020143-$F302017F	Serial Controller 2
$F3020183-$F30201BF	Serial Controller 3
$F30201C3-$F30201FF	Serial Controller 4
$FE000000-$FEFFFFFF	Local Prom
$FF000000-$FFFFFFFF	VME A24/D32

Table 2.8: Alternate Address Map

Address	Function
$00000000-$00FFFFFF	Local PROM
$F4000000-$F4FFFFFF	Local RAM

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Table 2.9: Internal Interrupt levels

Interupt	Source
Level7	VMEbus ACFAIL*
Level7	Abort Push-button
Level 6	Serial Controller IRQ
Level 5	Serial Controller IRQ
Level 4	Serial Controller IRQ
Level 3	VIA auto vector
Level 2	SYSFAIL* auto vector
Level 1	RTC auto vector

Internal Interrupt levels for the SCC

Serial Controller Group	Jumper W9	Interrupt
1,2	1-2	IRQ6
	3-4	IRQ5
	5-6	IRQ4
3,4	7-8	IRQ6
	9-10	IRQ5
	11-12	IRQ4

2.11 CONTROL REGISTER

The ICC8 Control register contains 8 bits which monitor and controls several of the board functions. Table 2.11 contains the meaning of the different bits.

The Control register is accessible at the address $F3020040. The Status Register reflect most of the Bit of the Control Register. See Table below for details
On board reset, all the bits of the control register are cleared.

Bit		Name	Description
D7	DD31		
D6	DD30		
D5	DD29		CR5 = 0 alternate address map
			CR5 = 1 standard address map
D4	DD28	WD	Watchdog toggle bit
D3	DD27		

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D2	DD26	FAILH	FAILH = 0: SYSFAIL* is high
			FAILH = 1 : SYSFAIL* is low
D1	DD25	ROR	ROR = 0 Release on Request
			ROR = 1 Release When Done
D0	DD24	N/A	not used

Table 2-6 Control Register

2.12 Status Register

Bit		Signal	Description
D7	DD31	DAT	CR Status
D6	DD30	UB0	=0 PIN 1 - 2, W10 jumpered
	DD29	UB1	=0 PIN 3 - 4, W10 jumpered
D4	DD28	WD	Watchdog toggle bit
D3	DD27	COP	68882 coprocessor = 0
D2	DD26	N/A	not used
D1	DD25	ROR	ROR / RWD option
D0	DD24	ACFAIL*	Bus Acfail* status

Table 2-7 Status Register

2.13 FRONT PANEL

The ICC8 front panel features a RESET switch, a STATUS indicator.

2.13.1 RESET Switch

When depressed, this switch resets the ICC8 board. When properly configured, it will also send a RESET signal on the VMEbus

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2.13.2 STATUS Indicator

This red LED reflects the state of the local processor STATUS line. When it is bright red, it means that the processor is halted (generally the result of a double bus fault).

3. HARDWARE PREPARATION

3.1 INTRODUCTION

This chapter provides hardware preparation instructions for the ICC8 processor module.

3.2 HARDWARE CONFIGURATION

3.2.1 Default configuration

.

Jumper	Setting	Description
W01	none	watchdog is disabled
W02	2-4, 6-8,10-12, 13-14, 15-16,23-24	Level 3 requester
W04	1-2, 3-4, 5-6	Arbiter is selected ,Board is Slot 1
W05	1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14	All VME interrupts are selected
W06	1-2, 3-4, 5-6	SYSRESET* generated
W07	1-3, 2-4, 5-7,8-10,13-14	128K X 8
W08	1-2	factory set
W10	none	All option bits set
WW1	1-2	batt.

Table 3-1 Default Board Configuration

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3.2.2 SYSRESET

The jumper area W6 allows the user to select the generation and/or the reception of the VMEbus SYSRESET* signal. Both jumpers can be set at the same time.

Jumper between header pins 3 and 4 of the jumper area allow SYSRESET* generation. If the outgoing VMEbus SYSRESET* is selected (5-6), it can be generated by the watchdog timer, the reset push-button, or the poweron reset. The 68000 RESET instruction will generate a local reset, but cannot generate a VMEbus reset.
Jumper header pins 1 and 2 allow SYSRESET* to generate a local interrupt when active.

Jumper setting W6	Description
1-2	External Sysreset * generate Halt also that generate local interrupt
3-4	External Sysreset * can reset the local processor
5-6	The local Reset is send to the VMEbus

Table 3-2 Sysreset

3.2.3 Watchdog Selection

The board uses a Dallas DS1232 Power Monitor to monitor the value of VCC and to generate the local reset signal timing.
This circuit resets the board when the VCC voltage falls below 4.5V. The memory is deselected when the local system reset is low. This protects the memory against erroneous write when the supply voltages are out of tolerance.
The power monitor has a watchdog input that must be toggled at least once every 500 mS to avoid a reset. The connection on the jumper W01 determines which signal is connected to this input.

Jumper setting W01	Description
1-2	The watchdog input is connected to the 8MHz clock. The watchdog feature is totally disabled

Table 3-3 Watchdog Selection

3.2.4 VMEbus Requester Selection

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The jumper area W02 selects on which level the board is to work as requested. The board features a single level arbiter on level 3, so if this arbiter is to be used, the requester must be selected as level 3.

Table 3-4 Requester Level Configuration

Level -	Connections
Level 0	17-18, 1-2, 3-4, 6-8, 10-12, 14-16
Level 1	19-20, 2-4, 5-6, 7-8, 10-12, 14-16
Level 2	21-22, 2-4, 6-8, 9-10, 11-12, 14-16
Level 3	23-24, 2-4, 6-8, 10-12, 13-14, 15-16

3.2.5 VME Arbiter Selection

The board features a single level arbiter working on level 3. This arbiter is generally sufficient for a low complexity system. When no other arbiter is used, the ICC8 should be in slot 1 of the chassis. As in all VME applications, it is extremely important that the daisychain jumpers are configured properly on the VMEbus backplane since they are prime suspects for any problems on the bus.

The jumper area W04 allows optional use of the onboard arbiter.
If the arbiter is not used, there should be no connection.

Table 3-4

W04 jumpers	Description
1-2	Bus Grant generation
3-4	BERR* generation on time-out
5-6	SYSCLK generation

3.2.6 VME Interrupt Selection

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The jumper W05 allows the user to choose the level of VME interrupt the board will acknowledge. ***No two CPUs should be allowed to receive the same interrupt***. Table 3.3 shows the connections to be made.

Interrupt Level	Jumper Connection
1	13-14
2	11-12
3	9-10
4	7-8
5	5-6
6	3-4
7	1-2

Table 3-5 VMEbus Interrupt selection

3.2.7 Clock Selection

The jumper W08 is factory set on the board.

3.2.8 Battery Backup Enable

The board features a back-up mechanism that maintains the static RAM content when the board power supply is turned off. The backup may use power from the VMEbus +5V STANDBY line if this line is active. Otherwise, it may use power from the on board battery.

Removing the jumper Ww1 disconnects the battery and prevents discharge when not in use. It has no influence on the backup from +5V STANDBY.

3.2.9 EPROM Type Selection

The jumper W07 allows the selection of the type of EPROM used in sockets U28,34,43,52. Refer to table 3.4 for the meaning of the different connections.

Although not required, the use of CMOS EPROMs is suggested in order to keep the power consumption of the board as low as possible.

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Table 3.4: EPROM Type Selection

EPROM type	W07
2764,27128	3-5,4-6,8-10
27256	3-5,2-4,8-10
27512	1-3, 2-4, 8-10
1 Mbit	1-3, 2-4, 5-7, 8-10,.13-14
2 Mbit	1-3, 2-4, 5-7, 10-12,.13-14
4 Mbit	1-3,.2-4, 5-7,10-12,.11-13

3.2.10 Software Selection Jumpers

Two read-only bits of the Status register allows the user software to verify the presence of connections on this jumper area. When the connection is done, the corresponding bit in the Status register reads 0. This can be used to indicate a hardware configuration or a start-up option, for instance.

Table 3.5: Software Option Bits

Connection	Bit of the control register
W10	
1-2	6
3-4	5

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