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EXM-8

Serial Port Interface

Reference

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NOTES

1. Getting Started

This manual contains the information you will need to install and use the EXM-8 serial-port interface.

EXM-8 provides two RS-422/RS-485 serial ports. It is software compatible with similar PC bus products. The base address, interrupts, DMA channels, and handshake signals are configurable by software. The EXM-8 incorporates the Intel 82530 Serial Communications Controller.

The external connectors are two female DB-9 connectors. Each connector has a two-color LED on the front panel; green signifies receiving and red signifies transmitting.

1 1

Specifications

The following table defines the power and environmental specifications of the EXM-8.

Characteristic		Value
Temperature	operating	0 to 60°C ambient
	storage	-40 to 85°C
Humidity	operating	5% to 90% non condensing
	storage	5% to 95% non condensing
Altitude	operating	10,000 ft (3000 m)
	storage	50,000 ft (15,000 m)
Vibration	operating	0.015 inch (0.38 mm) Peak to Peak displacement with 2.5 g peak (max) acceleration over 5 to 2000 Hz
	storage	0.030 inch (0.76 mm) P-P displacement with 5.0 g peak (max) acceleration over 5-2000 Hz
Shock	operating	30 g, 11 ms duration, half-sine shock pulse
	storage	50 g, 11 ms duration, half-sine shock pulse
Power	maximum	5V @ 0.5A
	maximum	-12V @ 0.1A

Table 1. EXM-8 Environmental and Electrical Specifications.

2. Installation

2 2

Before installing the EXM-8, unpack and inspect it for shipping damage.

- **DO NOT REMOVE THE MODULE FROM ITS ANTI-STATIC BAG UNLESS YOU ARE IN A STATIC-FREE ENVIRONMENT. THE EXM-8, LIKE MOST OTHER ELECTRONIC DEVICES, IS SUSCEPTIBLE TO ESD DAMAGE. ESD DAMAGE IS NOT ALWAYS IMMEDIATELY OBVIOUS, IN THAT IT CAN CAUSE A PARTIAL BREAKDOWN IN SEMICONDUCTOR DEVICES THAT MIGHT NOT IMMEDIATELY RESULT IN A FAILURE.**

- **ENSURE THAT THE INSTALLATION PROCESS AS DESCRIBED HEREIN IS ALSO PERFORMED IN A STATIC-FREE ENVIRONMENT.**

Insertion in an EXM Carrier

Once the header pins are set, insertion of the EXM-8 into an EXM carrier is straightforward. Remove a blank EXM panel from the carrier (by unscrewing the thumbscrews) and insert the EXM-8 into the card guides. Firmly press the
EXM-8 front panel to ensure that the module is properly seated in the subplane and secure it with the thumbscrews. DO NOT OVERTIGHTEN.

- **MAKE SURE THAT POWER TO YOUR SYSTEM IS OFF. THIS EXM IS NOT DESIGNED TO BE INSERTED OR REMOVED FROM A LIVE SYSTEM.**

- **WHEN INSERTING THE EXM, AVOID TOUCHING THE CIRCUIT BOARD, AND MAKE SURE THE ENVIRONMENT IS STATIC-FREE.**

- **INSERT IT WITH ADEQUATE CONTINUOUS FORCE RATHER THAN TAPPING OR HAMMERING ON IT.**

2 2 Configuring the BIOS Setup

Once the EXM-8 is inserted into the carrier, turn the system on. The EXM configuration data in the EPC to which the EXM-8 is connected now must be modified to recognize and enable the card and select from the available options. Invoke the BIOS setup function from the command line by pressing the CTRL-ALT-ESC keys simultaneously.

Enabling the EXM module

Once in the setup program, a menu displays specifying which function keys are available for further configuration. Press the F2 function key to invoke the EXM menu. The screen display resembles the figure below.

```
          ID OB1 OB2
Slot 0    FF  00  00
     1    EC  01  00
     2    F7  51  5B
     3    DE  01  00
     4    7D  05  00
     5    DC  F5  00
```

Figure 1. EXM Setup Screen.

The EXM Setup Screen displays the EXM configuration data (in hexadecimal) stored in nonvolatile memory which the EPC uses at power-up to recognize and configure each installed EXM. An example of configuration data for the EXM-8 is shown in bold in slot 2. The displayed data shows SLOT, ID, OB1 and OB2. These are defined as follows:

SLOT — indicates the slot in which the EXM is installed. See the diagram below to determine which EXM slot the EXM-8 occupies. Note that dashed lines indicate EXM slots that may not be available on all systems.

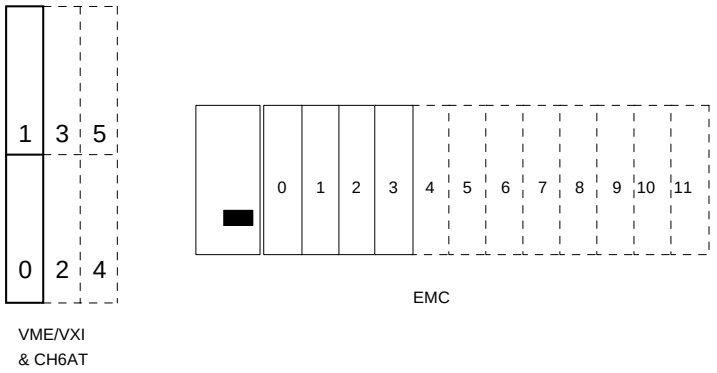


Figure 2. EXM Slot Numbering.

ID is a hard-wired ID value. Each EXM has a unique ID value.

OB1/OB2 are two bytes of option information.

All slots **not** occupied by an EXM module should show an ID of FF and OB1/OB2 of 00 00 indicating that no EXM is present.

To add or change an EXM configuration, use the cursor keys (arrows) to move between the fields on the screen. Move the cursor to the appropriate slot entry and type in the correct value.

The **ID** for the EXM-8 should be set to **F7**h.

OB1 should be set according to the following bit definitions:

Bit 7 Clock	Bits 6-4 Interrupt		Bit 3 Driver enable	Bits 2-1 I/O Base	Bit 0 EXM enable
0 4.9152 MHz	000	none	0 by RTS	238 0 0	0 disabled
1 3.6864 MHz	001	reserved	1 always	2B8 0 1	1 enabled
	010	IRQ2 (9)		338 1 0	
	011	IRQ3		3B8 1 1	
	100	IRQ4			
	101	IRQ5			
	110	IRQ6			
	111	IRQ7			

Table 2. OB1 Definition.

For instance, a typical OB1 value is **51**h (01010001), representing 4.9152 MHz, IRQ5, output drivers enabled by RTS, 238h I/O base, and EXM enabled.

OB2 should be set according to the following bit definitions:

Bits 7-6 Port B handshake	Bits 5-4 Port A handshake	Bits 3-2 Port B DMA	Bits 1-0 Port A DMA
00 HSKi⇒TxC	00 HSKi⇒TxC	0 0 Chan 0	0 0 Chan 0
01 HSKi⇒RxC TxC⇒HSKo	01 HSKi⇒RxC TxC⇒HSKo	0 1 Chan 1	0 1 Chan 1
10 HSKi⇒RxC DTR⇒HSKo	10 HSKi⇒RxC DTR⇒HSKo	1 0 none	1 0 Chan 2
11 HSKi⇒RxC RTS⇒HSKo	11 HSKi⇒RxC RTS⇒HSKo	1 1 Chan 3	1 1 none

Table 3. OB2 Bit Definitions.

A typical OB2 value is **5B** (01011011), representing clocks on both handshake signals and no DMA usage.

For compatibility with many PC bus cards, select the 4.9 MHz clock, IRQs 3-5, DMA channels 1 or 3, and the handshake encoded as 01.

3. Connectors

The EXM-8 has two standard female DB-9 connectors. The signals on both connectors are as shown below.

Pin	Signal		Direction
1	HSKo-	Handshake out -	output
2	HSKo+	Handshake out +	output
3	GND	Signal ground	
4	Tx+	Transmit data +	output
5	Tx-	Transmit data -	output
6	HSKi+	Handshake in +	input
7	HSKi-	Handshake in -	input
8	Rx+	Receive data +	input
9	Rx-	Receive data -	input

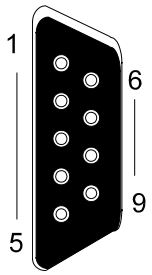


Table 4. DB-9 Connector Pin-out.

The handshake lines are under program control, as shown in the following table. The HSKo outputs can be the transmit clock, receive clock, DTR or RTS. The HSKi inputs can be the transmit clock, receive clock, and/or CTS.

Handshake setting notes	HSKo source	HSKi use
HSKi ⇒ TxC	none	T clock CTS
HSKi ⇒ RxC	T clock	R clock CTS
TxC ⇒ HSKo		
HSKi ⇒ RxC DTR ⇒ HSKo	DTR	R clock CTS
HSKi ⇒ RxC RTS ⇒ HSKo	RTS	R clock CTS

Table 5. Handshake Settings.



NOTES



4. Programming Interface

This chapter contains information needed to write custom software drivers for the EXM-8. The EXM-8 defines the following registers in the I/O space.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	I/O Port
1	1	1	1	0	1	1	1	100
Device ID Register								
CLK	Interrupt			DrEn	I/O Base		CDEN	102
Configuration Option Byte 1 Register								
B Handshake	A Handshake			B DMA channel		A DMA Channel		103
Configuration Option Byte 2 Register								
								xx0
Port A Data Register								
								xx1
Port A Command Register								
								xx2
Port B Data Register								
								xx3
Port B Command Register								

The I/O port denoted xx0 represents the selected I/O base address for the EXM-8, xx1 represents this address plus one, and so on.



The first three are standard EXM registers for device identification and configuration. The EXM-8 responds to accesses to these ports only if EXMbus line -EXMID is asserted. An 8-bit read from I/O address 100h returns the value F7, the device ID of the EXM-8. Read/write configuration registers appear at I/O addresses 102h and 103h. The bit encodings are defined in the previous chapter.

Clk selects the baud rate clock frequency for the SCC (serial communications controller) chip.

Interrupt selects the interrupt to be generated.

DrEn specifies whether the output drivers are enabled by RTS or whether they are enabled always.

I/O base selects where in I/O space the 4-byte I/O port area of the SCC appears.

CDEN specifies whether the EXM is disabled or enabled. If disabled, the EXM will not respond to any I/O or memory addresses and will not assert an interrupt output; it will only respond to reads from I/O port 100h and reads and writes from I/O ports 102h and 103h, and then only if EXMbus line -EXMID is asserted.

A handshake specifies the usage of the HSKi and HSKo lines on the DB-9 connector for port A. For setting 00, the SCC's TxC signal is driven from an external source and its RxC signal is driven by the internal baud rate clock oscillator. For all other settings, the SCC's RxC signal is driven from an external source and its TxC input is disabled. Note that the HSKi input always drives the CTS input of the SCC.

B handshake specifies the usage of the HSKi and HSKo lines on the DB-9 connector for port B (in the same manner as for port A).

A DMA channel specifies the DMA channel associated with data transfer through port A.

B DMA channel specifies the DMA channel associated with data transfer through port B.

For details on the remaining registers, refer to documentation on the Intel 82530 SCC or the Zilog 8530. Note that the Tx outputs are enabled only when the SCC's RTS output is asserted.

5. Support and Service

In North America

Technical Support

RadiSys maintains a technical support phone line at (503) 646-1800 that is staffed weekdays (except holidays) between 8 AM and 5 PM Pacific time. If you have a problem outside these hours, you can leave a message on voice-mail using the same phone number. You can also request help via electronic mail or by FAX addressed to RadiSys Technical Support. The RadiSys FAX number is (503) 646-1850. The RadiSys E-mail address on the Internet is *support@radisys.com*. If you are sending E-mail or a FAX, please include information on both the hardware and software being used and a detailed description of the problem, specifically how the problem can be reproduced. We will respond by E-mail, phone or FAX by the next business day.

Technical Support Services are designed for customers who have purchased their products from RadiSys or a sales representative. If your RadiSys product is part of a piece of OEM equipment, or was integrated by someone else as part of a system, support will be better provided by the OEM or system vendor that did the integration and understands the final product and environment.

Bulletin Board

RadiSys operates an electronic bulletin board (BBS) 24 hours per day to provide access to the latest drivers, software updates and other information. The bulletin

board is not monitored regularly, so if you need a fast response please use the telephone or FAX numbers listed above.

The BBS operates at up to 14400 baud. Connect using standard settings of eight data bits, no parity, and one stop bit (8, N, 1). The telephone number is (503) 646-8290.

Repair Services

Factory Repair Service is provided for all RadiSys products. Standard service for all RadiSys products covers factory repair with customers paying shipping to the factory and RadiSys paying for return shipment. Overnight return shipment is available at customer expense. Normal turn-around time for repair and re-certification is five working days.

Quick Exchange services (immediate shipment of a loaner unit while the failed product is being repaired) or other extra-cost services can be arranged, but need to be negotiated in advance to allow RadiSys to pool the correct product configurations. RadiSys does not maintain a general "loaner" pool: units are available only for customers that have negotiated this service in advance.

RadiSys does not provide a fixed-price "swap-out" repair service, as customers have indicated that issues of serial number tracking and version control make it more convenient to receive their original products back after repair.

Warranty Repairs

Products under warranty (see warranty information in the front of this manual) will have manufacturing defects repaired at no charge. Products sent in for warranty repair that have no faults will be subject to a recertification charge. Extended Warranties are available and can be purchased at a standard price for any product still under warranty. RadiSys will gladly quote prices for Extended Warranties on products whose warranties have lapsed; contact the factory if this applies.

Customer induced damage (resulting from misuse, abuse, or exceeding the product specifications) is not covered by the standard product warranty.

Non-Warranty Services

There are several classes of non-warranty service. These include repair of customer induced problems, repairs of failures for products outside the warranty period,

recertification (functional testing) of a product either in or out of warranty, and procurement of spare parts.



All non-warranty repairs are subject to service charges. RadiSys has determined that pricing repairs based on time and materials is more cost-effective for the customer than a flat-rate repair charge. When product is received, it will be analyzed and, if appropriate, a cost estimate will be communicated to the customer for authorization. After the customer authorizes the repair and billing arrangements have been made, the product will be repaired and returned to the customer.

A recertification service is provided for products either in or out of warranty. This service will verify correct operation of a product by inspection and testing of the product with standard manufacturing tests. There is a product-dependent charge for recertification.

There are only a few components that are generally considered field-repairable, but, because RadiSys understands that some customers want or need the option of repairing their own equipment, all components are available in a spares program. There is a minimum billing charge associated with this program.

Arranging Service

To schedule service for a product, please call RadiSys Technical Support directly at (503) 646-1800. Have the product model and serial numbers available, along with a description of the problem. A Technical Support representative will issue a Returned Materials Authorization (RMA) number, a code number by which we track the product while it is being processed. Once you have received the RMA number, follow the instructions of the Technical Support representative and return the product to us, freight prepaid, with the RMA number clearly marked on the exterior of the package. If possible re-use the original shipping containers and packaging. In any case, be sure you follow good ESD-control practices when handling the product, and ensure that anti-static bags and packing materials with adequate padding and shock-absorbing properties are used.

Ship the product, freight prepaid, to the following address:

Product Service Center
RadiSys Corporation
15025 SW Koll Parkway
Beaverton, Oregon 97006-6902



When shipping the product, include the following information: return address, contact names and phone numbers in purchasing and engineering, and a description of the suspected problem. Any ancillary information that might be helpful with the debugging process will be appreciated.

Other Countries

Contact the sales organization from which you purchased your RadiSys product for service and support.

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