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DM5952/DM6952
Power Relay Output Module
User's Manual

Hardware Revision 1.0



BDM-610010004
Rev. A

ISO9001 and AS9100 Certified

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DM5952/DM6952

POWER RELAY OUTPUT MODULE

User's Manual



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Chapter 1 INTRODUCTION

This User's Manual describes the operation and characteristics of the DM5952/DM6952 power relay boards.

Features

Some of the key features of the DM5952/DM6952 include:

- 16 power relay outputs
- 60 VA switching capability from DC to 230 VAC
- Operate and release time only 4 ms
- Max load 30 VDC / 2 A or 125 VAC / 0.5 A
- 500 VAC or DC isolation from PC
- RTD IDAN compatible
- XT (DM5952) and AT (DM6952) boards available
- +5V only operation
- Fully PC/104 compliant

The following paragraphs briefly describe the major features of the DM5952 and DM6952. A more detailed discussion is included in Chapter 3 (Hardware description), and in Chapter 4 (Board operation and programming). The board set-up is described in Chapter 1 (Board Settings).

Power relays

16 relay outputs may be used to directly drive loads which need high current such as solenoids, lamps or motors. Reliability relays lifetime reached 100 million operations. Short action time 4 ms operate and release ensure reliable high speed switching. Each relay has 3 contacts, Normally Open, Common and Normally closed. The contact arrangement is parallel connected DPCO.

Mechanical description

The DM5952 is designed on a PC/104 form factor. An easy mechanical interface to both PC/104 and EUROCARD systems can be achieved. Stack your PC/104 compatible computer directly on the DM5952 using the onboard mounting holes.

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Connector description

There are either two 50 pin interface connectors or two 25 position screw terminal blocks on the DM5952/DM6952 board. The connector style is indicated with following order codes:

DM6952-H Header connectors
DM6952-S Screw terminal blocks

What comes with your board

Your DM5952/DM6952 package contains the following items:

- DM5952/DM6952 Power relay module
- Software and diagnostics diskette with C source code
- User's manual

If any item is missing or damaged, please call Real Time Devices Scandinavia customer service department at the following number :(+358) 9 346 4538.

Board accessories

In addition to the items included in your DM5952 delivery, several software and hardware accessories are available. Contact your distributor for more information and for advice on selecting the most appropriate accessories to support your instrumentation system.

- Application software and drivers
- Hardware accessories

Real Time Devices can supply a complete set of accessories for your DM5952/DM6952 card. These include: Eurocard enclosures and power supplies, terminal boards (TB50), and other connection systems. The board is also available in the rugged IDAN enclosure system. Please consult the factory for more details or visit our websites at www.rtdscandinavia.fi or www.rtdusa.com.

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Using this manual

This manual is intended to help you install your new board and get it working quickly, while also providing enough detail about the board and it's functions so that you can enjoy maximum use of it's features even in the most demanding applications .

When you need help

This manual and all the example programs will provide you with enough information to fully utilize all the features on this board. If you have any problems with installation or use of the board, contact our Technical Support Department (+358) 9 346 4538 during European business hours. Alternatively, send a FAX to (+358) 9 346 4539, or Email to: sales@rtdscandinavia.fi. When sending a FAX or Email request please include the following information: Your company's name and address, your name, your telephone number, and a brief description of the problem.

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Chapter 2 BOARD SETTINGS

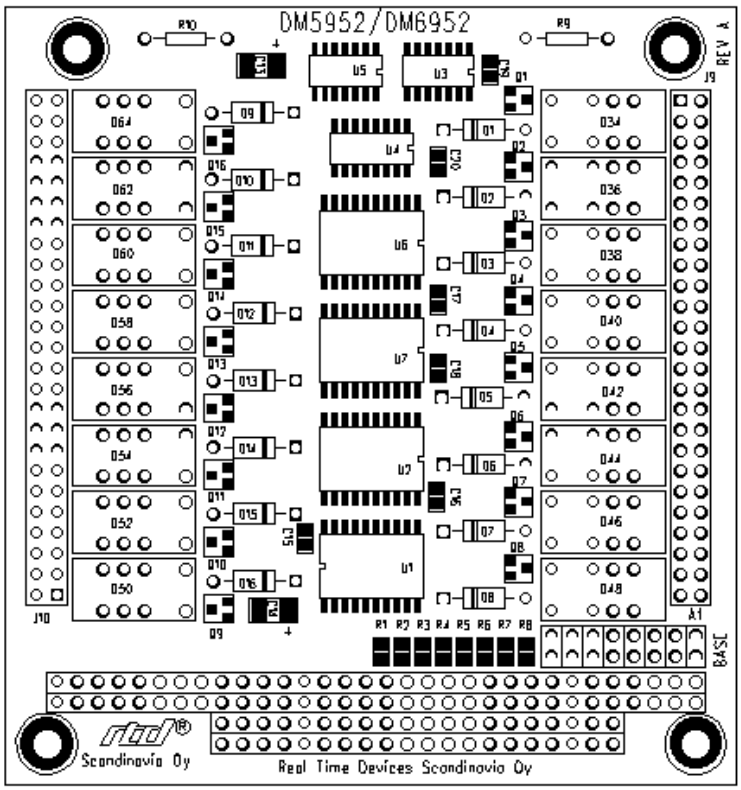
The DM5952/DM6952 Power Relay board has jumper settings which can be changed to suit your application. The factory settings are listed and shown in the diagram in the beginning of this chapter.

Factory-Configured Jumper Settings

Table 2-1 below illustrates the factory jumper setting for the DM5952/DM6952. It also shows the board layout of the DM5952/DM6952 and the locations of the jumpers. The following paragraphs explain how to change the factory jumper settings to suit your specific application.

Table 2-1: Factory jumper settings (see figure 2-1 below for detailed locations)

Jumper name	Jumper description	Number of Jumpers	Factory setting jumpers installed
Base address	Base address	8	300h



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Figure 2-1 - Board layout showing jumper locations (Figure shows DM6952 board)

Base address Jumpers (Factory setting :300h)

The most common cause of failure when you are first setting up your module is address contention Some of your computers I/O space is already occupied by other internal I/O devices and expansion boards. When the board attempts to use it's own reserved I/O addresses (which are being already used by another peripheral device), erratic performance may occur and the data read from the board may be corrupted.

To avoid this problem make sure you set up the base address first using the eight jumpers marked "BASE". It allows you to choose from 256 different I/O addresses in your computer I/O map. Should the factory installed setting of 300h be unusable for your system configuration, you may change this setting to another using the options illustrated in Table 2-2 (below). The table shows the switch settings and their corresponding values in hexadecimal values. Ensure that you verify the correct location of the base address jumpers. When the jumper is removed it corresponds to a logical "0", connecting the jumper to a "1". When you set the base address of the module, record the setting inside the back cover of this manual (directly after the Appendices).

BASE ADDRESS JUMPER SETTINGS FOR DM5952/DM6952 BOARDS

Base address Hex / (Decimal)	Jumper Settings 8 7 6 5 4 3 2 1	Base Address Hex / (Decimal)	Jumper settings 8 7 6 5 4 3 2 1
200 / (512)	0 0 0 0 0	300 / (768)	1 0 0 0 0
210 / (528)	0 0 0 0 1	310 / (784)	1 0 0 0 1
220 / (544)	0 0 0 1 0	320 / (800)	1 0 0 1 0
230 / (560)	0 0 0 1 1	330 / (816)	1 0 0 1 1
240 / (576)	0 0 1 0 0	340 / (832)	1 0 1 0 0
250 / (592)	0 0 1 0 1	350 / (848)	1 0 1 0 1
260 / (608)	0 0 1 1 0	360 / (864)	1 0 1 1 0
270 / (624)	0 0 1 1 1	370 / (880)	1 0 1 1 1
280 / (640)	0 1 0 0 0	380 / (896)	1 1 0 0 0
290 / (656)	0 1 0 0 1	390 / (912)	1 1 0 0 1
2A0 / (672)	0 1 0 1 0	3A0 / (928)	1 1 0 1 0
2B0 / (688)	0 1 0 1 1	3B0 / (944)	1 1 0 1 1
2C0 / (704)	0 1 1 0 0	3C0 / (960)	1 1 1 0 0
2D0 / (720)	0 1 1 0 1	3D0 / (976)	1 1 1 0 1
2E0 / (736)	0 1 1 1 0	3E0 / (922)	1 1 1 1 0
2F0 / (752)	0 1 1 1 1	3F0 / (1008)	1 1 1 1 1

1 = NOT JUMPERED, 0 = JUMPER INSTALLED

Table 2-2 : Base Address Jumper settings , factory default Base Address shaded

Note: In the table above only the MSB address decoder jumper settings are illustrated. You may also connect jumpers 1-3 to decode address lines A1-A3

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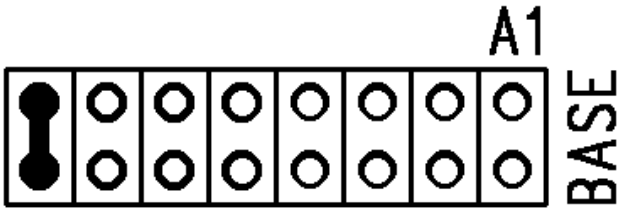


Figure 2-2 Base Address jumpers set for 300H.

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Chapter 3 INSTALLATION

The DM5952/DM6952 Power Relay board is very easy to connect to your industrial or automotive control system. Direct interface to PC/104 systems as well as EUROCARD boards is possible. This chapter gives step-by-step instructions on how to install the board into your system.

After completing the installation it is recommended that you use the diagnostic software "diag5952.exe" to fully verify that your board is working.

Board Installation

Keep your board in the antistatic bag until you are ready to install it to your system! When removing it from the bag, hold the board at the edges and do not touch the components or connectors. Please handle the board in an antistatic environment and use a **grounded** workbench for testing and handling of your hardware. Before installing the board in your computer, check the jumper settings .Chapter 1 reviews the factory settings and how to alter them. If any alterations are needed please refer to the appropriate instructions in this chapter. Do however note that incompatible settings can result in unpredictable board operation and erratic response.

General installation guidelines:

- Turn OFF the power to your computer
- Touch the grounded metal housing of your computer to discharge any antistatic build-up and then remove the board from its antistatic bag.
- Hold the board by the edges and install it in an enclosure or place it on the able on an antistatic surface.

Connect the board to the I/O devices using the twisted pair 50-pin flat cable or discrete wires.

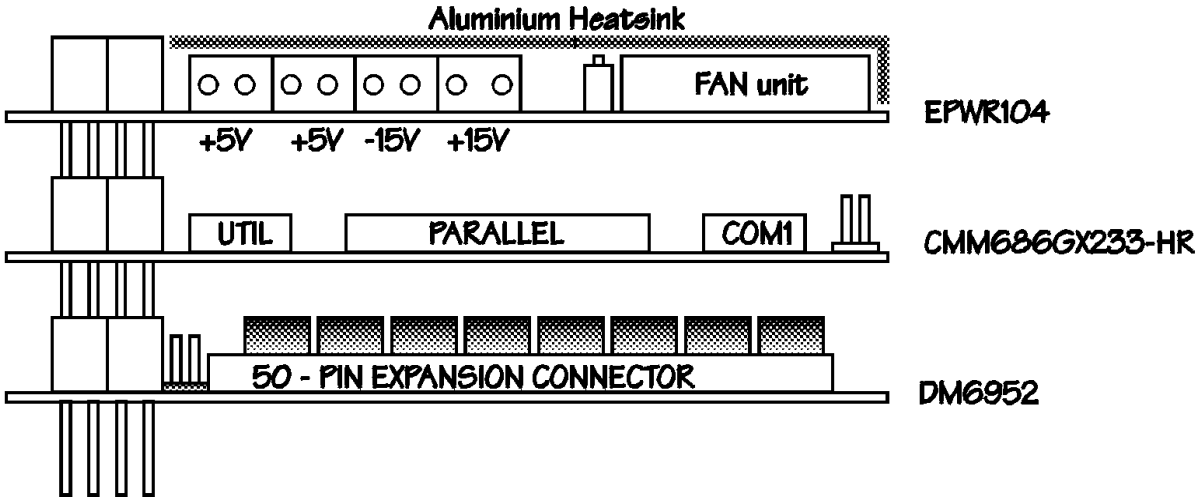


Fig. 3-1: DM6952 integrated in a PC/104 RTD cpuModule stack

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3U rack or enclosure installation with a EUROCARD CPU with one DM6952

The PC/104 system can easily be inserted into a 19" rack installation using the CPU as a "form factor adapter". Assemble your PC/104 data modules on a RTD single board EUROCARD computer and install the system in a 19" enclosure. Multiple DM6952 boards can be easily connected to this system. See figure 3-2 below.

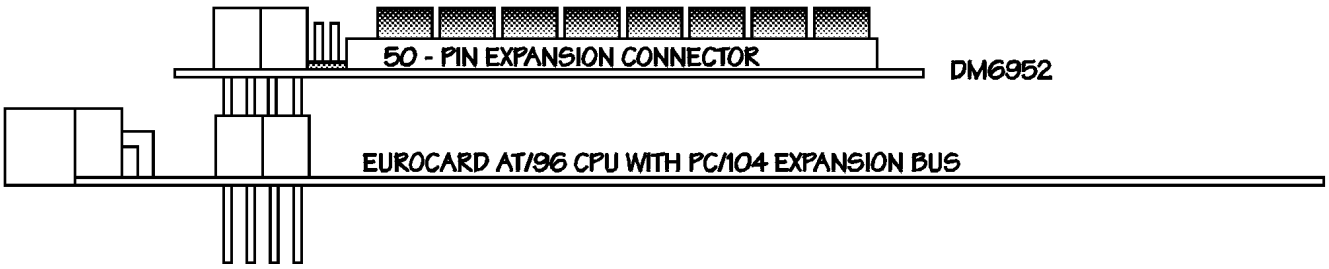


Fig 3-2: 19" Eurocard rack installation with an integrated PC/104 dataModule and EUROCARD cpuModule computer system

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External I/O Connections

Table 3-1 below shows the **output** connection pinouts

J9 (right side, top view, pin#1 away from bus)

Connection	Pin	Pin	Connection
0 NO	1	2	**0 NO**
0 C	3	4	**0 C**
0 NC	5	6	**0 NC**
1 NO	7	8	**1 NO**
1 C	9	10	**1 C**
1 NC	11	12	**1 NC**
2 NO	13	14	**2 NO**
2 C	15	16	**2 C**
2 NC	17	18	**2 NC**
3 NO	19	20	**3 NO**
3 C	21	22	**3 C**
3 NC	23	24	**3 NC**
4 NO	25	26	**4 NO**
4 C	27	28	**4 C**
4 NC	29	30	**4 NC**
5 NO	31	32	**5 NO**
5 C	33	34	**5 C**
5 NC	35	36	**5 NC**
6 NO	37	38	**6 NO**
6 C	39	40	**6 C**
6 NC	41	42	**6 NC**
7 NO	43	44	**7 NO**
7 C	45	46	**7 C**
7 NC	47	48	**7 NC**
Not used	49	50	Not used

J10 (left side, top view, pin#1 toward bus)

Connection	Pin	Pin	Connection
8 NO	1	2	**8 NO**
8 C	3	4	**8 C**
8 NC	5	6	**8 NC**
9 NO	7	8	**9 NO**
9 C	9	10	**9 C**
9 NC	11	12	**9 NC**
10 NO	13	14	**10 NO**
10 C	15	16	**10 C**
10 NC	17	18	**10 NC**
11 NO	19	20	**11 NO**
11 C	21	22	**11 C**
11 NC	23	24	**11 NC**
12 NO	25	26	**12 NO**
12 C	27	28	**12 C**
12 NC	29	30	**12 NC**
13 NO	31	32	**13 NO**
13 C	33	34	**13 C**
13 NC	35	36	**13 NC**
14 NO	37	38	**14 NO**
14 C	39	40	**14 C**
14 NC	41	42	**14 NC**
15 NO	43	44	**15 NO**
15 C	45	46	**15 C**
15 NC	47	48	**15 NC**
Not used	49	50	Not used

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Signal	*Definition*
NO	Normally open contact; when power is off or a 0 bit is written to the relay control register this contact is not connected. When power is on and a 1 bit is written to the relay control register this signal is connected to the C (common) contact.
C	Relay common contact; this contact is always used with relay output connections.
NC	Normally connected contact; when power is off or a 0 bit is written to the relay control register this contact is connected to the C (commmon) contact. When power is on and a 1 bit is written to the relay control register this contact is not connected.

Note: When using header connector such as on the DM5952-H board all the pins are used, but on DM5952-S boards the even pins are used since the connector is a single row screw terminal with 25 contacts on each side.

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Chapter 4 - HARDWARE DESCRIPTION

This chapter describes in detail detail the features of the DM5952/DM6952 board

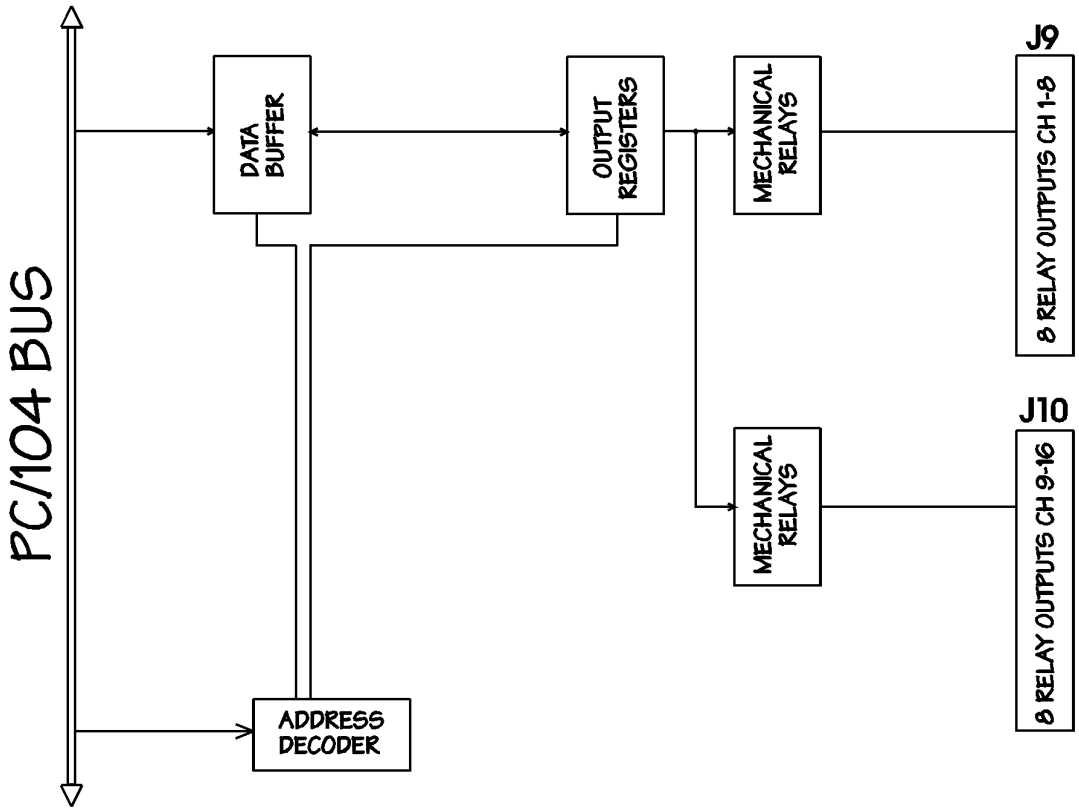


Fig 4-1: DM5952/DM6952 Block Diagram

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Relay outputs

The DM5952/6952 features 16 onboard miniature relays designed to switch up to 2A of current. These devices may be connected either with Normally open or Normally closed poles. Both options are available on the expansion connectors. Directly wire your I/O signals to your board onto the screw terminal connectors of the DM6952-S module or use flat ribbon cables to interface to your DM6952-H module. Figure 4-1 below illustrates the connection of the relays used on your DM6952. Also please refer to the wiring table in the previous chapter when making connections. More information about the relays used you will find at the adress: **http://www.mac-europe.com/downloads/relay_pdf/TXE.PDF**.

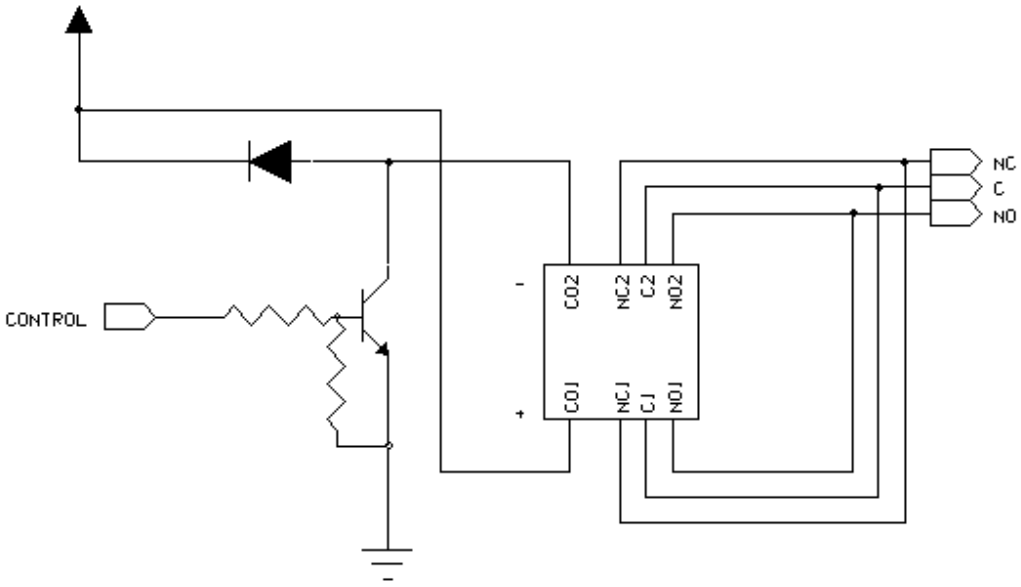


Fig 4-2: This diagram illustrates the output relay connection

Resets

On circuitry only enables one reset that clears the outputs. This is the first reser occurring at power-up. The state of the relay outputs does not change even though a system software or hardware reset (WDT) may occur. Only a software write to the output register will update state of the relay outputs.

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Fuses

The DM5952/DM6952 Power relay board is protected against over loading or error conditions in the relay coils with two fuses. These fuses protect a group of 8 relays. The fuses are located to the top of your board (away from the bus connector). The fuse type is 2A quick blow.

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Chapter 5 - BOARD OPERATION AND PROGRAMMING

This chapter shows you how to program and use your DM5952/DM6952: It provides a complete description of the I/O-map plus a detailed discussion of programming operations to aid you in programming.

Defining the I/O Map

The I/O map of the DM5952/DM6952 is shown in Table 5-1 below. As shown ,the module occupies two addresses. The Base Address (designated as BA) can be set using the jumpers as described in Chapter 2 (Board settings). The following sections describe the register contents of each address used in the I/O map.

Table 5-1: DM5952/DM6952 I/O Map

Register Description	Write Function	Address in HEX
Low Byte (ch. 1-8)	Relay outputs 1-8	BA+0
High Byte (ch. 9-16)	Relay outputs 9-16	BA+1

BA = Base Address

BA+0 Digital Outputs

The Data Output register controls the output relays 1-8. Data is transferred from the Data register to the outputs by performing an 8-bit write to **BA+0**. Direct transfer of data to the output latch for all 16 bits can be performed by executing a 16-bit write to BA+0. The address decoder of the DM5952 will automatically write consecutive addresses BA+0 and BA+1with the correct output data bytes.

BA+1 Digital Outputs

This Data Output register controls the output relays 9-16. Data is transferred from the Data register to the outputs by performing an 8-bit write to **BA+1**.

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Programming the DM5952/DM6952

This section gives you some general information about programming the DM5952 board. It then walks you through the major programming functions of the DM5952. This will help you use the example program that is included with the board. All of the program descriptions use decimal values unless otherwise specified.

The DM5952 is programmed by writing to the correct I/O-port addresses of the board. These I/O ports were described in the previous section 1 of this chapter. The following example shows how to perform a 8-bit write I/O port addresses using "C"-syntax and assembly code:

	Write:
"C"-syntax	**outp**(address,data);
Assembly	**mov** dx,address **mov** ax,data **out** dx,ax

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Clearing and setting bits in an I/O port

When you clear or set bits in an I/O port you must be careful not to alter the status of other bits. You can preserve the status of all the bits you do not wish to change by proper use of the bitwise AND- and OR- operators. Using and /or operators, single or multiple bits can easily be set or cleared in one line operations.

1. *To clear a single bit in a port*, AND the current value of the port with the value "B", where B = 255-2(exp) bit.

2. *To set a single bit in a port*, OR the current value of the port with the value "B", where B = 2(exp) bit.

Bits are numbered from 0-7 for the low byte of a word and from 8-15 for the high byte of a word. Setting and clearing of multiple bits in a bye or word is more complex.

3. *To clear multiple bits in a port*, AND the current value of the port with the value "B", where B = 255 - (the sum of the values of the bits to be cleared). Note that the bits do not have to be consecutive.

4. *To set multiple bits in a port*, OR the current value of the port with the value "B", where B = (sum of the individual bits to be set).

Output Programming

The relay outputs are controlled with a register structure. These outputs can be commanded in the following ways (examples in "C" syntax):

1. *Software controlled byte write*

outp(BA,***low_byte***);
outp(BA,***high_byte***);

2. *Software controlled direct word write*

outpw(BA,***word***);

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Chapter 6 - DM5952/DM6952 SPECIFICATIONS

Host Interface

Jumper selectable base address, I/O mapped

Relay Outputs

Number of lines	16 relays
Breakdown voltage	1000 V Rms
Max switching power (resistive load)	60 W
(motor load)	30 W
Max switching voltage	230 V DC
Max switching current	2 A
Nominal switching capacity	2 A , 30 V DC
Contact resistance	100 mOhms max

Connectors

Outputs	50 pin header connector or screw terminal blocks
Bus connector	PC/104 XT or AT-bus

Power requirements

Supply voltage	+5V +/- 8%
	Supply current TBD

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Operating temperature range

Standard	-0 to +70 C
Extended	-40 to +85 C

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Chapter 7 RETURN POLICY AND WARRANTY

Return Policy

If you wish to return a product to the factory for service, please follow this procedure:

Read the Limited Warranty to familiarize yourself with our warranty policy.

Contact the factory for a Return Merchandise Authorization (RMA) number.

Please have the following available:

- Complete board name
- Board serial number
- A detailed description of the board's behavior

List the name of a contact person, familiar with technical details of the problem or situation, **along with their phone and fax numbers, address, and e-mail address** (if available).

List your shipping address!!

Indicate the shipping method you would like used to return the product to you.
We will not ship by next-day service without your pre-approval.

Carefully package the product, using proper anti-static packaging.

Write the RMA number in large (1") letters on the outside of the package.

Return the package to:

RTD Embedded Technologies, Inc.
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State College PA 16803-0906
USA

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Chapter 8 LIMITED WARRANTY

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, INC. This warranty is limited to the original purchaser of product and is not transferable.

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