Powerful Sensing Solutions For a Better Life

CRM500GA Series
OPERATORS MANUAL

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Revision History

Revision	Date	Author	Comments
-01_A	12/17/04	DJ	Initial Release
-01_B	12/22/04	DIP	Corrected wiring diagram pin-out.
-02_A	2/3/05	GB	Updated address, wiring diagram and MagAlign.
-03_A	8/05	GB/DIP	Updated MagAlign.
-03_B	1/09	MPS	Package contents updated. Install drawing updated to reflect additional mounting holes.
-03_C	11/09	PAL	Added AHRS500GA-32x to list of model #'s compatible w/ CRM500 per ECO 1312
-04_A	12/20	AP	Updated w/ MEMSIC logo and address per ECO 1886

Table of Contents

1 About this Manual

The following annotations have been used to provide additional information.

1.1 Notation

The designation CRM500GA-[] denotes the family of CRM500GA products and the topic is common to all models identified by dash number. Instances where the dash number is called out, i.e., CRM500GA-200, indicates a topic that pertains only to the particular model of the CRM500GA called out by the dash number.

NOTE

Note provides additional information about the topic.

☑ EXAMPLE

Examples are given throughout the manual to help the reader understand the terminology.

IMPORTANT

This symbol defines items that have significant meaning to the user

WARNING

The user should pay particular attention to this symbol. It means there is a chance that physical harm could happen to either the person or the equipment.

2 Introduction

2.1 AHRS500GA-[] Model compatibility

Please refer to section 6.1 Model Compatibility, for specific compatibility of the AHRS500GA-[] family and the CRM500GA-[] family.

2.2 The CRM500GA-[] Series Remote Magnetometer Units

This manual explains the use of the CRM500GA-[] Series of products, three-axis remote magnetometer measurement system designed to measure earth's magnetic field in a dynamic environment.

The 3-axis magnetometer CRM500GA-[] is used by the AHRS500GA-[] product to make a true measurement of magnetic heading.

MEMSIC CRM500GA-[] units employ onboard digital processing to compensate for deterministic error sources within the unit and to compute magnetometer information. The CRM500GA-[] units accomplish these tasks with an analog to digital converter and a high performance Digital Signal Processor.

The CRM500GA-[] uses three state-of-the-art miniature fluxgate sensors. Fluxgate sensors make the CRM500GA-[] sensitive and responsive, with better temperature performance than other technologies such as magneto-resistive sensors. The CRM500GA-[] also includes three accelerometers designed to aid initial installation and alignment of the CRM500GA-[].

3 Package Contents

In addition to the CRM500GA-[] sensor product and the CRM500GA-[] User Manual you should have:

- **1 CD with AHRS500 and CRM500 Installation MagAlign Software**

  AHRS500 and CRM500 Installation MagAlign software will allow you to align the magnetometers on the CRM500GA-[] on a PC running Microsoft® Windows™. You can also download this software from MEMSIC's web site at http://www.xbow.com.
- **CRM500GA-[] Installation Drawing** (also included in Appendix section 9.1 of this manual)
- **CRM500GA-[] Installation Wiring Diagram** (also included in Appendix section 9.2 of this manual)
- **1 CRM500GA-[] Series Installation Manual**

  This contains installation instructions for the CRM500GA-[].
- **1 Mating connector and backshell**

  The mating connector and backshell is to be used to interconnect to the CRM500GA-[].
- **1 set of Mounting Hardware**

  Size #6 non-magnetic screws, nuts and washers are provided for installation of the CRM500GA-[].

4 CRM500GA-[] Description

4.1 CRM500GA-[] Coordinate System

The CRM500GA-[] uses the following coordinate system. With the connector facing you, and the mounting plate down, the axes are defined as:

X-axis – from face with connector through the CRM500GA

Y-axis – along the face with connector from left to right

Z-axis – along the face with the connector from top to bottom

This is the default configuration for the generic CRM500GA-[] model.

4.2 Connections

The CRM500GA-[] has a D38999/24FA35SN mating connector. The signals are as shown in Table 1.

Table 1 Connector Pin Assignments

Pin	Signal	Electrical Specifications
1	DC Power In	Aircraft power per DO160D, section 16, "B".
2	DC Power Return and RS422 Reference	
3	RS422TX+	
4	RS422TX-	
5	No connection	Do not connect
6	No connection	Do not connect

4.2.1 I/O Cable

The user must provide a shielded cable with the shield connected to the I/O connector shell in order to provide the required EMI protection.

4.2.2 Power Input and Power Input Ground

The CRM500GA-[] power requirements are designed to operate with either a nominal 14VDC or 28VDC aircraft power system and meets all DO-160D, part 16, category B requirements.

4.2.3 Case Ground

The case is electrically connected to the I/O connector shell. The shell should be electrically connected to the user's cable shield. The case is isolated from the Power Input Ground, and should be bolted to a good conducting surface that is grounded.

4.2.4 Serial Data Interface

The CRM500GA-[] serial interface is standard RS-422, 38400 baud, 8 data bits, 1 start bit, 1 stop bit, no parity, and no flow control, and will output at 50 Hz. This needs to be directly interfaced to the AHRS500GA-[].

4.2.5 No Connection

During normal operation of the CRM500GA-[], no connection is made to pins 5 and 6.

4.3 Measurements

The CRM500GA-[] Series is designed to operate with a MEMSIC model AHRS500GA-[] Attitude and Heading Reference System.

4.3.1 Sensor Measurements

The analog magnetometer and accelerometer sensors are sampled, converted to digital data, corrected for misalignment, and scaled to engineering units. The accelerometers are temperature compensated. The digital data represents the actual value of the quantities measured. A calibration table for each sensor is stored in the CRM500GA-[] non-volatile memory. The data is sent as signed 16-bit 2's complement integers.

4.4 Commands

The CRM500GA-[] does not have a command structure. The serial interface is provided with serial port settings of 8 data bits, 1 start bit, 1 stop bit, no parity, and no flow control.

4.5 Data Packet Format

In general, the digital data representing each measurement is sent as a 16-bit number (two bytes). The data is sent MSB first then LSB.

Byte #	Description	Description
0	Header (0xAA)	Synchronization bytes
1	Header (0x55)	
2	X-axis Acceleration (MSB)	X Accel (G) = X Accel (int)*2/32767
3	X-axis Acceleration (LSB)	
4	Y-axis Acceleration (MSB)	Y Accel (G) = Y Accel (int)*2/32767
5	Y-axis Acceleration (LSB)	
6	Z-axis Acceleration (MSB)	Z Accel (G) = Z Accel (int)*2/32767
7	Z-axis Acceleration (LSB)	
8	X-axis Magnetometer (MSB)	X Mag (Gauss) = X Mag (int)/32767
9	X-axis Magnetometer (LSB)	
10	Y-axis Magnetometer (MSB)	Y Mag (Gauss) = Y Mag (int)/32767
11	Y-axis Magnetometer (LSB)	
12	Z-axis Magnetometer (MSB)	Z Mag (Gauss) = Z Mag (int)/32767
13	Z-axis Magnetometer (LSB)	
14	Model Number (MSB)	Model Identifier (Revolving bytes decode model type, unit serial number, and sensor calibration parameters)
15	Model Number (LSB)	
16	BIT (MSB)	
17	BIT (LSB)	
18	Checksum (MSB)	
19	Checksum (LSB)	

4.6 Timing

The CRM500GA-[] data output rate is set to a constant value.

4.7 Magnetic Heading

Magnetic north is the direction toward the magnetic north pole; true north is the direction towards the true North Pole.

The CRM500GA-[] magnetometer output is referenced to magnetic north. The direction of true north will vary from magnetic north depending on your position on the earth.

5 CRM500GA-[] Operation

5.1 Normal Operation

The CRM500GA-[] is configured to output data continuously when power is applied. The CRM500GA-[] does not recognize any input serial commands. A magnetic alignment process must be completed before use of the CRM500GA-[]. See the CRM500GA-[] Installation Manual for specific instructions. The CRM500GA-[] requires a 90 second initialization period after power is applied before the output data is valid.

5.2 Alignment Operation

The AHRS500GA-[] can be commanded to perform a hard/soft iron alignment for the CRM500GA-[] magnetometers using the procedure in the CRM500GA-[] Installation Manual. Data supplied during normal operation will not be available and the data output should not be used for flight purposes.

6 Limitations

6.1 Model Compatibility

The CRM500GA-[] can be used in conjunction with the following AHRS500 model number and part numbers.

AHRS500GA-220	p/n 8350-0260-03 or higher dash number
AHRS500GA-221	p/n 8350-0261-03 or higher dash number
AHRS500GA-222	p/n 8350-0262-03 or higher dash number
	p/n 8360-0262-03 or higher dash number
AHRS500GA-223	p/n 8350-0263-03 or higher dash number
	p/n 8360-0263-04 or higher dash number
AHRS500GA-224	p/n 8350-0264-03 or higher dash number
AHRS500GA-225	p/n 8350-0265-03 or higher dash number
AHRS500GA-226	p/n 8350-0266-03 or higher dash number
AHRS500GA-227	p/n 8350-0267-03 or higher dash number
AHRS500CA-220	p/n 8350-0250-03 or higher dash number
AHRS500CA-222	p/n 8350-0252-03 or higher dash number
	p/n 8360-0252-03 or higher dash number
AHRS500CA-224	p/n 8350-0254-03 or higher dash number
AHRS500GA-320	p/n 8350-0270-01 or higher dash number
AHRS500GA-321	p/n 8350-0271-01 or higher dash number
AHRS500GA-322	p/n 8350-0272-01 or higher dash number
AHRS500GA-323	p/n 8350-0273-01 or higher dash number
AHRS500GA-324	p/n 8350-0274-01 or higher dash number
AHRS500GA-325	p/n 8350-0275-01 or higher dash number
AHRS500GA-326	p/n 8350-0276-01 or higher dash number
AHRS500GA-327	p/n 8350-0277-01 or higher dash number

Updates are available from MEMSIC, Inc.

6.2 Installation

The CRM500GA-[] must be mounted in accordance with the procedures outlined in the CRM500GA-[] Installation Manual. The CRM500GA-[] must be mounted in a location with limited magnetic material near the unit. Refer to the installation manual for detailed instructions.

6.3 Alignment

The CRM500GA-[] must successfully complete a hard iron alignment to reach full accuracy. Refer to the CRM500GA-[] installation manual for detailed instructions.

6.4 Operation in Magnetic Environment

Introduction of large ferrous or magnetic material objects close to the CRM500GA-[], after alignment, will affect the heading performance. Maintain at least 24 inches of distance between moving ferrous metal or magnetic material and the CRM500GA-[].

6.5 Range Limitations

The CRM500GA-[], like all magnetometer and magnetic compass-based systems, will not perform properly at the magnetic North and South Poles.

The CRM500GA-[] will not operate properly in low magnetic fields encountered during space flight.

7 CRM500GA-[] Installation

Refer to the CRM500GA-[] Installation Manual (Doc# 7410-0140-03) for detailed mounting instructions for the CRM500GA-[].

8 Warranty and Support Information

8.1 Customer Service

As a MEMSIC customer you have access to product support services, which include:

- Single-point return service
- Web-based support service
- Same day troubleshooting assistance
- Worldwide MEMSIC representation
- Onsite and factory training available
- Preventative maintenance and repair programs
- Installation assistance available

8.2 Contact Directory

United States:	Phone:	1-408-964-9700 (8 AM to 5 PM PST)
	Fax:	1-408-854-7702 (24 hours)
	Email:	techsupportca@memsic.com
Non-U.S.:	Refer to website	www.memsic.com

8.3 Return Procedure

8.3.1 Authorization

Before returning any equipment, please contact MEMSIC to obtain a Returned Material Authorization number (RMA).

Be ready to provide the following information when requesting an RMA:

- Name
- Address
- Telephone, Fax, Email
- Equipment Model Number
- Equipment Serial Number
- Installation Date
- Failure Date
- Fault Description
- Will it connect to GyroView?

8.3.2 Identification and Protection

If the equipment is to be shipped to MEMSIC for service or repair, please attach a tag TO THE EQUIPMENT, as well as the shipping container(s), identifying the owner. Also indicate the service or repair required, the problems encountered, and any other information considered valuable to the service facility such as the list of information provided to request the RMA number.

Place the equipment in the original shipping container(s), making sure there is adequate packing around all sides of the equipment. If the original shipping containers were discarded, use heavy boxes with adequate padding and protection.

8.3.3 Sealing the Container

Seal the shipping container(s) with heavy tape or metal bands strong enough to handle the weight of the equipment and the container.

8.3.4 Marking

Please write the words, "***FRAGILE, DELICATE INSTRUMENT***" in several places on the outside of the shipping container(s). In all correspondence, please refer to the equipment by the model number, the serial number, and the RMA number.

8.3.5 Return Shipping Address

Use the following address for all returned products:

MEMSIC, Inc.
1759 McCarthy Blvd.
Milpitas, CA 95035
Attn: RMA Number (XXXXXX)

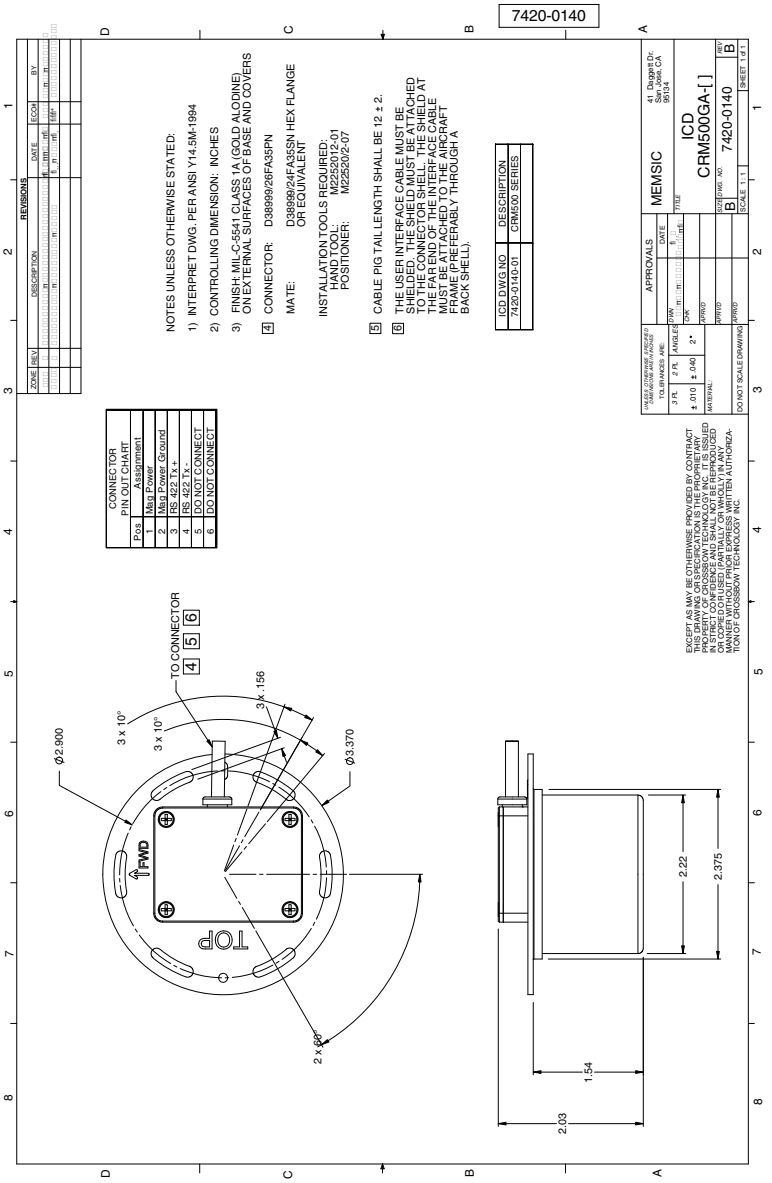
8.4 Warranty

The MEMSIC product warranty is one year from date of shipment.

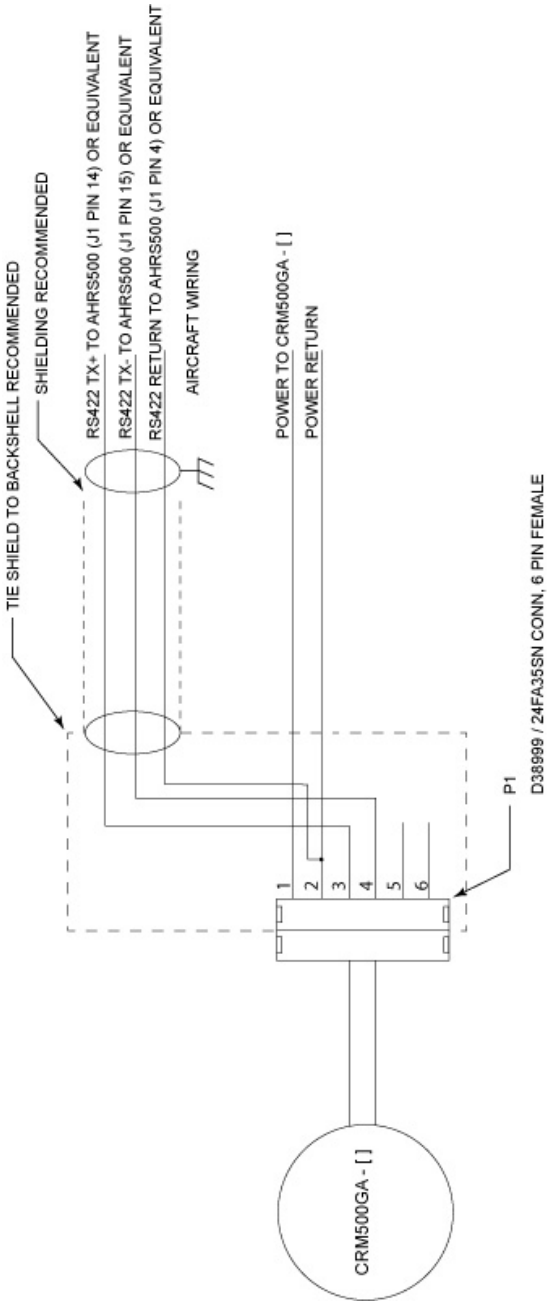
9 Appendix A. Mechanical and Installation Specifications

Refer to the CRM500GA-[] Installation drawing, 7420-0140-01, below for the mechanical specifications. Refer to the CRM500GA-[] installation wiring diagram for electrical connections.

9.1 Installation Drawing



9.2 Installation Wiring Diagram



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