APPENDIX G

USER MANUAL

Device Product Group

MCR500 User Manual

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Document History

Revision	Revision Date	Description	Author
0.1	12 Jan 2004	Initial Draft	M Hanssen
1.0	8 Mar 2004	Released	M Hanssen
1.1	28 Feb 2005	Updated with details of short variant MCR500	Dan Zorde
2.0	4 Mar 2005	Released for FCC	Dan Zorde

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FCC Compliance Statement

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encourage to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning: Any changes or modifications not expressively approved by ERG Transit Systems could void the user's authority to operate this equipment

1 Introduction

1.1 Purpose

The purpose of this document is to provide summary technical details of the electrical interface and physical characteristic of the Multiprotocol Card Reader (MCR500) and its shorter variant. It is intended for use by third party developers wanting to integrate the MCR500 Module into new or existing products.

1.2 Scope

This manual is intended for use by third party developers and integrators familiar with similar type of equipment. This manual contains technical information sufficient to give technical personnel an operational understanding of the MCR500 and its variant.

1.3 Terminology

Figure 1: Terminology

Term	Definition
A	Amp(s), Ampere(s)
ASK	Amplitude Shift Keying
bps	Bits per second
BPSK	Binary Phased Shift Keying
CMOS	Complementary Metal-Oxide Semiconductor
CSC	Contact-less Smart Card
DUT	Device Under Test
EEPROM	Electrically Eraseable ROM
EMC	Electromagnetic Compatibility
EPLD	Eraseable, Programmable Logic Device
GND	Ground – negative supply
Host	A processing unit. (iPaq)
Hz	Hertz, cycles per second
IEC	International Electrotechnical Commission
ISO	International Standards Organisation
JTAG	Joint Test Action Group
MCR	Multi protocol Contactless Reader
mm	millimetre(s)
NRZ-L	Non-return to zero - level
OOK	On-Off keying
PCB	Printed Circuit Board
RAM	Random Access Memory
s	second(s)
SAM	Security Access Module

2 MCR500 Technical Specifications

Form Factor

- PCMCIA Type II PC Card Extended.
- Card and Socket Services 2.1 compliant

Contactless Card

- Contact less cards as per ISO 14443 type A & type B
- 8bit Parallel access to controller.

Security Access Modules

- 2 x ID-000 SAM sockets provided.
- 8Bit Parallel access to controller.

Power Consumption

- <500mA worst case. (Datasheet Calculations, 5V SAMs)
- <160mA @ 3.3V (Card transaction with 2 SAMs)
- <50mA when in standby mode (Both chips in standby mode).
- <15mA when in sleep mode

Temperature Range

- Operating temperature range 0º to +70ºC.
- Storage temperature range -20º to +80ºC.

Weight & Dimmensions

- 40g
- 121.6 x 53.9 x 5.0mm (± 0.3)

Humidity

- 5% to 95% Relative Humidity (non- condensing).

Ingress Protection

- IP52.

EMC Compliance

- US – FCC Part 15
- Europe - CE R&TTE
- Australia C Tick

Operating System

- Windows CE 2003 (Driver available)
- Extendable to other PC operating systems.

3 Electrical specification

3.1 Host PCMCIA interface

Item	Description
MCR to Host communication interface	PCMCIA Type II PC Card Extended. Card and Socket Services 2.1 compliant

3.2 Power Supply

The MCR500 PC Card module derives power directly from the host.

Item	Description
Supply voltage	3.3Vdc ±0.1V with ripple of less than 100mV peak-peak.
Supply current	Maximum 500 mA, typical 150 mA
Input power requirements	Maximum 1.65 Watts, typical 0.5 Watts

3.3 RF controller

The standards supported by the RF controller are ISO/IEC 14443 Type A, ISO/IEC 14443 Type B and Mifare Standard.

3.3.1 Transmitter

The MCR500 transmitter complies with the following specifications:

Item	Description
Carrier Frequency	13.56 MHz $\pm$ 7 kHz (ISO/IEC 14443-2:2001, 6.1)
Modulation Rise and Fall Time	< 2.0 μsec (ISO/IEC 14443-2:2001, 8.1.2 and 9.1.2)
ASK Modulation	100% Modified Miller (ISO/IEC 14443-2:2001, 7 and 8) 8%-14% NRZ (ISO/IEC 14443-2:2001, 7 and 9)

3.3.2 Receiver

The MCR500 receiver complies with the following specifications:

Item	Description
Carrier Frequency	13.56 MHz
Subcarrier Frequency	847.5 kHz (ISO/IEC 14443-2:2001, 7, 8 and 9)
Subcarrier Data	OOK Manchester (ISO/IEC 14443-3:2001 7 and 8) BPSK NRZ-L (ISO/IEC 14443-2:2001, 7 and 9)

4 Recommended Hardware

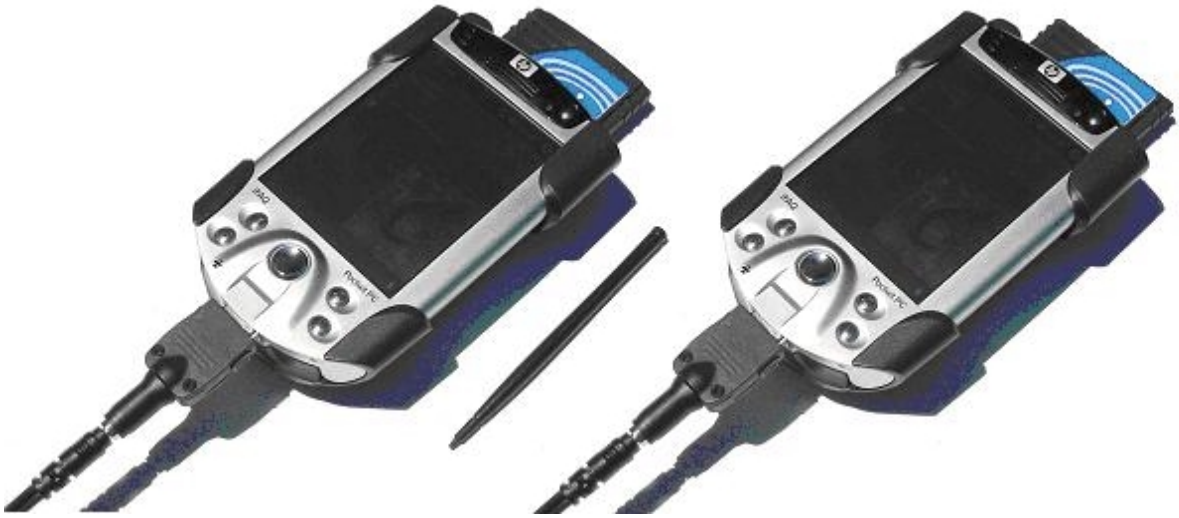

Figure 2: iPAQ with MCR500 and MCR500 Short Variant Photos

Ref	Item / Order No	Description	Qty	Source / Manufacturer	Purpose
1.	H5550/ FA107A	IPAQ Pocket PC H5550	1	Hewlett-Packard	Processing Unit, Interface for transactions
2.	249704-B22 FA120A#AC3	PC Card Expansion Pack	1	Hewlett-Packard	PC Slot for IPAQ, external battery
3.	MCR500 / 11081	Multipurpose Card Reader	1	ERG	Card reader
4.	MCR500 / 18252	Multipurpose Card Reader	1	ERG	Card reader with shorter antenna

Table 1: Recommended Hardware

5 Software and iPAQ Configuration

The following describes how the iPAQ software should be configured for correct operation. This assumes that an application based on ERG example source files has been created called MCR500APP.EXE.

5.1 Test Software

Ref	Description	Ver	Source	Purpose
1.	MCR500.DLL	1.0.0.6	ERG	MCR500 PCMCIA Driver
2.	MCR500APP.EXE	1.0	ERG	MCR500 Application Software
3.	MFCCE300D.DLL	6.0.99.0	MS	MFC DLL
4.	CIS.BIN	00.15	ERG	MCR500 EEPROM Code (CIS)

Figure 3: Software

5.2 iPAQ Software installation

Install Microsoft ActiveSync on the PC following the instructions which came with the iPAQ. After successful installation place the iPAQ into its cradle and wait for ActiveSync to connect. Then launch the ActiveSync Explorer from the PC's System Tray and copy the following files from the DAMS release floppy onto the iPAQ:

A:\mcr500.dll to \Windows

A:\ mfcce300d.dll to \Windows

A:\mcr500app.exe to \Windows\Start Menu

A:\cis.bin to \

Enable mcr500app in the Start Menu by selecting the appropriate entry in:

Start|Settings|Menus

6 MCR500

6.1 MCR500 Photo's

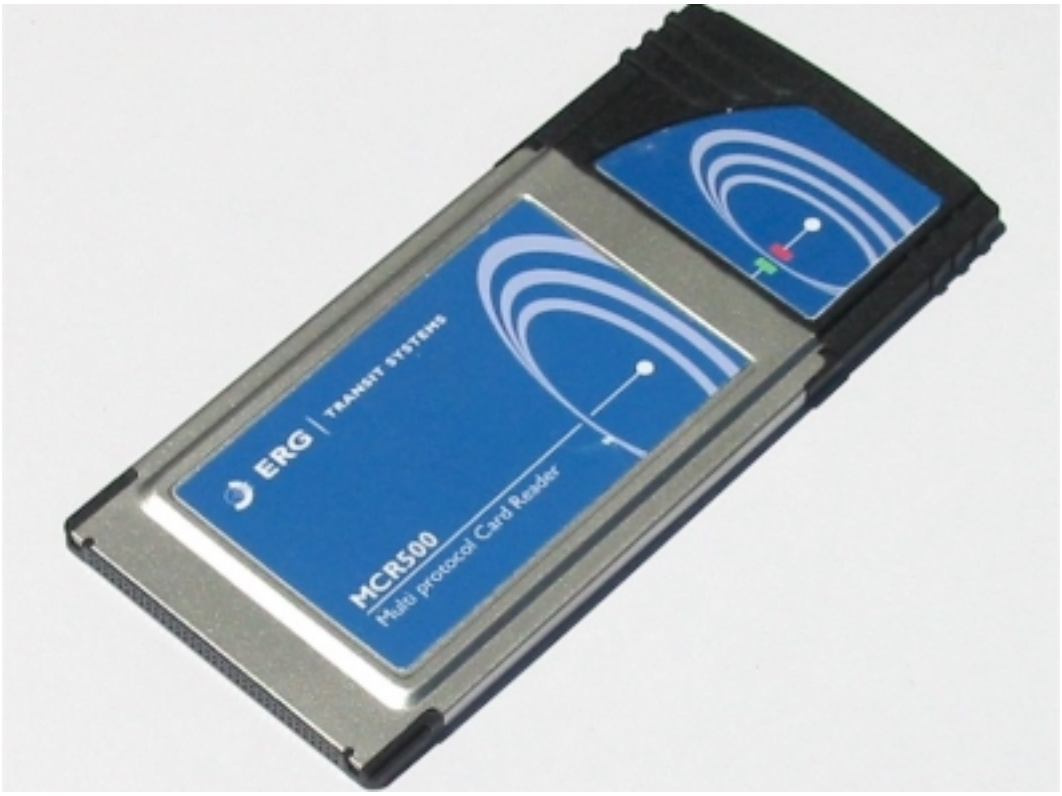

Figure 4: MCR500 Photo of the Front

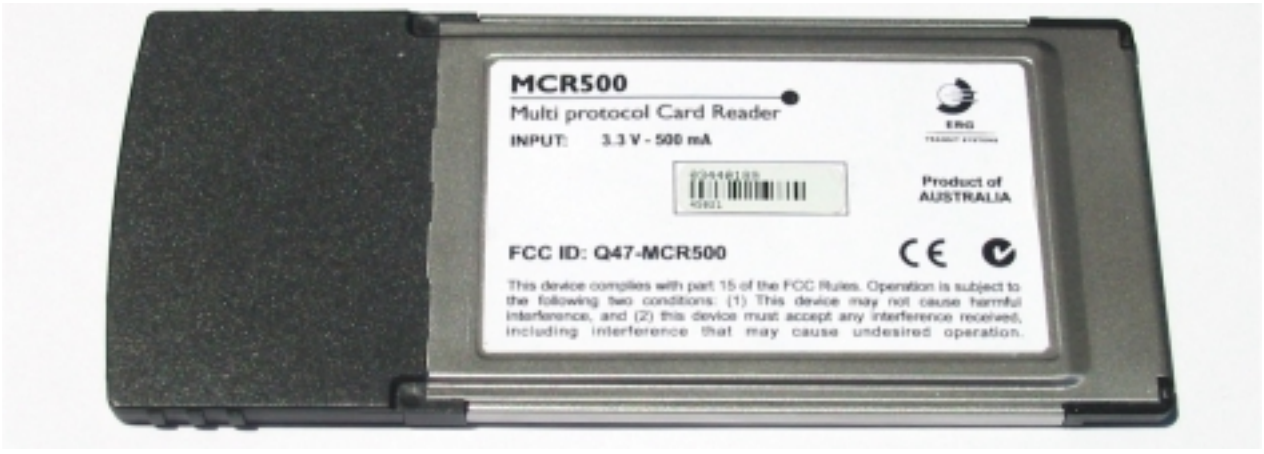

Figure 5: MCR500 Photo of the Back

6.2 MCR500 Short Variant Photo's

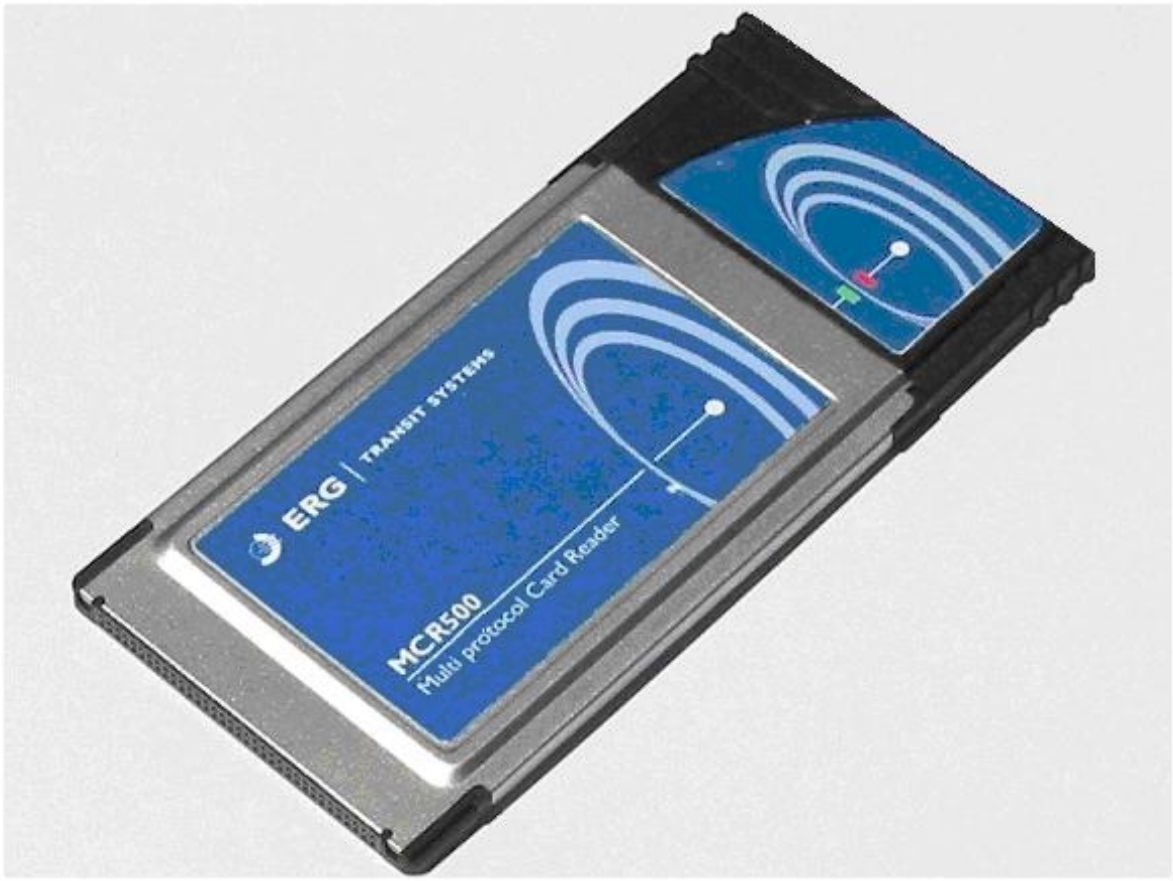

Figure 6: MCR500 Short Variant Photo of the Front

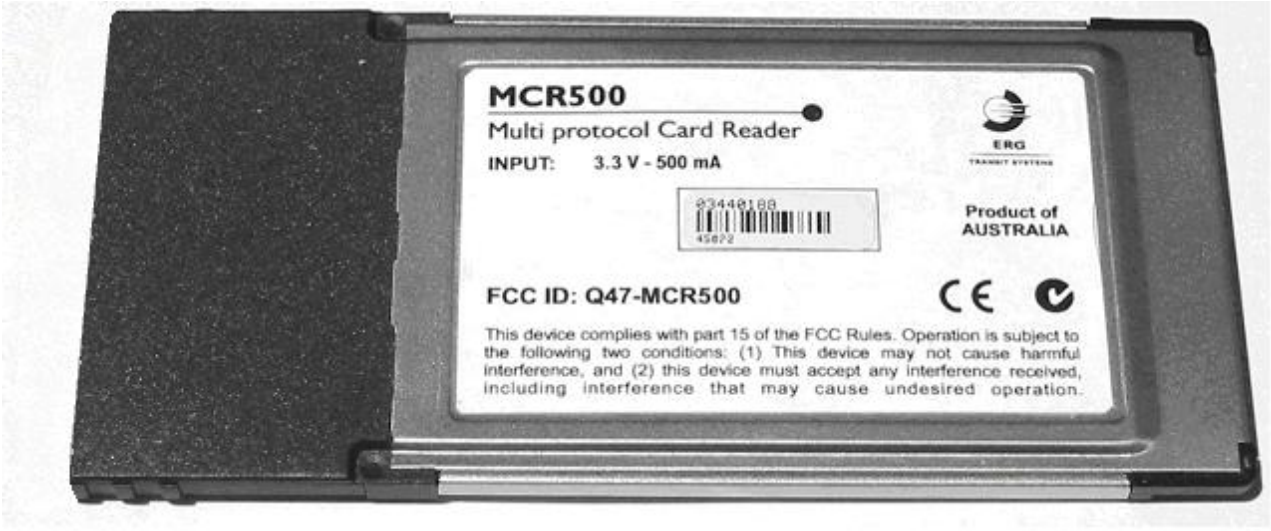

Figure 7: MCR500 Short Variant Photo of the Back