



Advanced Card Systems Ltd.
Card & Reader Technologies

ACR89U-A2 Handheld Smart Card Reader



Technical Specifications V1.04



Table of Contents

1.0.	Introduction	3
2.0.	Features	4
3.0.	Supported Card Types	5
3.1.	MCU Cards	5
3.2.	Memory-based Smart Cards (Synchronous Interface)	5
3.3.	Contactless Cards	5
4.0.	Typical Applications.....	6
5.0.	Technical Specifications.....	7



1.0. Introduction



As smart card technology becomes more widely accepted in the market, developers find an opportunity to offer better usage experience and security by adding more features to smart card reading devices. The ACR89U-A2 Handheld Smart Card Reader with NFC tag support is primarily designed for multi-application that can access any contact and contactless smart cards following the ISO 7816 and ISO 14443 standards.

ACR89U-A2 is a versatile dual interface smart card reader with PIN-pad which can be used to access ISO 7816 MCU cards, ISO 14443 Type A and B contactless cards, MIFARE®, FeliCa, and ISO 18092 or NFC tags. It can operate in both office and field-based environments by using it on PC-linked and standalone modes, respectively. It comes with a built-in keypad, LCD, rechargeable battery, and large programmable

memory features. It is a reliable reader that can support the rigorous performance requirements of highly demanding smart card applications, though operates under low energy consumption.

ACR89U-A2 also supports Secure PIN Entry (SPE) which allows you to securely input data such as PIN through the device's PIN-pad. This security measure prevents PINs from getting exposed to a vulnerable personal computer or workstation, and successfully eliminates the possibility of Virus (Trojan) or USB Sniffer getting hold of them.

Furthermore, ACR89U-A2 has User Firmware Upgradeability that can be done through its USB interface. This capability makes ACR89U-A2 very accessible and ideal for many applications.



2.0. Features

- 32-bit RISC Processor running on Embedded FreeRTOS
- Supports Secure PIN Entry (SPE)
- Tamper Detection Switch to protect against unauthorized intrusion
- Supports Protocol and Parameters Selection (PPS) with 115,200 bps – 206,451 bps in reading and writing smart cards
- USB Firmware Upgradability
- Handheld size and weight
- Contact Interface:
 - Two Full-sized Contact Card Slots
- SAM Interface:
 - Three SAM Card Slots
- Dual Operation Modes:
 - PC-linked Mode:
 - USB 2.0 Full Speed Interface
 - Through detachable USB cable
 - CCID-compliant
 - Supports PC/SC
 - Standalone Mode:
 - Rechargeable Li-ion Battery (charging through USB)
 - Supports third party application programming via FreeRTOS
 - User-programmable in C language
- Built-in Peripherals:
 - Easy-to-Read High Resolution Backlit LCD
 - Highly Durable Chemical Resistant Keypad
 - Four LED Status Indicators
 - Monotone Buzzer
 - Real-time Clock (RTC) with independent backup battery
 - Optional Detachable Thermal Printer (PTR89)
- Supports Android™ 3.1 and later¹
- Compliant with the following standards:
 - ISO 7816
 - PC/SC
 - PC/SC 2.0 Part 10 - Secure PIN Entry
 - CCID
 - CE
 - FCC
 - RoHS 2
 - Microsoft® WHQL

¹ Uses an ACS-defined Android Library



3.0. Supported Card Types

3.1. MCU Cards

The ACR89U-A2 operates with MCU cards that follow:

- T=0 or T=1 Protocol
- ISO 7816-compliant Class A, B, C (5 V, 3 V, 1.8 V)

3.2. Memory-based Smart Cards (Synchronous Interface)

The ACR89U-A2 supports the following memory cards:

- Cards following the I2C bus protocol (free memory cards) such as:
 - Atmel®: AT24C01/02/04/08/16
- SLE4432/5542 intelligent 256 bytes EEPROM with write protect function:
 - SLE4432, SLE5542
- SLE4418/5528 intelligent 1 KB EEPROM with write-protect function:
 - SLE4418, SLE5528

Note: Memory card supports ICC0 slot (front slot) only.

3.3. Contactless Cards

The ACR89U-A2 supports the following contactless cards:

- ISO 14443-compliant, Type A and B Standard, Parts 1 to 4
- Supports all four types of NFC Tags (ISO/IEC 18092 Tags)
- T=CL Protocol
- MIFARE Classic®
- MIFARE® DESFire®
- MIFARE Ultralight®
- MIFARE Ultralight® C
- FeliCa
- Topaz

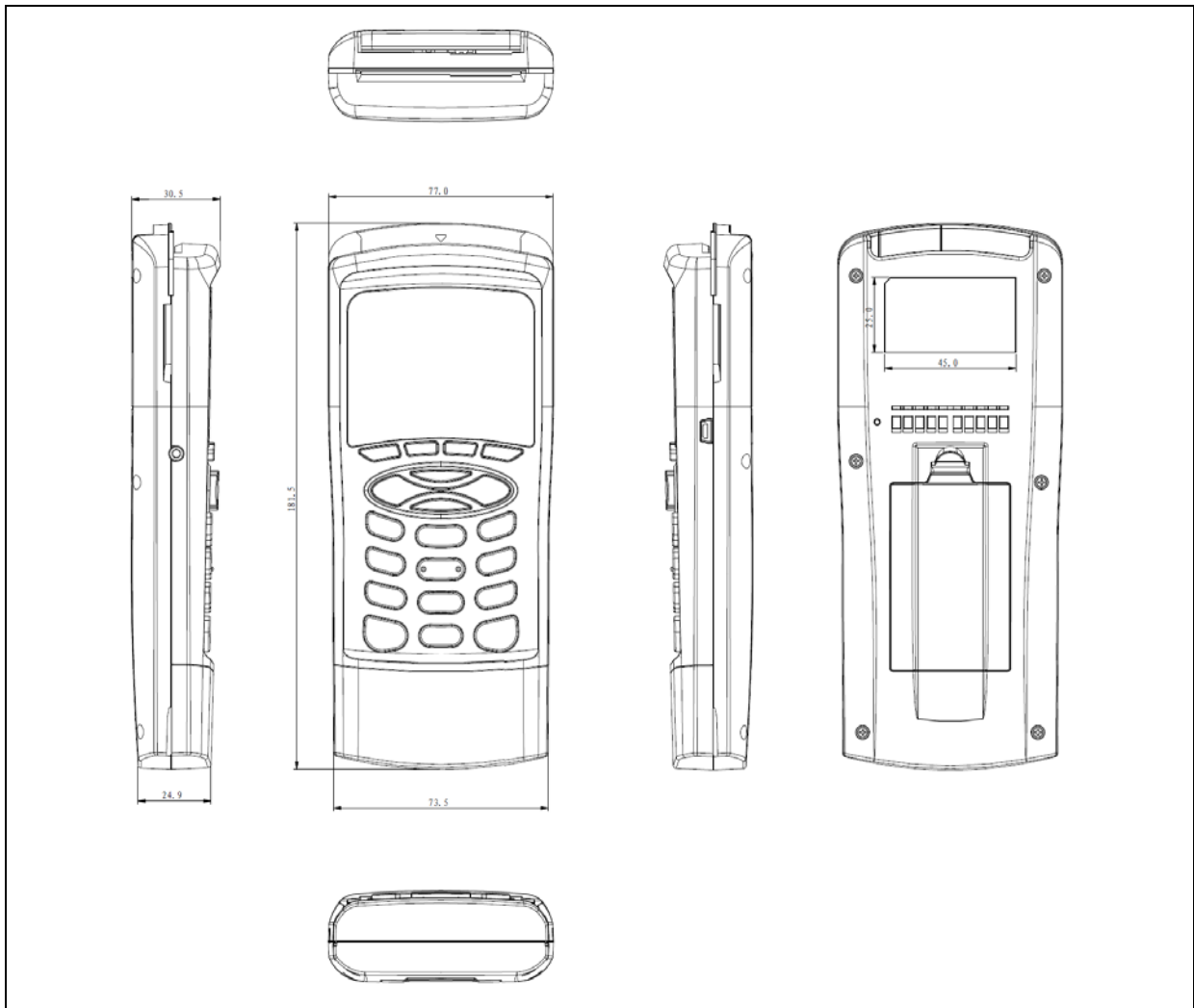


4.0. Typical Applications

- e-Healthcare
- e-Government
- e-Banking and e-Payment
- Transportation
- Loyalty Program
- Time and Attendance Checking



5.0. Technical Specifications



Physical Characteristics

Dimensions 181.5 mm (L) x 77.0 mm (W) x 30.5 mm (H)
Weight 235 g
Color Black

Processor

32-bit RISC Processor

Standalone Mode

Operating System Embedded FreeRTOS
Power Source Lithium-ion battery, 3.7 V, 900 mAh
..... Charging via ACR89 connecting USB cable
Operation Time 10 hours (varies upon usage and application)

Device and User Programmable Memory

Programmable Language C
Compiler Provided Yes
RAM 20 KB
Third Party Applications NOR Flash: 512 KB (default)/1 MB (upon request)
Data Storage Serial Flash: 384 KB (multi-lingual storage)
..... EEPROM: 64 KB
Tamper-Protected Memory 238 bytes (for sensitive data storage with API provided)



USB Host Interface

Protocol..... USB CCID
 Connector Type..... Standard Type A
 Power Source..... From USB Port (PC-linked Mode)
 Speed..... USB Full Speed (12 Mbps)
 Supply Voltage..... 5 V
 Cable Length..... 1 m, Detachable

Contact Smart Card Interface

Number of Slots 2 Full-sized Card Slots
 Standard ISO 7816 Parts 1-3, Class A, B, C (5 V, 3 V, 1.8 V)
 Protocol..... T=0 and T=1; Memory Card Support (ICC Slot 0 only)
 Supply Current Max. 60 mA
 Smart Card Read/Write Speed..... 12.9 Kbps – 206.4 Kbps
 Short Circuit Protection +5 V/GND on all pins
 Clock Frequency 4.80 MHz
 Card Connector Type..... ICC Slot 0: Landing
 ICC Slot 1: Contact
 Card Insertion Cycles..... ICC Slot 0: Min. 300,000
 ICC Slot 1: Min. 100,000

Contactless Smart Card Interface

Standard ISO/IEC 18092 NFC, ISO 14443 Type A and B (Parts 1-4), MIFARE, FeliCa
 Protocol..... ISO 14443 T=CL for ISO 14443-4-compliant cards
 T=CL Emulation for MIFARE Classic, ISO 18092, FeliCa, and NFC tags
 Operating Frequency 13.56 MHz
 Operating Distance Up to 30 mm
 Smart Card Read/Write Speed..... 106 Kbps, 212 Kbps, 424 Kbps

SAM Card Interface

Number of Slots 3 Standard SIM-sized Card Slots
 Standard ISO 7816 (Parts 1-3), Class A, B, C (5 V, 3 V, 1.8 V)
 Protocol..... T=0, T=1
 Smart Card Read/Write Speed..... 12.9 Kbps – 206.4 Kbps
 Card Connector Type..... SAM Slot 0: Contact
 SAM Slot 1: Contact
 SAM Slot 2: Contact

Built-in Peripherals

LCD..... Black and White Graphic LCD with Backlight
 128 pixels x 64 pixels
 Number of characters: 21 characters x 8 lines
 Window size: 49 mm x 29 mm; Active area size: 46 mm x 28 mm
 LED..... 4 tri-color: Red, Green, and Yellow
 Buzzer..... Monotone
 Keypad..... 20 keys

Other Features

Security..... Tamper Switch (internal anti-intrusion detections and protection)
 Real-time Clock..... Supported
 Firmware Upgrade Supported (thru USB)

Printer (Optional)

Printer Type Thermal, External (PTR-89)
 Number of Dots/Lines 384
 Resolution 203 DPI
 Print Width 48 mm
 Speed..... Max. 50 mm/sec
 Parts Interface..... 6-pin serial port
 Communication Interface UART
 Input Buffer Size..... 512 bytes

Application Programming Interface

PC-linked Mode..... PC/SC
 Standalone Mode..... FreeRTOS

Operating Conditions

Temperature..... 0 °C – 50 °C
 Humidity Max. 90% (non-condensing)
 MTBF 135,000 hrs



Certifications/Compliance

ISO 7816, USB Full Speed, PC/SC, PC/SC 2.0 Part 10 - Secure PIN Entry, CCID, CE, FCC, RoHS 2, Microsoft® WHQL

Device Driver Operating System Support

Windows® 2000, Windows® XP, Windows Vista®, Windows® 7, Windows® 8, Windows® 8.1, Windows® 10
Windows® Server 2003, Windows® Server 2008, Windows® Server 2008 R2, Windows® Server 2012,
Windows® Server 2012 R2
Linux®, Mac OS®, Solaris, Android™ 3.1 and later



Android is a trademark of Google Inc.
Atmel is registered trademark of Atmel Corporation or its subsidiaries, in the US and/or other countries.
EMV is a registered trademark or trademark of EMVCo LLC in the United States and other countries.
Linux® is the registered trademark of Linus Torvalds in the U.S. and other countries.
Mac OS is a trademark of Apple Inc., registered in the U.S. and other countries.
Microsoft, Windows, and Windows Vista are either registered trademarks or trademarks of the Microsoft Corporation in the United States and/or other countries.
MIFARE, MIFARE Classic, MIFARE DESFire, and MIFARE Ultralight are registered trademarks of NXP B.V. and are used under license.