



2.0. Features

- 32-bit RISC Processor running on Embedded FreeRTOS
- USB Firmware Upgradability
- Handheld size and weight
- Two Full-sized Contact Card Slots
- Three SAM Card Slots
- Dual Operation Modes:
 - PC-linked
 - Standalone
- PC-linked Operation:
 - USB 2.0 Full Speed Interface
 - Through detachable USB Cable
 - CCID Compliance
 - Supports PC/SC
- Standalone Operation:
 - 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)
- Tamper Detection Switch to protect against unauthorized intrusion
- Supports Secure PIN Entry (SPE)
- Supports PPS (Protocol and Parameters Selection) with 115,200 bps – 206,451 bps in reading and writing smart cards
- Supports Android™ 3.1 and above¹
- Compliant with the following standards:
 - ISO 7816
 - USB Full Speed
 - EMV™ Level 1 (Contact)
 - 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-A1 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-A1 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

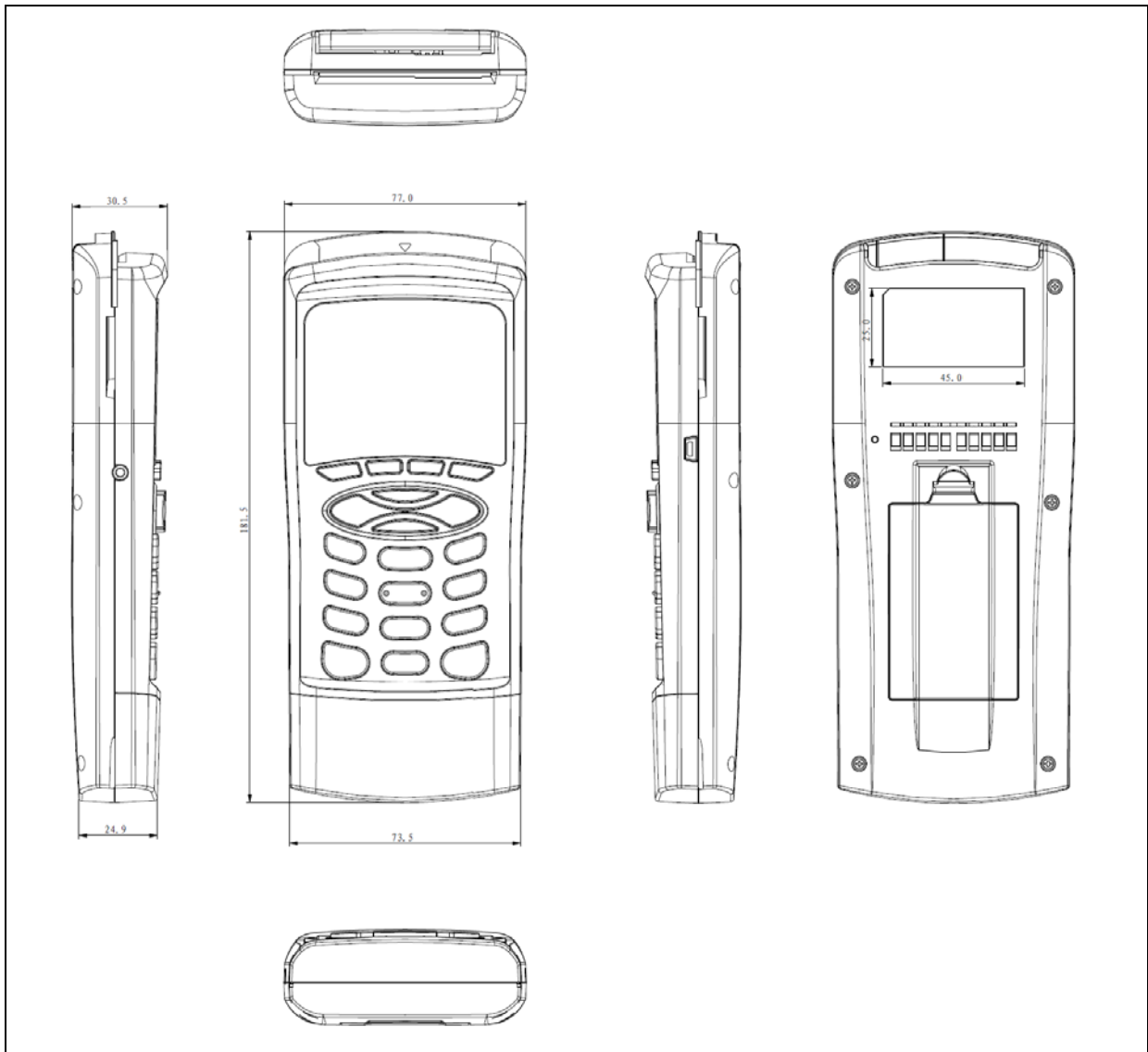
Note: Memory card supports ICC0 slot (front slot) only.



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) × 77.0 mm (W) × 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 |
| | Via detachable USB cable (PC-linked Mode) |
| Operation Time | 10 hours (varies upon usage and application) |
| Power Consumption | Less than 40 mA (excluding card and backlight power) |
| Backup Battery | Independent rechargeable backup battery for RTC |

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) |



Connectivity

USB OTG 2.0 Full Speed

USB Host Interface

Protocol..... USB CCID
Type Four Lines: +5 V, GND, D+ and D-
Connector Type..... Standard Type A
Power Source..... From USB Port (PC-linked Mode)
Speed..... USB Full Speed (12 Mbps)
Supply Voltage 3.7 V
Cable Length..... 1 m detachable cable

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

SAM Card Interface

Number of Slots 3 Standard SIM-sized
Standard ISO 7816 Parts 1-3, Class A, B, C (5 V, 3 V, 1.8 V)
Protocol..... T=0, T=1
Supply Current Max. 60 mA
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 128 pixels x 64 pixels Black and White Graphic LCD with Backlight
..... 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
Number of Dots/Lines 384
Resolution 203 DPI
Print Width 48 mm
Max. Speed 50 mm/s
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, EMV™ Level 1 (Contact), 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®, Android™



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 trademark owned by EMVCo LLC.
Linux® is the registered trademark of Linus Torvalds in the U.S. and other countries.
Mac OS is a trademark of Apple Inc.
Microsoft, Windows and Windows Vista are registered trademarks of Microsoft Corporation in the United States and/or other countries.