

ACR3x Mobile Card Reader

User Manual V1.02

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1.0.Introduction

The ACR3x Mobile Card Reader serves as an interface for the communication between a mobile device and a magnetic stripe card or smart card. Different types of cards have different communication protocols which, in most cases, prevent direct communication between a card and a mobile device. The ACR3x Mobile Card Reader establishes a uniform interface from the mobile device to the card. By taking care of the card's particulars, it releases the computer software programmer from being responsible with the operations' technical details, which in many cases, are not relevant to the implementation of the card system.

This document contains information regarding the installation and workflow of demo included in the Android[™] and iOS library of the ACR3x Mobile Card Reader.

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2.0. Installing the demo application

Download the device library from the download page of ACS's Mobile Card Reader below:

http://www.acs.com.hk/en/drivers/

The library supports both iOS and Android on AR31, ACR3201 and ACR35.



2.1. For iOS

1. Using XCode application, open the AudioJackDemo.xcodeproj.

? • •		AudioJackDemo			R ₂	
FAVORITES All My Files AirDrop Applications Desktop	ACSIcon_57x57.pn g	ACSicon_114x114. png	AudioJack	AudioJackDemo	AudioJackDemo.xc odeproj	

2. Transfer the *AudioJackDemo.xcodeproj* to your mobile device by choosing your mobile device and then clicking the play button.

Note: Make sure that your mobile device is connected to your computer.

Please include dummy.mm into your application development.



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2.2. For Android™

1. Connect your mobile device to the computer.



2. In the internal storage of your device, create a folder where the ACR3X Android demo will be placed.



3. Copy the *AudioJackDemo.apk* file from the downloaded ACR31 Android library into the previously created folder.

🕌 Temp
😋 🕞 🗢 🛄 🔹 Computer 👻 Galaxy Nexus 👻 Internal Storage 👻 Temp
Organize 🔻
AudioJackDemo APK File 115 KB



4. Disconnect your mobile device from the computer, and then locate the *AudioJackDemo.apk* using a file manager application.



5. Tap the AudioJackDemo.apk file to start the installation process.



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6. A prompt will ask for hardware control access. Tap Install to proceed.



7. Once the installation is complete, you may now open the AJ Demo application.



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3.0. Using the application with ACR31 mobile card reader

This section provides a simple step-by-step procedure on how to use the ACR31 mobile card reader with a magnetic stripe, ICC or PICC card using the AudioJack demo application.

3.1. Using a magnetic stripe card

- 1. Open the AJ Demo application.
- 2. Connect the ACR31 to the audio port of your mobile device.

Note: Make sure that the volume is set to its maximum level to allow communication between the ACR31 reader and your mobile device.

3. The reader is in sleep mode by default. Tap **Reset** to wake up the reader.

Note: By default, the reader will enter sleep mode if there is no operation after 4 seconds.(default).

(47)	🦻 🖉 📲 11:22
📦 AJ Demo	
DUKPT setup	
Track data setup	
ICC	
Resetting the reader	
Reset	
Sleep	
Data received	
TRACK DATA	
Swipe count	
Û Û	

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4. Swipe your magnetic stripe card to the reader. The reader and card details will be displayed on the screen.

(1)	?∕	11:23
💿 AJ Demo	CLEAR	ABOUT
TRACK DATA		
Swipe count		
Battery status Full		
Key serial number		
Track 1 - MAC		
Track 2 - MAC		
TRACK 1		
JIS2 data		
Primary account number 8880512827303450		
Ĵ		

5. Tap **About reader** to know more about the firmware version, battery status and sleep timeout.

(46)	📚 🖉 불 11:24
🧔 About reader	
Firmware version	
Battery level	
Sleep timeout	
FUNCTION	
Get firmware version	
Get status	
Set sleep timeout	

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3.1.1. Get firmware version

To get the reader's firmware version:

1. Go to About reader, and then tap Get firmware version.

46	☞⊿ 🛢 11:24
🧔 About reader	
Firmware version ACR31 V2.20	
Battery level	
Sleep timeout	
FUNCTION	
Get firmware version	
Get status	
Set sleep timeout	
Û Û	

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3.1.2. Get battery status

To get the battery status:

1. Go to About reader, and then tap Get status.

(46)	🦻 📕 11:24
👘 About reader	
Firmware version ACR31 V2.20	
Battery level 2.50V - 2.59V	
Sleep timeout 20 secs	
FUNCTION	
Get firmware version	
Get status	
Set sleep timeout	
Û Û	

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3.1.3. Set sleep timeout

To set the sleep timeout:

- 1. Go to About reader, and then tap Sleep timeout.
- 2. Enter a value between 4 and 20, and then tap **OK**.

(46)	🦻 🛓 🗐 🗐
蘭 About reader	
Firmware version ACR31 V2.20	
Battery level 2.50V - 2.59V	
Sleep timeout	
Enter the value betw	veen 4 and 20:
Cancel	ОК
Set sleep timeout	
(

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3.1.3.1. Customize ID

To change the Custom ID:

- 1. Go to Reader ID, and then tap Set custom ID.
- 2. Type in your preferred ID text, and then tap **OK**.

ţ	Reader ID		
Cu	istom ID		
De	vice ID		
FU	Custom ID		
Ge Se	Enter the text (maximum 10 characters):		
Ge	Cancel	ок	
	\leftarrow		

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3.1.3.2. Get Device ID

To get the Device ID:

1. Go to **Reader ID**, and then tap **Get device ID**.

(45) 🖿	☞⊿ 🛢 11:25
醇 Reader ID	
Custom ID acs	
Device ID DF B7 82 50 02 FD 29 24	
FUNCTION	
Get custom ID	
Set custom ID	
Get device ID	

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3.1.3.3. Change master key

The master key is used to change the setting in the application and the reader (e.g., Custom ID and AES Key). In order to use the new master key, authentication is required.

1. Go to Cryptographic keys, and then tap New master key.



2. Type in your preferred value (in hexadecimal format), and then tap OK.



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3. Tap Set master key to change the master key inside the ACR31.

🧐 🗖 👘 🤝 🦻 🔁	26
🟮 Cryptographic keys	
New master key 00 00 00 00 00 00 00 00 00 00 00 00 00	
Master key oo oo	
AES key 4E 61 74 68 61 6E 2E 4C 69 20 54 65 64 64 79 20	
FUNCTION	
Set master key	
Set AES key	
Use default key	

4. Tap **Master key** to make it similar with the **New master key** so that the master keys between the reader and application are the same. Otherwise, they cannot authenticate each other.

(43) ====						1.	7/	11:29
	👼 Cryptographic keys							
N	/aste	r key	1					٦
	10 00 0 10 00 2	0 00 2	00 00	000	00 00	00 00	00 00)
	С	ancel				ОК		
FUN	CTION							
								_
q	w ²		4	5 t	y ⁶	u	i °	• p
а	s	d	f	g	h	j	k	1
ۍ	z	x	c	v	b	n	m	×
?123	.							┵
	\rightarrow			\frown)	Γ		

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3.1.3.4. Change AES key

To change the AES key:

1. Go to Cryptographic keys, and then tap AES Key.

(40) 👞	🤿 🛔 12:16
👼 Cryptographic keys	
New master key 00 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00 22
Master key 00 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00 22
AES key 4E 61 74 68 61 6E 2E 4C 69 20 54 65	64 64 79 20
FUNCTION	
Set master key	
Set AES key	
Use default key	

2. Type in your preferred value (in hexadecimal format), and then tap **OK**.



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- 3. Tap Set AES key to load the new AES to ACR31.
- 4. To set the keys back to its default state for any new default ACR31, tap Use default key.

• · •	8 🖘 🛔 4:18
💼 Cryptographic keys	
New master key 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00 00 00
Master key 00 00 00 00 00 00 00 00 00 00 00 00	0 00 00 00 00 22
AES key 4E 61 74 68 61 6E 2E 4C 69 20 54	65 64 64 79 FF
FUNCTION	
Set master key	
Set AES key	
Use default key	
(\mathbf{r})	

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4.0. Using the application with ACR3201 mobile card reader

This section provides a simple step-by-step procedure on how to use the ACR3201 mobile card reader with various card types using the AudioJack demo application.

4.1. Using a magnetic stripe card

For instructions on how to use a magnetic stripe card with ACR3201, please refer to **Section 3.1** of this document.

4.2. Using a contact smart card (ICC)

1. Connect the ACR3201 to the audio port of your mobile device.

Note: Make sure that the volume is set to its maximum level to allow communication between the ACR3201 reader and your mobile device.

2. Tap **ICC** to explore the functions of a contact smart card.



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4.2.1. Change timeout setting

To change the timeout setting of the reader:

1. Go to ICC, and then tap Wait timeout.

(39)		☞⊿ 🛢 12:18
icc		
ATR		
Power action Warm reset		
Wait timeout		
Card state		
PROTOCOL		
T=0		
T=1		
Active protocol		
APDU		
\rightarrow	\bigcirc	

2. Type in your preferred value, and then tap **OK**.

(39)						1-	7/	12:18
	СС							
W	/ait ti	meo	ut					٦
_1(009							_
	С	ancel				ОК		1
Carc	state	2						
qv	v ² e	e r	- ⁴	t J	/ _ _	J I	i	ວ
а	s	d	f	g	h	j	k	1
쇼	z	x	c	v	b	n	m	×
?123	₽							ł
	\rightarrow		I	\bigcirc		C	Ŀ	

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4.2.2. Get ATR

To get the ATR of the card:

- 1. Go to **ICC**.
- 2. Insert smart card into the ACR3201.
- 3. Tap **Reset**, and then tap **Power** to wake up the smart card.

(39)	☞_/ 🛢 12:	19
icc		
E0 00 00 18 00		
Control response		
FUNCTION		_
Reset		
Power		
Set protocol		
Transmit		
Control		
Update card state		
ý (

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4. The ATR will be displayed.

3	ً ∑	12:21
I	icc	
	ATR 38 BE 11 00 00 41 01 25 00 00 00 00 00 00 00 00 00 00 00 90 00	
	Power action Warm reset	
	Wait timeout 1009 ms	
	Card state Specific	
_	PROTOCOL	
	T=0	1
	T=1	1
	Active protocol	
	APDU	
	Û D	

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4.2.3. Transmit command APDU

To send message to the card:

- 1. Go to **ICC**.
- 2. Insert smart card into the ACR3201.
- 3. Under APDU, tap Command APDU.
- 4. Type in the command (in hexadecimal format), and then tap **OK**.

Note: For the list of APDU commands, please refer to the Reference Manual of the card in use.

(36)	: <u></u> :						@ _	1 📕 1	2:21
Ę	j i 10	CC							
ſ	Сс	omm	and A	PDU					
I	80	14 00	00 00	4					
		Ca	ncel				ОК		
E	Resp	onse	APDU						
1	2	3	4	5	6	7	8	9	0
@	#	\$	%	&	*	-	+	()
= \	v	!	"	'	:	;	/	?	×
AB	SC	,							Ļ
		\langle						ק	

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5. Tap **Reset**, and then tap **Power** to wake up the smart card.

39 👞	🦻 🗐 12:19
icc	
E0 00 00 18 00	
Control response	
FUNCTION	
Reset	
Power	
Set protocol	
Transmit	
Control	
Update card state	
\leftarrow	

6. Under **Function**, tap **Transmit** to execute the APDU command. The reponse will be displayed under Response APDU.

(3	5	☞⊿ 🗋 12:22
I	🔋 ICC	
	APDU	
	Command APDU 80 14 00 00 08	
	Response APDU 6F AD FB B1 88 20 08 00 90 00	
	DEVICE CONTROL	
	Control code 3500	
	Control command E0 00 00 18 00	
	Control response	
	FUNCTION	
	Reset	
	Ú Ú	

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4.2.4. Execute a command

To send message to the reader:

- 1. Go to ICC, and then tap Control Command.
- 2. Insert smart card into the ACR3201.
- 3. Type in the command (in hexadecimal format), and then tap **OK**.

Note: For a list of APDU commands, please refer to the Reference Manual of ACR3201 mobile card reader.

35						La		12	24
	ICC								
	Contro	ol co	mma	and					
	E0 00 0	00 18	FF						
	C	Cancel				ОК			
Co	ontrol re	espon	se						
FU	NCTION								
q	W	e I	4	5 1	y ⁶ ι	7 1	i [®]	9	p
a	s	d	f	g	h	j	k	1	
仑	z	x	c	v	b	n	m	•	×
?123	₿							+	_
	~			\frown]	C			

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4. Tap **Reset**, and then tap **Power** to wake up the smart card.

(35) 👞	🦻 🖉 📲 12:23
	icc	
	DEVICE CONTROL	
	Control code 3500	
	Control command E0 00 00 18 00	
	Control response	
	FUNCTION	
	Reset	
	Power	
	Set protocol	
	Transmit	
	Û Û	

5. Tap **Control** to execute the APDU command. The reponse will be displayed under **Control Response**.

3	63 ⊾ 🦻 🔁			
	है। ICC			
	DEVICE CONTROL			
	Control code 3500			
	Control command E0 00 00 18 FF			
	Control response E1 00 00 00 14 41 43 52 33 32 5F 41 31 5F 49 43 43 56 30 2E 30 31 2E 30 33			
	FUNCTION			
	Reset			
	Power			
	Set protocol			
	Transmit			

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5.0. Using the application with ACR35 mobile card reader

This section provides a simple step-by-step procedure on how to use the ACR35 mobile card reader with various card types using the AudioJack demo application.

5.1. Using a magnetic stripe card

For instructions on how to use a magnetic stripe card with ACR35, please refer to **Section 3.1** of this document.

5.2. Using a contactless smart card (PICC)

1. Connect the ACR35 to the audio port of your mobile device.

Note: Make sure that the volume is set to its maximum level to allow communication between the ACR31 reader and your mobile device.

2. Tap **PICC** to explore the functions of a contactless smart card.



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5.2.1. Change timeout setting

Timeout is the value of response time (in seconds) before a card starts to poll. To change the timeout setting of the reader:

1. Go to **PICC**, and then tap **Timeout**.

PICC
ATR
Timeout 1 secs
Card type ^{8F}
Command APDU 00 84 00 00 08
Response APDU
RF configuration 07 85 85 85 85 85 85 85 69 69 69 69 69 69 69 69 69 3F 3F
FUNCTION
Reset

2. Type in a value between 1 to 5, and then tap **OK**.

(35) 📟 🛌	🦻⊿ 🛢 12:25
PICC	
Timeout	
_3	
Cancel	ок
Command APDU 00 84 00 00 08	
1 2 3 4 5	6 7 8 9 0
@ # \$ % &	* - + ()
=\< ! " '	: ; / ?
ABC ,	. +
~ (

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5.2.2. Get the ATR

To get the ATR of the card:

- 1. Go to **PICC**.
- 2. Tap **Reset**, and then tap **Power ON** to power up the reader.

34 🛋	☞_/ 📋 12:25
00 84 00 00 08	
Response APDU	
RF configuration 07 85 85 85 85 85 85 85 85 3F 3F	85 69 69 69 69 69 69 69 69 69
FUNCTION	
Reset	
Power ON	
Power OFF	
Transmit	
Set RF configuration	ı
\leftarrow	

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3. Quickly tap the contactless smart card to the ACR35 to display the ATR of the card.

ً⊬ 🖬 🛜 🖉 🗐 12:25
ATR 3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 01 00 00 00 00 6A
Timeout 3 secs
Card type 8F
Command APDU 00 84 00 00 08
Response APDU
RF configuration 07 85 85 85 85 85 85 85 85 69 69 69 69 69 69 69 69 3F 3F
FUNCTION
Reset
Power Obl
f d l

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5.2.3. Transmit command APDU

To send message to the card:

- 1. Go to **PICC**, and then tap **Command APDU**.
- 2. Type in the command (in hexadecimal), and then tap **OK**.

Note: For a list of APDU commands, please refer to the Reference Manual of the card in use.

(34) 💷 🛓					? /	1	2:26
i Pi	CC						
ATR							
- Cor	nmand	APDU					I
FF C	CA 00 00	00					
	Cancel			C	к		
Comm	and APE	DU					
00 84 00	00 08						
1 0				_	•	•	
1 2	3 4	1 5	6		8	y	U
@ #	\$ %	%	*	-	+	()
= \ <	! "	':	;	/	?		×
ABC	,						L
	\sim					ק	

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3. Tap Reset, and then tap Power ON to wake up the reader and start polling.

🏮 PICC
Command APDU FF CA 00 00 00
Response APDU 90 00
RF configuration 07 85 85 85 85 85 85 85 85 69 69 69 69 69 69 69 69 3F 3F
FUNCTION
Reset
Power ON
Power OFF
Transmit

4. Tap **Transmit**, and then quickly tap the contactless smart card to the ACR35 to send the APDU command. The response will be displayed under Response APDU.

PICC
Command APDU FF CA 00 00 00
Response APDU 90 00
RF configuration 07 85 85 85 85 85 85 85 85 69 69 69 69 69 69 69 69 3F 3F
FUNCTION
Reset
Power ON
Power OFF
Transmit

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5.2.4. Configure radio frequency

The RF Configuration sets the antenna setting parameter. For more information, please contact ACS.

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6.0. Replacing the ACR31 battery

ACR31 uses a CR2016 3.0 V coin battery. You may need to replace the battery when you see the battery status in an application (e.g., AJ Demo Application) is running low.

To replace the battery:

1. Using a Phillips screwdriver, remove the screws on each side.



2. Remove the battery cover and take out the old battery.



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3. Replace the battery with a new one. Make sure that positive contact is facing up.



4. Place the battery cover back and close.



5. Put the screws back.



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