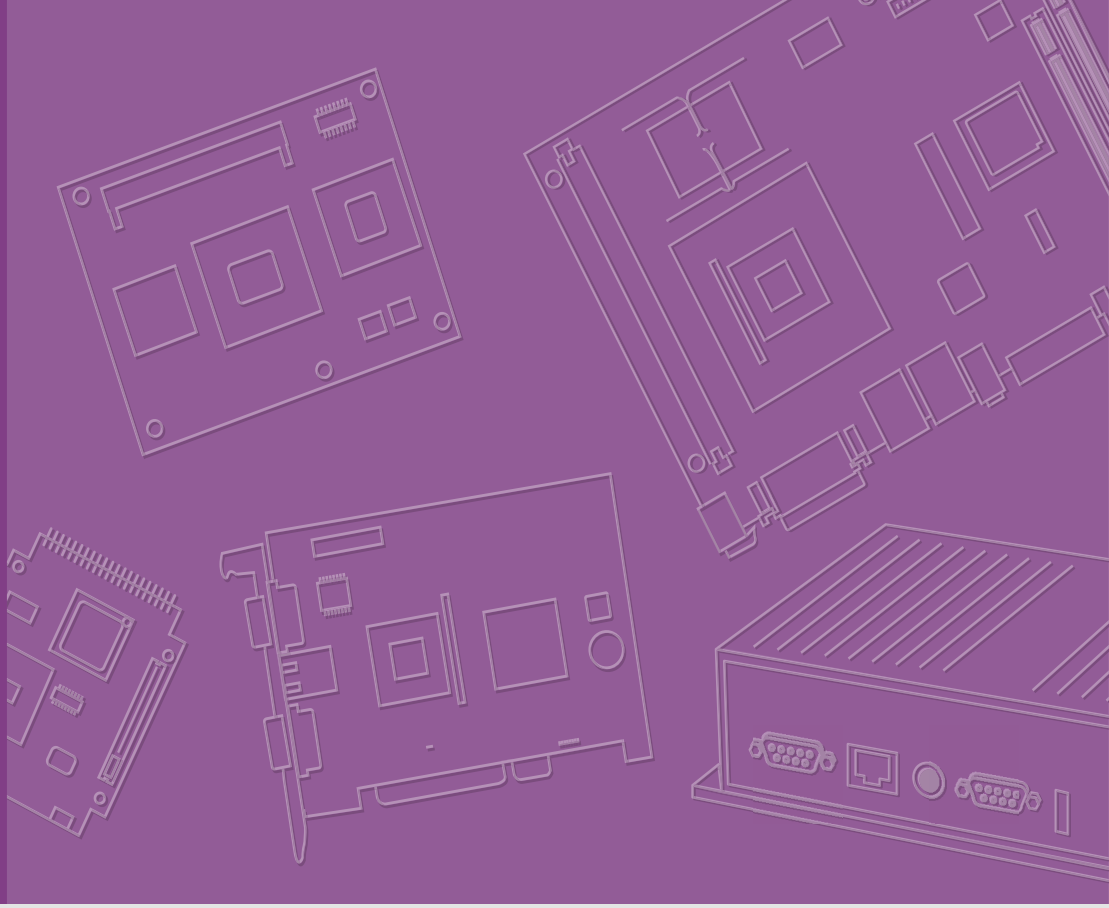

User Manual

EPD Device
EPD-302.303
System Solution

Wireless ePaper Display Solution

ADVANTECH

Enabling an Intelligent Planet

Copyright

Acknowledgments

Product Warranty (2 Years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof-of-purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof-of-purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

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Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Packing List

Before installing the system, please check that the items listed below are included and in good condition. If any item does not accord with the list, contact your dealer immediately.

- EPD-302.EPD-303 ePaper device or optional accessories

Ordering Information

Part No.	Description
EPD-303-N1001	3.7" EPD-303 NFC B/W/R Display Blue Fastener
EPD-303-N2001	3.7" EPD-303 NFC B/W/R Display
EPD-302-N1001	3.7" EPD-303 NFC B/W Display Blue Fastener
EPD-302-N2001	3.7" EPD-303 NFC B/W Display

Optional Accessories

Part No.	Description
LEO-D30-RD1	NFC Reader
199L000102T000	Fastener-Badge for EPD-303
199L000101T000	Back Holder for EPD-303

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.
    - The equipment is malfunctioning, or does not operate according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment shows obvious signs of breakage.
15. There is danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
    - Replacement of a battery with an incorrect type that can defeat a safeguard (for example, in the case of some lithium battery types);
    - Disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, that can result in an explosion;
    - Leaving a battery in an extremely high-temperature environment can result in an explosion or leakage of flammable liquid or gas;
    - A battery subjected to extremely low air pressure may result in an explosion or leakage of flammable liquid or gas.

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Consignes de Sécurité

1. Lisez attentivement ces instructions de sécurité.
2. Conservez ce manuel de l'utilisateur pour référence ultérieure.
3. Débranchez cet appareil de toute prise secteur avant le nettoyage Utilisez un chiffon humide. N'utilisez pas de détergents liquides ni en spray pour le nettoyage
4. Pour les équipements enfichables, la prise de courant doit être située à proximité de l'équipement et doit être facilement accessible.
5. Gardez cet équipement à l'abri de l'humidité.
6. Placez cet équipement sur une surface fiable lors de son installation
7. Les ouvertures de l'enceinte sont destinées à la convection de l'air. Protégez le matériel contre la surchauffe. NE COUVREZ PAS LES OUVERTURES.
8. Assurez-vous que la tension de la source d'alimentation est correcte avant de connecter l'équipement à la prise de courant.
9. Placez le cordon d'alimentation de sorte que personne ne puisse marcher dessus. Ne placez aucun objet sur le cordon
10. Toutes les mises en garde et avertissements sur l'équipement doivent être notés
11. Si l'équipement n'est pas utilisé pendant une longue période, débranchez-le de la source d'alimentation pour éviter tout dommage d? à une surtension transitoire
12. Ne jamais verser de liquide dans une ouverture sous peine de provoquer un incendie ou un choc électrique
13. Ne jamais ouvrir l'appareil.Pour des raisons de sécurité, cet équipement ne doit être ouvert que par du personnel qualifié
14. Si l'une des situations suivantes se produit, faites vérifier l'équipement par le personnel de service:
    - Le cordon d'alimentation ou la fiche est endommagé.
    - Un liquide a pénétré dans l'appareil.
    - L'équipement a été exposé à l'humidité.
    - L'équipement ne fonctionne pas bien ou vous ne pouvez pas le faire fonctionner conformément au manuel d'utilisation.
    - Equipment L'équipement est tombé et a été endommagé.
    - Equipment L'équipement présente des signes évidents de rupture.
15. Danger d'explosion si la batterie est remplacée de manière incorrecte. Remplacez uniquement avec le même type ou un type équivalent recommandé par le fabricant. Jetez les piles usagées conformément aux instructions du fabricant.
    - remplacement d'une batterie avec un type incorrect qui peut annuler une sau- vegarde (par exemple, dans le cas de certains types de batterie au lithium);
    - élimination d'une batterie dans le feu ou dans un four chaud, ou écrasement ou découpage mécanique d'une batterie, pouvant entraîner une explosion;
    - laisser une batterie dans un environnement environnant à des températures extrêmement élevées pouvant provoquer une explosion ou une fuite de liquide ou de gaz inflammable;
    - a battery subjected to extremely low air pressure that may result in an explosion or the leakage of flammable liquid or gas.

AVERTISSEMENT: Cet ensemble d'instructions est donné conformément à la norme CEI 704-1. Advantech décline toute responsabilité quant à l'exactitude des déclarations contenues dans le.

Contents

Chapter 1

Product Overview

1.1 Introduction

Featuring innovative passive NFC technology and a vibrant panel with black, white, and red colors, these displays offer wireless NFC-powered refresh capabilities and battery-free operation. They are versatile and can be used in factory production, inventory management, medical management, and logistics.

Highlighted Features:

- ARM Cortex M0+ RISC 128KB Flash
- 3.7" black, white, and red ePaper panel display
- Passive NFC-powered e-Paper, battery-free
- Fast transmission with a 3-color LED
- Enables refresh by smartphone through the Advantech NFC App or NFC Reader
- Supports an operating temperature range of 0 ~ 40°C (B/W)
- Includes DLL sample code for seamless communication with the EPD server to streamline automation processes

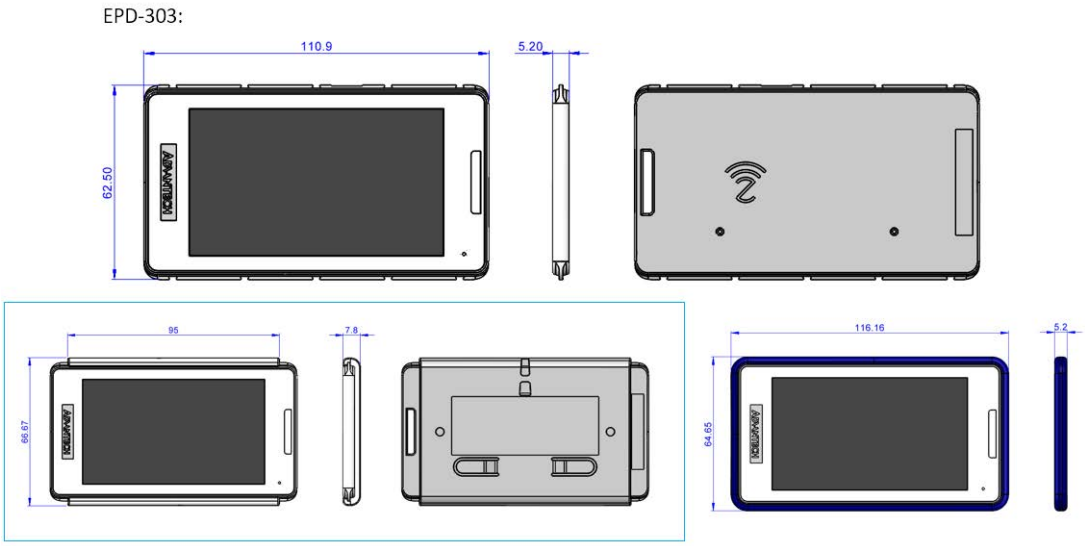
1.2 Specifications

1.2.1 Hardware Specifications

Table 1.1: EPD-303-N1001/EPD-303-N2001		
Computing System	Processor	ARM Cortex M0+ RISC 128KB Flash
	Memory	RAM 20KB
Display	Screen Size	3.7" (53 x 92.99 x 1.0 mm)
	Resolution	240 x 416 pixels
	Color	EPD-302 black and white EPD-303 black, white, and red
Storage	Internal	Flash: 128 KB RAM: 20 KB
	External	N/A
	User data/Image	253bytes
Protocol	ISO/IEC	ISO/IEC 15693 type (ePaper image / user data read/write)
Power		NFC power supply
Physical Characteristics	Outline Dimensions	62.5 x 110.9 x 5.2 mm
	Weight	34 g
	Bracket	Back Holder for EPD-303
Environment	Operating Temperature	Black & White & Red: 0 ~ 40°C Black & White: 0 ~ 50°C Black, White, Red, & Yellow: 0 ~ 50°C
	Storage Temperature	Black, White, & Red: -25 ~ 60°C Black & White: -25 ~ 70°C Black, White, Red, & Yellow: -25 ~ 60°C
	Operating Humidity	80% Relative Humidity, non-condensing
Certifications	Safety and EMC	Yes

1.2.2 ID Dimensions

EPD-303:



1.3 System Implementation

Advantech provides a ready-to-use NFC Agent for seamless communication with the EPD, streamlining automation processes. We will provide DLL sample code to use with the Advantech NFC reader to refresh the ePaper. Additionally, Advantech provides an APP that allows customers to use their mobile phones to change the image.

1.3.1 Advantech EPD-303, NFC APP, NFC Agent, NFC Reader

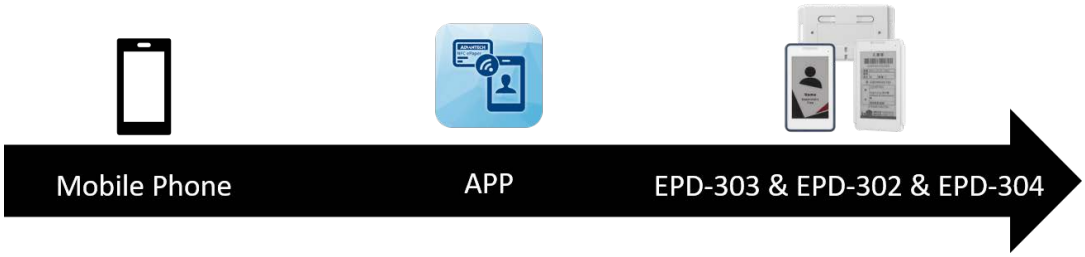
The wireless EPD-303 system consists of an NFC agent, NFC APP tool, NFC reader, and EPD device.

- The NFC agent using C# sample code and a DLL can help the user compile images and data.
- The NFC APP tool designed by Advantech and downloaded by end users can transmit images and data to the ePaper device.
- The NFC reader transmits images and data to the ePaper device.
- The EPD-303 ePaper device displays images and user data.

Advantech provides a total solution for developing various architectures according to the end customer's system requirements.

1. NFC agent: Users can utilize Advantech C+ sample code and a DLL to compile API and user data.

2. Advantech NFC APP: Download the Advantech NFC APP on Android smartphones, which reads ISO15693 type. Smartphones transmit ePaper images and user data. Various templates are available to meet different scenarios.



Chapter 2

NFC Writer & Reader

2.1 Introduction

The EPR-210 is Advantech's NFC writer and reader. Users can apply the Advantech C# DLL to develop APIs and handle data binding. The NFC APP is an Android app that allows users to generate various types of images using pre-defined templates and push them to the Advantech EPD-210 via Near Field Communication (NFC).

2.2 Specifications

Figure 2.1 EPR-210

Table 2.1: EPR-210	
Protocols	ISO/IEC 15693 type ISO/IEC 14443 type
Frequency	13.56 MHz (+/-7 KHz)
RF Output Power	200 mW
RF Output Impedance	50 ohms
Input Voltage	5 V_{DC}
Host Interface	Micro USB
Operating Temperature	0 ~ 70°C (32 ~ 158°F)
Dimensions	121.5 x 74.2 x 14.5 mm (4.78 x 2.92 x 0.57 in)
Weight	37 g (0.081 lb)

Chapter 3

NFC Agent with DLL Sample Code and Mobile Phone APP

3.1 NFC APP

3.1.1 Introduction

Advantech offers a free app featuring local templates, empowering end users to input data independently.

3.1.2 Preparation

1. An Android phone (version >= 5.0, NFC)
2. Google Play Store
3. Advantech EPD-303 NFC ePaper device

3.1.3 Installation

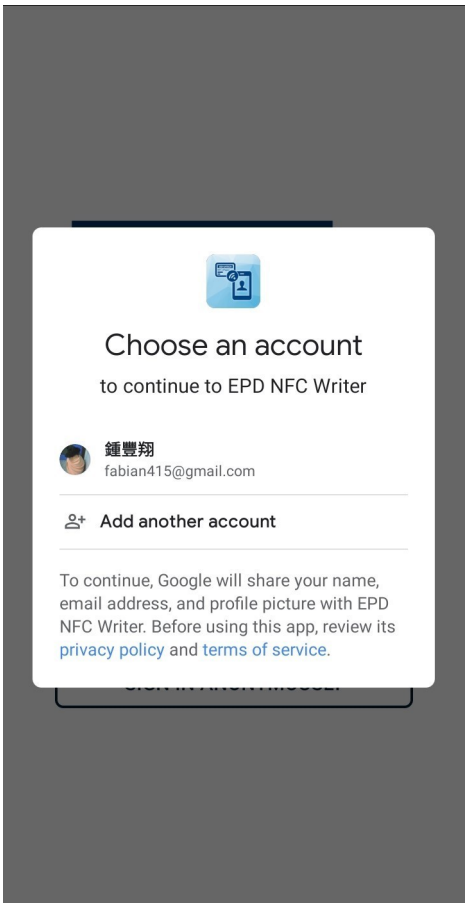
Search for the APP in the Google Play Store. Keyword: **EPD NFC Writer**
https://play.google.com/store/apps/details?id=com.advantech.nfcepaper

3.1.4 Functions

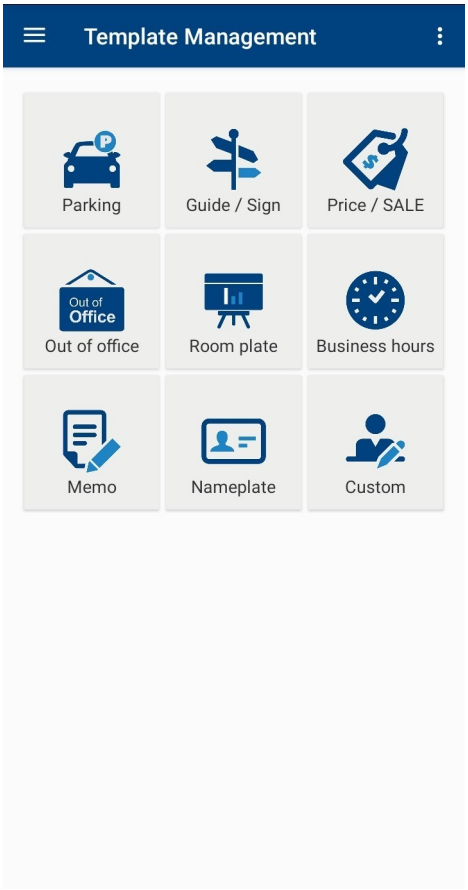
- **Editing and Refreshing Images**

1. Sign in with a Google account or anonymously.
   After opening the NFC APP, the first step is to sign in with a Google account or anonymously.

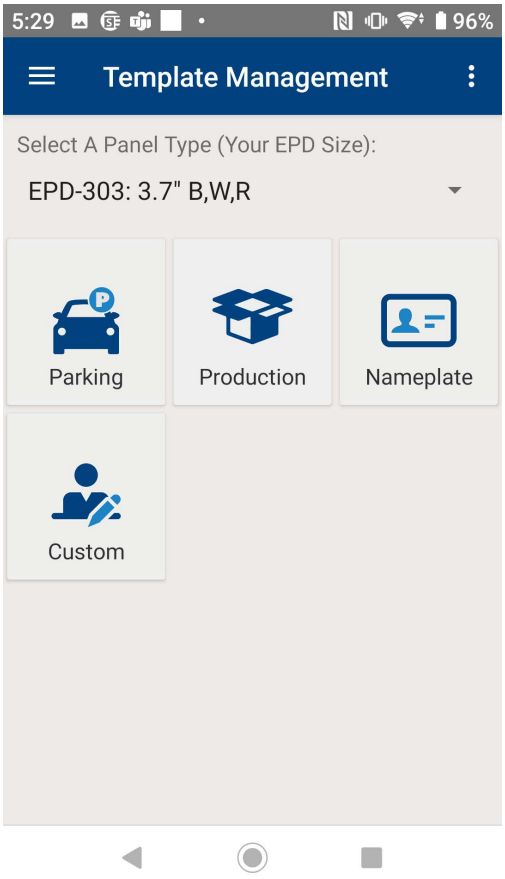
2. Confirm your Google account to sign in.



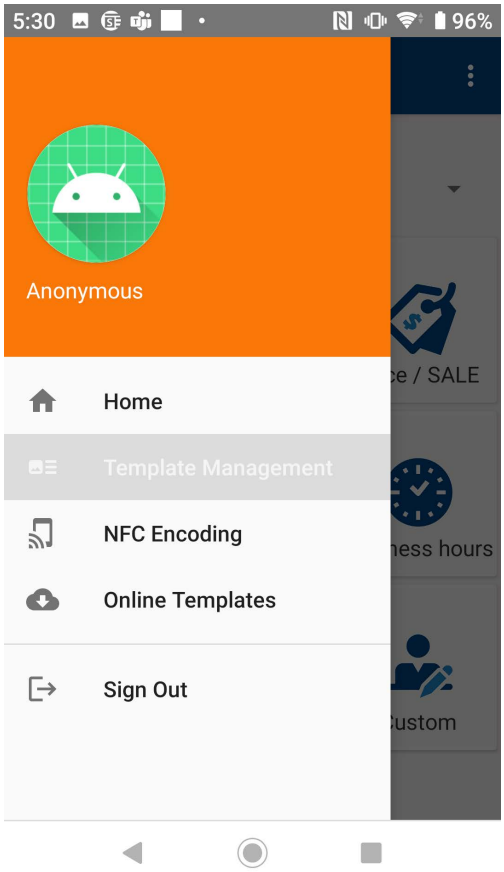
3. First screen after signing in.



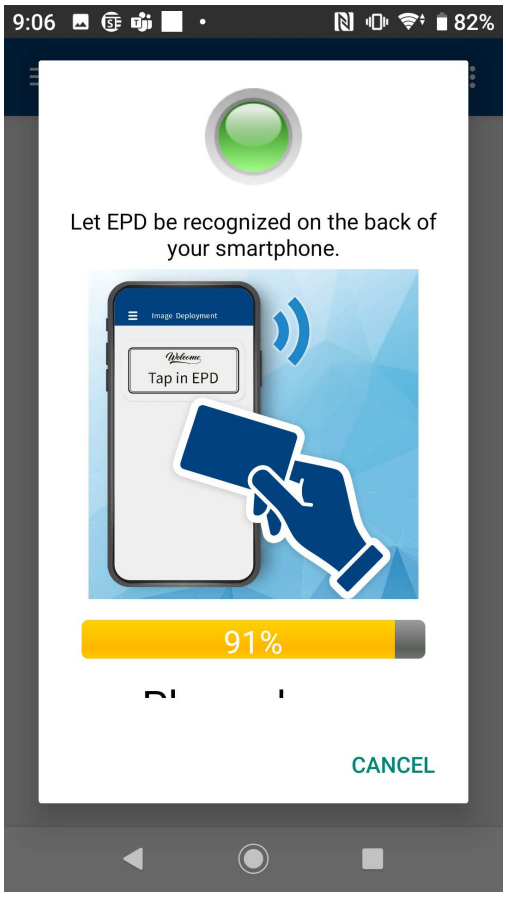
4. Choose your model name: EPD-210 or EPD-303.
The app provides a variety of sample templates for different domains. You can select your preferred template to create an image for the EPD display. For example, consider the price tag template.



5. Create your own template by typing in some user data.



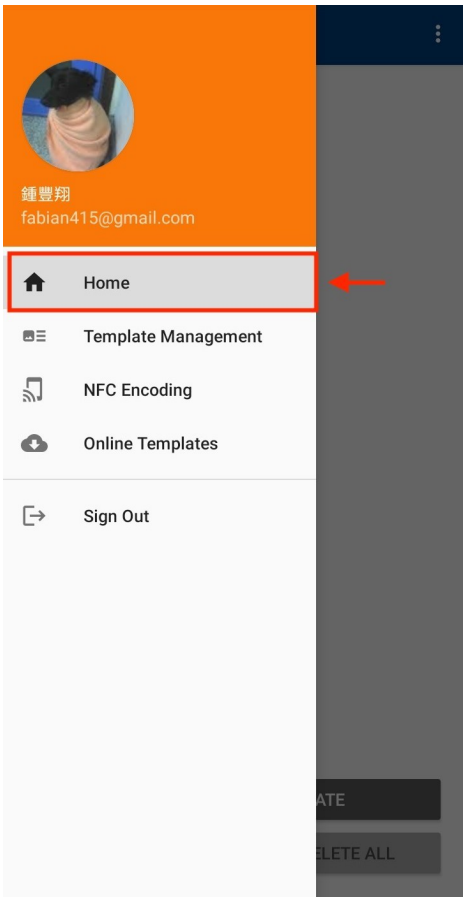
6. The green light indicates successful device detection and image transmission.



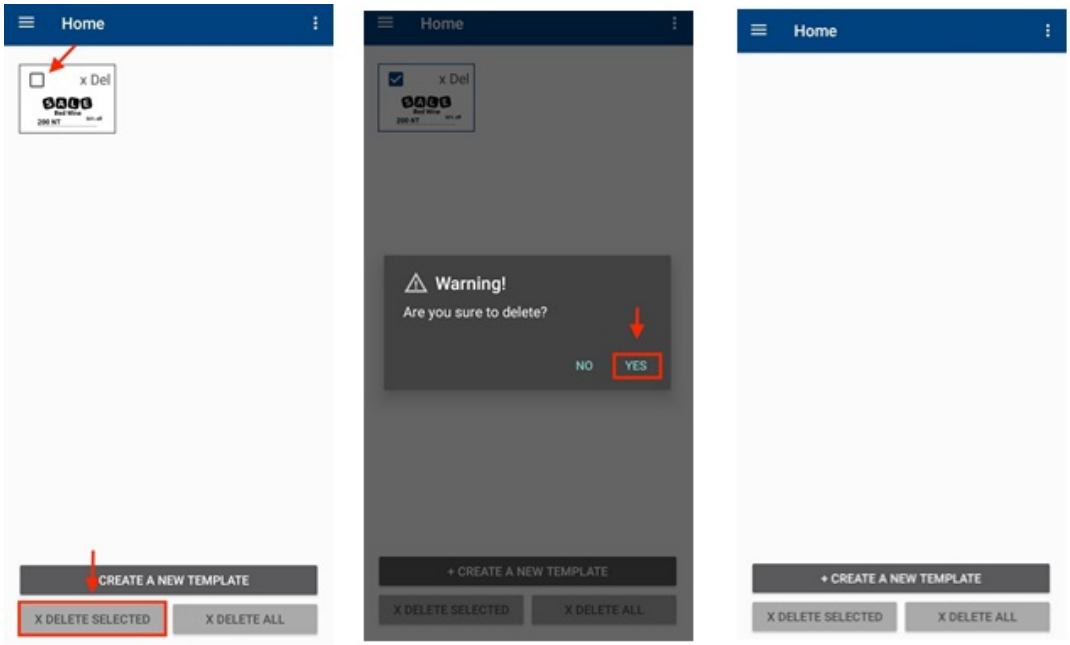
7. Position your mobile phone over the EPD-303 ePaper device, ensuring it matches the NFC icon positioned at the bottom of the ePaper display. Wait until the progress bar reaches completion to confirm successful data transmission.

Image Management

1. Images generated by local templates can be found in the Home section. In this section, you can browse all images and delete unnecessary ones.

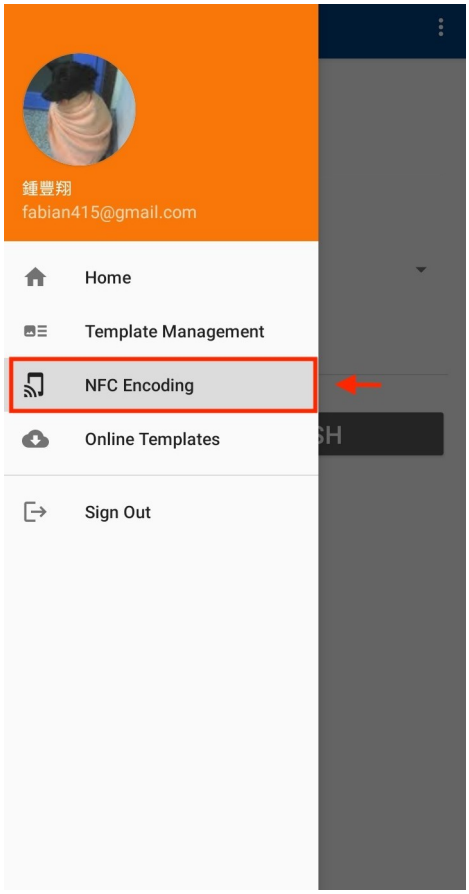


2. Click an image to delete it.

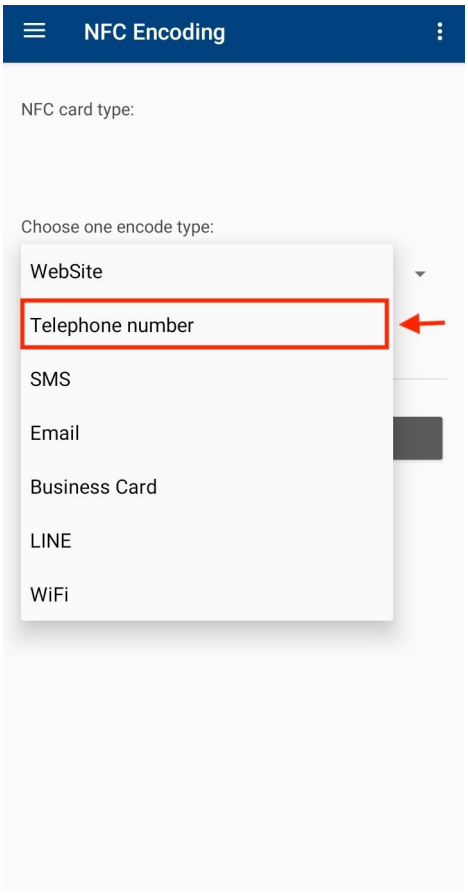


User Data Encoding

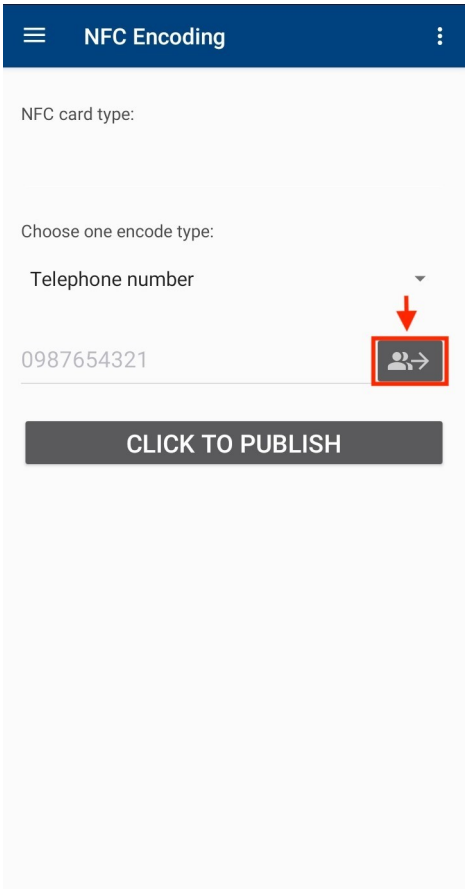
1. Go to the NFC Encoding Page, where you can learn how to encode user data into the EPD-302/EPD-303 card through NFC encoding.



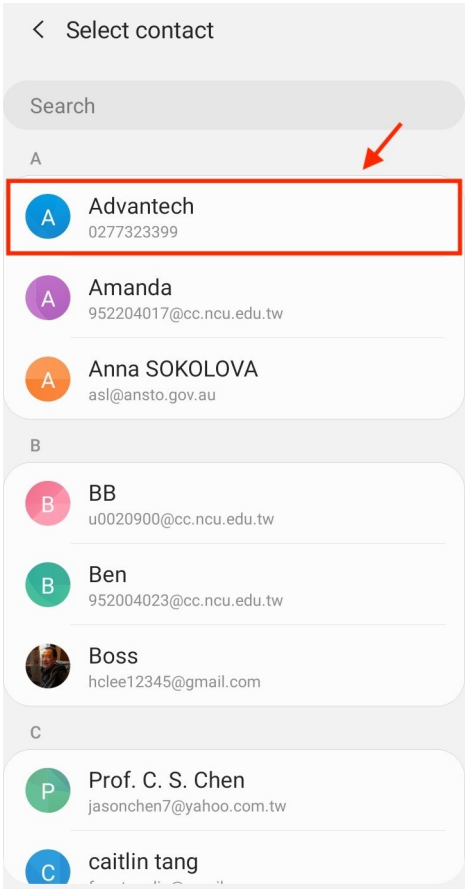
2. Choose an encoding type. We support various types such as Website, Telephone, SMS, Email, Business Card, LINE, and Wi-Fi settings. For this example, we'll use Telephone number.



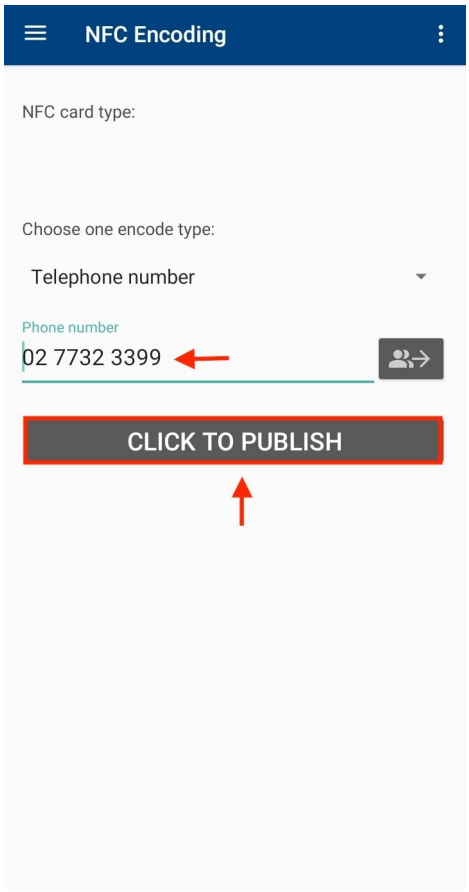
3. You can enter a telephone number manually or select it from your contact list on your Android phone. Here, we'll select one from the contact list.



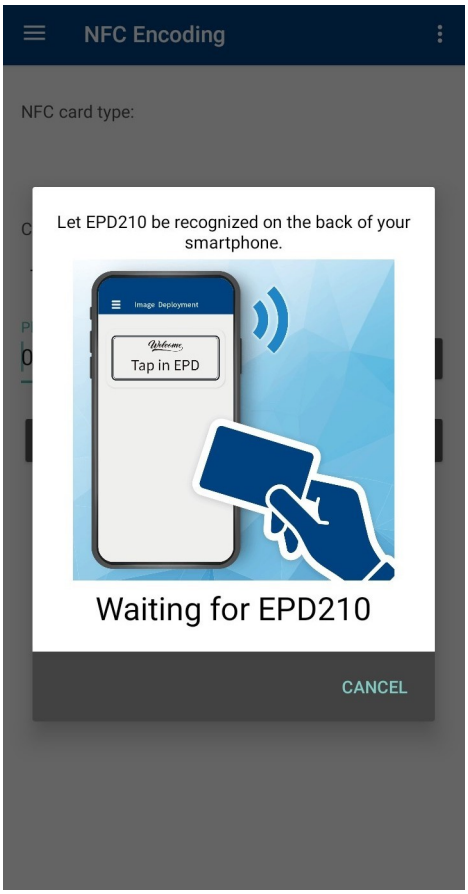
4. Choose a contact with a phone number.



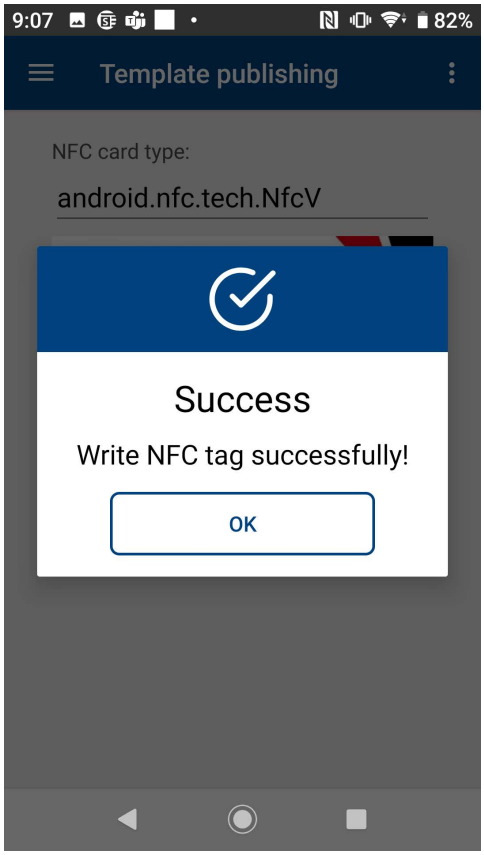
5. You can see the telephone number is filled in. Click the CLICK TO PUBLISH button to start.



6. Place the EPD-303 against the NFC chip location on the back of your Android phone. Please wait patiently until the process completes. If there is an NFC type detection error (e.g., IsoDep), remove the EPD-303 card from your Android phone and try touching it again until the correct NFC type is detected (e.g., NfcV).



7. Data sent successfully.



3.2 NFC DLL: Read/Write Data and Refresh Images

3.2.1 Introduction

Advantech provides NFC driver sample code to help customers seamlessly integrate their WMS or system. This ensures easy deployment and includes functionalities such as device detection, data reading/writing, and image refreshing.

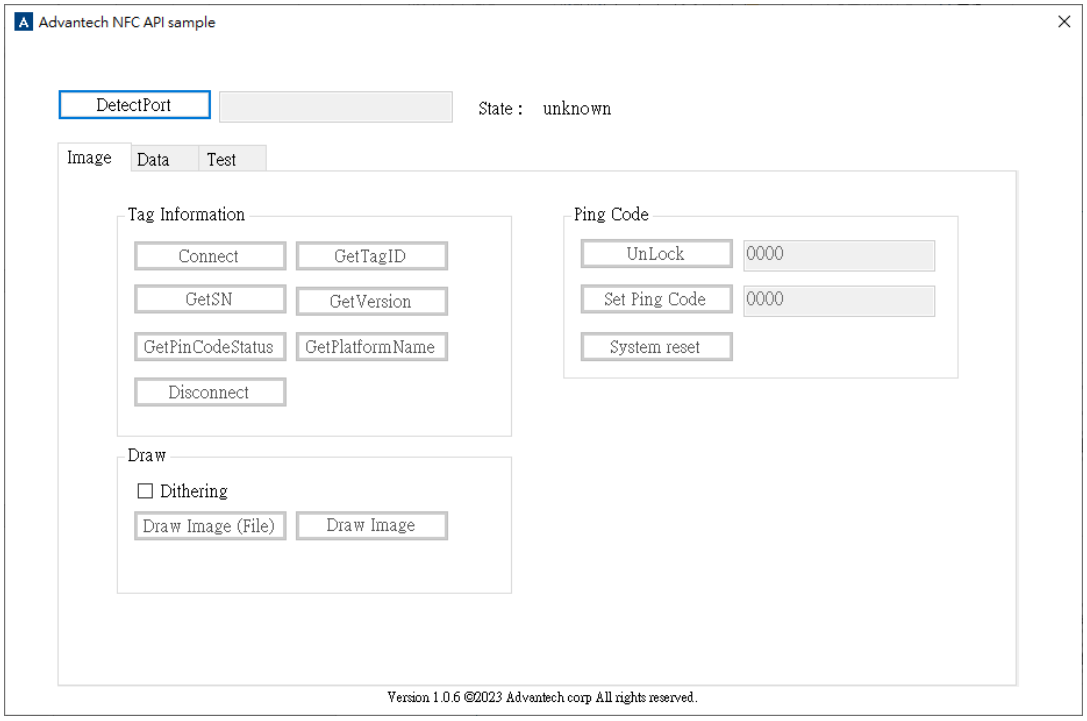
3.2.2 Preparation

1. Kindly request the DLL sample code from Advantech.
2. Driver for USB Serial Port: FTDI (Future Technology Devices International)
3. Microsoft Visual Studio 2017+
4. C# App with Library: NFCApp Release
5. Extra Library: Lz4Net.dll

3.2.3 C# Library for NFC

1. Please request the DLL sample code from Advantech.
2. Connect tag: await oNFC.ConnectTagAsync()
3. Information: oNFC.GetTagID(), oNFC.GetVersion()...
4. Refresh Image: await oNFC.DrawImageAsync(oImage)
5. Read Data: oNFC.GetTagDataFlash()
6. Write Data: oNFC.WriteTagDataFlash (txtTagData.Text)

3.2.4 Sample Programing: NFC APP



3.2.5 Sample Code: Initial Code

- **using AdvNFCWrap;**

```
public partial class Form1 : Form, NFCWrap.TagState, AdvNF-
CWrap.NFCWrap.ProcessState
{
private AdvNFCWrap.NFCWrap oNFC = new NFCWrap();
// TagState callback
public void onTagState(nTagState state)
{
}
// ProcessState callback
public void onProcessState(nImageState state, object data)
{
}
}
```

3.2.6 Sample Code: Detect Port

- **using AdvNFCWrap;**
- **using Gma.QrCodeNet.Encoding;**
- **using Gma.QrCodeNet.Encoding.Windows.Render;**
- **using BarcodeLib;**

```
private AdvNFCWrap.NFCWrap oNFC = new NFCWrap();

enableButtonButtons(false);
string strResult = oNFC.GetPort();
if (strResult != "")
{
    txtPort.Text = strResult;
    oNFC = new NFCWrap(txtPort.Text);
```

```
        enableButtonButtons(true);
    }
```

3.2.7 Sample Code: Connect Tag

- **Connect tag Async**

```
string strReturn = await oNFC.ConnectTagAsync();
MessageBox.Show(strReturn);
```

3.2.8 Sample Code: Get Information

- **Tag ID**

```
String strReturn = oNFC.GetTagID();
MessageBox.Show(strReturn);
```

- **Tag Version**

```
String strReturn = oNFC.GetVersion();
MessageBox.Show(strReturn);
```

3.2.9 Sample Code: Pin Code

- **Unlock**

```
String strReturn = oNFC.UnlockPinCode(txtUnLock.Text);
MessageBox.Show(strReturn);
```

- **Set Pin Code**

```
String strReturn = oNFC.UnlockPinCode(txtUnLock.Text);
if (strReturn == "OK")
{
    strReturn = oNFC.SetPingCode(txtPinCode.Text);
    MessageBox.Show(strReturn);
}
else
{
    MessageBox.Show("UnLock Error");
}
```

3.2.10 Sample Code: Draw Image

- **DrawImage**

```
string strReturn = await oNFC.DrawImageAsync(bitmap);
string strReturn = await oNFC.DrawImageAsync(bitmap,
isDithering);
```

- **Draw Image from File**

```
String strReturn = oNFC.UnlockPinCode(txtUnLock.Text);
if (strReturn == "OK")
{
    OpenFileDialog open = new OpenFileDialog();
    // image filters
    open.Filter = "Image Files(*.png; *.jpg; *.jpeg; *.gif;
*.bmp)|*.png; *.jpg; *.jpeg; *.gif; *.bmp";
    if (open.ShowDialog() == DialogResult.OK)
    {
        Bitmap oImage = new Bitmap(open.FileName);
        strReturn = await oNFC.DrawImageAsync(oImage);
        MessageBox.Show(strReturn);
    }
}
else
```

```
{
    MessageBox.Show(strReturn);
}
```

3.2.11 Sample Code: Draw Image from Code

```
String strReturn = oNFC.UnlockPinCode(txtUnLock.Text);
if (strReturn == "OK")
{
    //Create Image
    Bitmap bitmap = new Bitmap(Convert.ToInt32(296), Con-
vert.ToInt32(128), System.Drawing.Imaging.PixelFormat.For-
mat32bppArgb);
    Graphics g = Graphics.FromImage(bitmap);
    g.Clear(Color.White);
    // Create font and brush.
    Font drawFont = new Font("Arial", 12);
    SolidBrush drawBrush = new SolidBrush(Color.Black);
    StringFormat drawFormat = new StringFormat();
    drawFormat.FormatFlags = StringFormatFlags.NoWrap;
    g.DrawString("CG4C001501", drawFont, drawBrush, 10, 10,
drawFormat);
    g.DrawString("2521M99G14", drawFont, drawBrush, 10, 30,
drawFormat);
    g.DrawString("SER CDACURUC", drawFont, drawBrush, 10,
50, drawFormat);
    ……
```

3.2.12 Sample Code: Read and Write Data

- **Read Data**

```
String strReturn = oNFC.GetTagDataFlash ();
MessageBox.Show(strReturn);
```

- **Set Pin Code**

```
String strReturn = oNFC.WriteTagDataFlash(txtTag-
Data.Text);
MessageBox.Show(strReturn);
```

3.3 Integration Requirements for a 3rd Reader

3.3.1 Integration Requirements for a 3rd Reader

- **SW requirements:**
  Figure 3.1 illustrates the architecture of EPD-302/303, including the system reader and software. If users want to use a third-party reader to control EPD-302/303, they must integrate the FTM application software for NFC first. Data exchange between EPD-302/303 and the reader occurs via FTM, based on ISO 15693. Therefore, it is essential for the reader to support the FTM mailbox NFC protocol. Additionally, users need to develop applications for transferring image data, refreshing images, and other functions. For more information, please contact us to obtain the development document.
  Read more about the FTM SDK:
  https://www.st.com/en/embedded-software/x-cube-nfc5.html#get-software

- **HW requirements:**
  The NFC reader must meet specifications that support the 13.56MHz operating band and comply with the ISO 15693 standard for air interface communication with EPD-302/303. Additionally, it should have an RF output power of at least 200mW (23dBm) for optimal performance, enabling card reading and image refreshing at distances of up to 10 mm.

3.3.2 Integration of NFC Software

Figure 3.1 depicts the architecture of EPD-303, including the system reader and software. If users intend to use a 3rd-party reader to control EPD-303, they must first integrate the FTM application software for NFC. EPD-303 exchanges data with the reader via FTM, based on ISO 15693, necessitating support for the FTM mailbox NFC protocol in the reader. Secondly, users need to develop applications for transferring image data, refreshing images and other tasks. For further details, please contact us to obtain the development document.

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Please verify specifications before quoting. This guide is intended for reference purposes only.

All product specifications are subject to change without notice.