EMV®
Mobile Payment

TapToMobile

User Experience Guidelines

Version 1.0
August 2021

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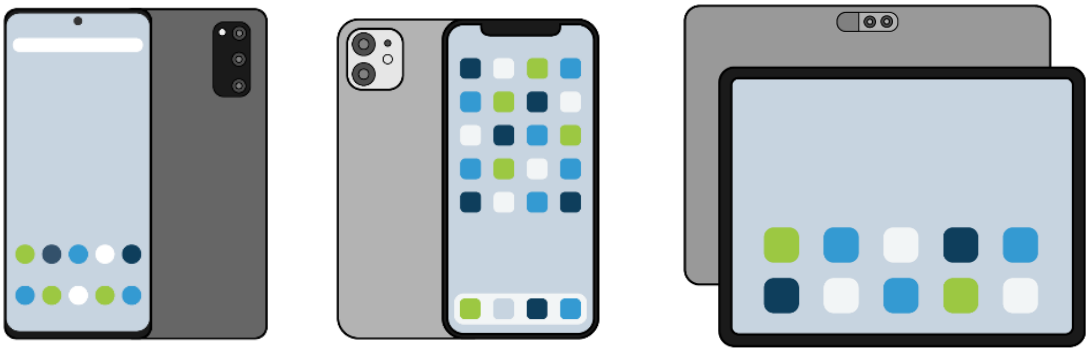
1 Introduction

TapToMobile allows Merchants to accept contactless payments directly on their NFC-enabled consumer mobile devices (phones or tablets) with no need for an additional connected device/dongle/attachment. TapToMobile applies to multi-application, consumer phones or tablets. It does not apply to similar looking devices that are purpose-built [or configured permanently] as payment acceptance terminals. The goal of this document is to highlight the differences between a Traditional Terminal and a TapToMobile solution and identify:

- how these differences effect the user experience and
- what user experience guidance EMVCo can provide to address related issues.

Note: All images in these guidelines are illustrative only and, with the exception of the Contactless Symbol, are not intended to reflect EMVCo requirements or best practices nor represent any specific hardware or device.

The following are illustrative examples of devices that are in scope of these guidelines:



The following are illustrative examples of POS or mPOS devices that are NOT in scope of these guidelines:

1.1 Scope

As with most new experiences, there is typically a learning curve prior to the experience becoming second nature. This is especially true in the contactless payment environment where there have been multiple innovations that have caused a shift in behaviour. For example, the realisation that a growing number of Traditional Terminals capable of accepting contactless payment, to consumers being aware that some of their card products were contactless enabled and, whether contactless enabled or not, that they could add any card to a mobile wallet on their phone. Additionally, for both merchants and consumers, there was a period of surprise and delight that a contactless transaction actually worked, prior to the disbelief seen today in most markets when a traditional terminal does not accept contactless.

TapToMobile is expected to grow the acceptance of contactless exponentially not only in places where Traditional Terminals are typically deployed but also in a whole set of new environments based on the ease in which anyone selling good and/or services can now accept contactless payments if they have an NFC-enabled phone or tablet. However, as with the preceding acceptance, it is necessary that the experience be as intuitive as possible for both the Merchant and Cardholder.

These guidelines are intended to highlight the differences between Traditional Terminals and present guidance that will hopefully be adopted for all TapToMobile deployments making the experience common and intuitive for the Cardholder.

Note: The current version of *[SYMBOL]* includes the following text:

> "The Contactless Symbol is intended only for use at the point-of-sale on EMV specification compliant terminals, and within associated marketing collateral directing consumers where to make contactless payments."

EMVCo is currently investigating the level 1 performance of TapToMobile Devices which could be below that currently defined in the EMV level 1 specifications while still delivering a payment experience fitting the needs for where such devices are deployed.
Until such time that this investigation is completed and a Level 1 program is in place to cater for otherwise complaint TapToMobile Devices, TapToMobile solutions may make use of the Contactless Symbol.

1.2 Target Audience

This document is intended for use by architects, developers, designers and providers of TapToMobile solutions.

1.3 Supporting Documentation

Table 1.1: Related Documentation

Reference	Document
[SYMBOL]	EMVCo Contactless Symbol Reproduction Requirements

1.4 Definitions

Table 1.2: Definitions

Term	Definition
Cardholder Device	Device used by the Cardholder to perform a payment transaction. The Cardholder Device is an NFC-enabled smart device (phone, wearable) capable of performing a contactless payment transaction or a contactless enabled payment card or tag.
Cardholder	The consumer making a payment to the Merchant.
Merchant	The owner of the TapToMobile Device accepting payment from the Cardholder.
TapToMobile Device	NFC-enabled commercial-off-the-shelf consumer mobile device (phone or tablet) without additional hardware used by the Merchant to accept contactless payment transactions.
TapToMobile Application	A Merchant facing application on a TapToMobile Device including functionality to facilitate a TapToMobile Transaction.
TapToMobile Transaction	A contactless payment transaction occurring between a TapToMobile Device and a Cardholder Device.
Hotspot	The location on a mobile device where the NFC Antenna is located and where optimal communication in both Reader/Writer and Card Emulation modes occur.
Hotspot Indicator	A visible indication of the location of the Hotspot.
Contactless Symbol 	An EMV trademarked image. The Contactless Symbol is intended only for use at the point-of-sale on EMV specification-compliant terminals and within associated marketing collateral directing Cardholders where to make contactless payments. See *[SYMBOL]* for reproduction guidelines.

Term	Definition
Traditional Terminal	An EMV specification-compliant point-of-sale capable of accepting contactless payments. Encompassing the terminals typically encountered in store, at kiosks, at transit gates, at the table at restaurants, etc. Includes handheld or tablet style devices that are purpose-built [or configured permanently] as payment acceptance terminals.
CVM	Cardholder Verification Method
CDCVM	Consumer Device Cardholder Verification Method
Operating Volume	The three-dimensional space in which the TapToMobile Device can communicate with a Cardholder Device by means of an electromagnetic field.
NFC	Near Field Communication
NFC Antenna	The antenna used by the TapToMobile Device to generate the electromagnetic field necessary to facilitate communication with a Cardholder Device.

2 Where to Tap

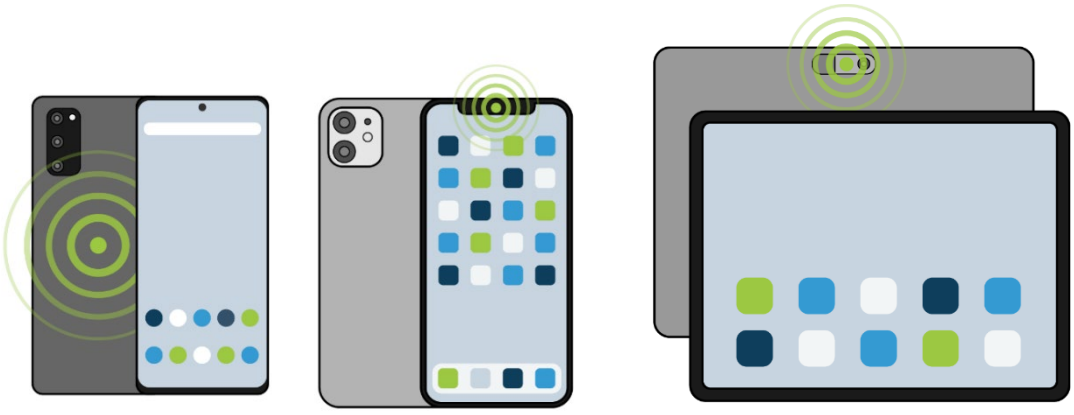
Traditional Terminals are marked with the Contactless Symbol which provides an indication to the Cardholder as to where the Cardholder Device should be “tapped” to ensure a successful transaction (the Hotspot). The Contactless Symbol is widely recognised by consumers and due to the variety of terminal styles and types in the market it is an expected visual aid when making contactless payments.

In addition, the ease of use of Traditional Terminals is assured, with few exceptions, because both the instructions displayed on the terminal screen and the Contactless Symbol are simultaneously in the sightlines of the user and are often co-located.

By contrast, the Contactless Symbol, or any other indicator of the Hotspot, is not typically present on mobile devices. For most TapToMobile Devices, the Hotspot location varies between devices although it is typically located on the back or at the top of the device. Unlike Traditional Terminals, the Operating Volume associated with the Hotspot on a mobile device is likely to be smaller due to lower power capability and constrained NFC Antenna size. This would mean that a more accurate placement of the Cardholder Device is needed for a successful TapToMobile Transaction.

One way to help identify the Hotspot could be to use a ‘Hotspot Indicator’ to show the exact location of the optimum spot for a Cardholder to place their Cardholder Device. However, this may prove difficult since the transaction involves both the front of the device for display purposes as well as the back of the device to perform the transaction. This would become increasingly challenging if the Cardholder presents a digital wallet for payment as there would be two mobile devices with two different Hotspot locations. It would therefore be necessary for both the Merchant and the Cardholder to be aware of the Hotspot location of their respective devices to facilitate a successful TapToMobile Transaction.

The following figures illustrate some examples of where the Hotspot is commonly located for TapToMobile Devices:



2.1 Guidance for a Hotspot Indicator

For optimal user interaction, a TapToMobile Device should provide an indication to the Merchant of the location of the Hotspot on their specific device. When using the EMVCo Contactless Symbol for this indication, these should comply where possible with *[SYMBOL]*.

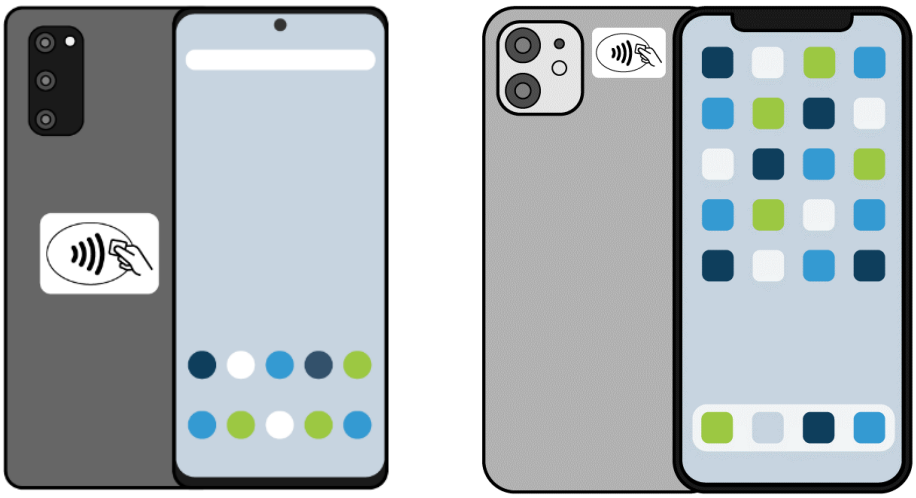
The following sections describe suitable options for providing an indicator which may be used or available singly or in combination.

2.1.1 Sticker

A sticker bearing the Contactless Symbol could be fixed to the TapToMobile Device cover to identify the Hotspot. Ideally this sticker, and placement of such, would be provided (mail, print, etc.) by the solution provider.

The correct positioning information for the sticker placement would be identified, either directly from the user manual provided by the mobile manufacturer or from user instructions provided by the solution provider as indicated in Section 2.3.

The following figures illustrate some examples of where the sticker could be placed for the appropriate TapToMobile Devices:



2.1.2 Mobile Device with co-located Display and Hotspot

Some mobile device manufacturers co-locate the Hotspot with the display. That is, the NFC Antenna may be placed behind the screen or very close to the edge of the screen. For these TapToMobile Devices, the instructions provided by the solution provider (as described in Section 2.1.3) can be enhanced with the user experience presented on the display since the Cardholder can view the screen while tapping occurs.

2.1.3 Display

The Contactless Symbol could be shown on the display by the TapToMobile Application alongside instructions describing where to tap the Cardholder Device.

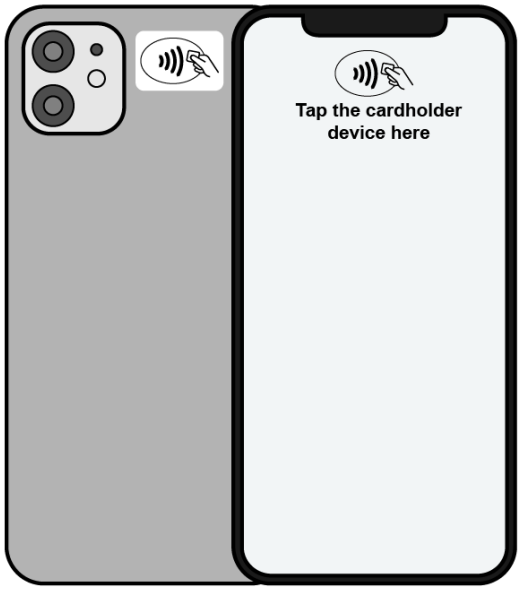
The inclusion of the Contactless Symbol in the displayed interactions provides awareness for the Merchant and the associated instructions to direct the Cardholder to find the Hotspot. Where the display capabilities allow, the Contactless Symbol could be incorporated into an image of the TapToMobile Application in a still or animated manner to provide direction to both the Merchant and the Cardholder.

If placement instructions are displayed to the Merchant, a TapToMobile Application developer might need to incorporate information related to the physical characteristics of the specific TapToMobile Device compatible with the application. If possible, the TapToMobile Application should be able to determine at installation what device it is being installed on and customise the instructions and any images or animations to suit the specific device.

Autorotation of the display (flipping the display between portrait and landscape orientation) should be inhibited during any display of the Contactless Symbol and instructions to avoid disorientation.

Combined use of a Hotspot Indicator in the displayed instructions along with a physical Hotspot Indicator at the Hotspot location would further improve the ease of finding the Hotspot.

The following figure illustrates an example of where the Contactless Symbol may be placed for a TapToMobile Device that has the Hotspot located near the top of the screen:



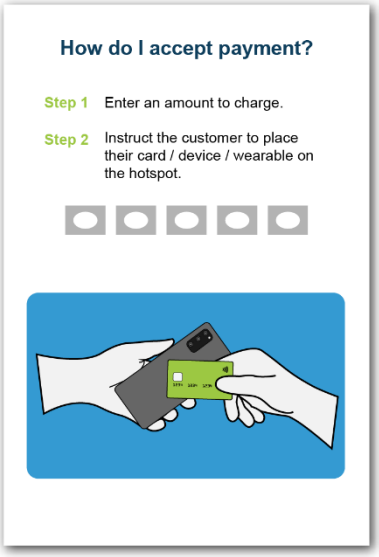
2.2 Merchant Training and Hotspot

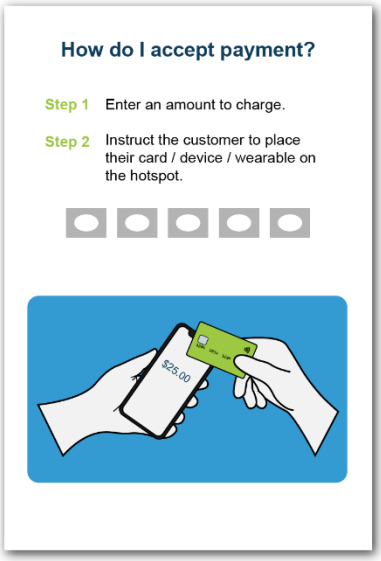
TapToMobile Transactions will primarily occur in the presence of the Merchant. Therefore, as an alternative to marking the Hotspot, the Merchant could undergo training to understand the characteristics of the TapToMobile Device including locating the Hotspot.

Training materials could include printed guidelines, videos or animations within the start-up or Help section of the TapToMobile Application demonstrating correct use of TapToMobile Devices. If printed instructions are being provided, they should cover a wide-range of suitable devices.

The Merchant could guide the Cardholder to tap the Cardholder Device to the Hotspot location on the TapToMobile Device or alternatively the Merchant could tap their TapToMobile Device to the Cardholder Device.

The following illustrates two examples of training material content for TapToMobile Devices that have the Hotspot located in different positions (Note that the white ovals in grey boxes are intended to represent acceptance marks):





3 Reduced Read Range

Traditional Terminals are connected to an electrical socket or extended batteries to supply power to a larger antenna and as such are capable of powering and communicating with a Cardholder Device from a distance of 0–4 cm. This allows a transaction to occur when the Cardholder Device is anywhere within that range and allows for some positional variance. In contrast for TapToMobile Devices due to the reduced read range (smaller antenna/less power), the Cardholder might need to touch and hold the Cardholder Device on the TapToMobile Device as opposed to a tap or wave.

3.1 Merchant Training

The Merchant should inform the Cardholder to touch and hold the Cardholder Device correctly. The Merchant could undergo training to understand the characteristics of their TapToMobile Device including the location of the Hotspot. Training materials could include printed guidelines, videos or animations within the start-up or Help section of the TapToMobile Application which demonstrates the correct use of the TapToMobile Device with a variety of Cardholder Devices (cards, tags, wearables and typical mobile phones used for contactless payments).

The training could also inform Merchants about possible impacts from use of after-market protective / decorative covers for their TapToMobile Devices. Specifically including that:

- A Hotspot Indicator might be obscured if such a cover is used necessitating the placement of an indicator on the outside of this cover.
- Such a cover could impede access to the Hotspot due to physical shape.
- The cover material (or the contents of in-built pockets) could restrict the read range or otherwise impede the transaction.

3.2 Guidance for Developers

The TapToMobile Application can be expected to work reliably with any approved Cardholder Device whenever the Cardholder Device is positioned in close proximity to the Hotspot of the TapToMobile Device.

- The solution provider should be aware of the TapToMobile Devices eligible for their solution and indicate to their customers which devices are appropriate.
- Additionally, the TapToMobile Application itself should be able to determine whether the device it is being installed upon is appropriate for the application.

4 Increased Transaction Time

Traditional Terminals are connected to an electrical socket or extended batteries to supply power to a larger antenna, and as such are capable of powering and communicating with a Cardholder Device with minimal retries or communication errors as well as providing the required field strength to run a processing-intensive operation in the Cardholder Device in a timely manner. In addition, depending on the execution environments used within the TapToMobile Device, processing might be slower than the dedicated hardware used in a Traditional Terminal.

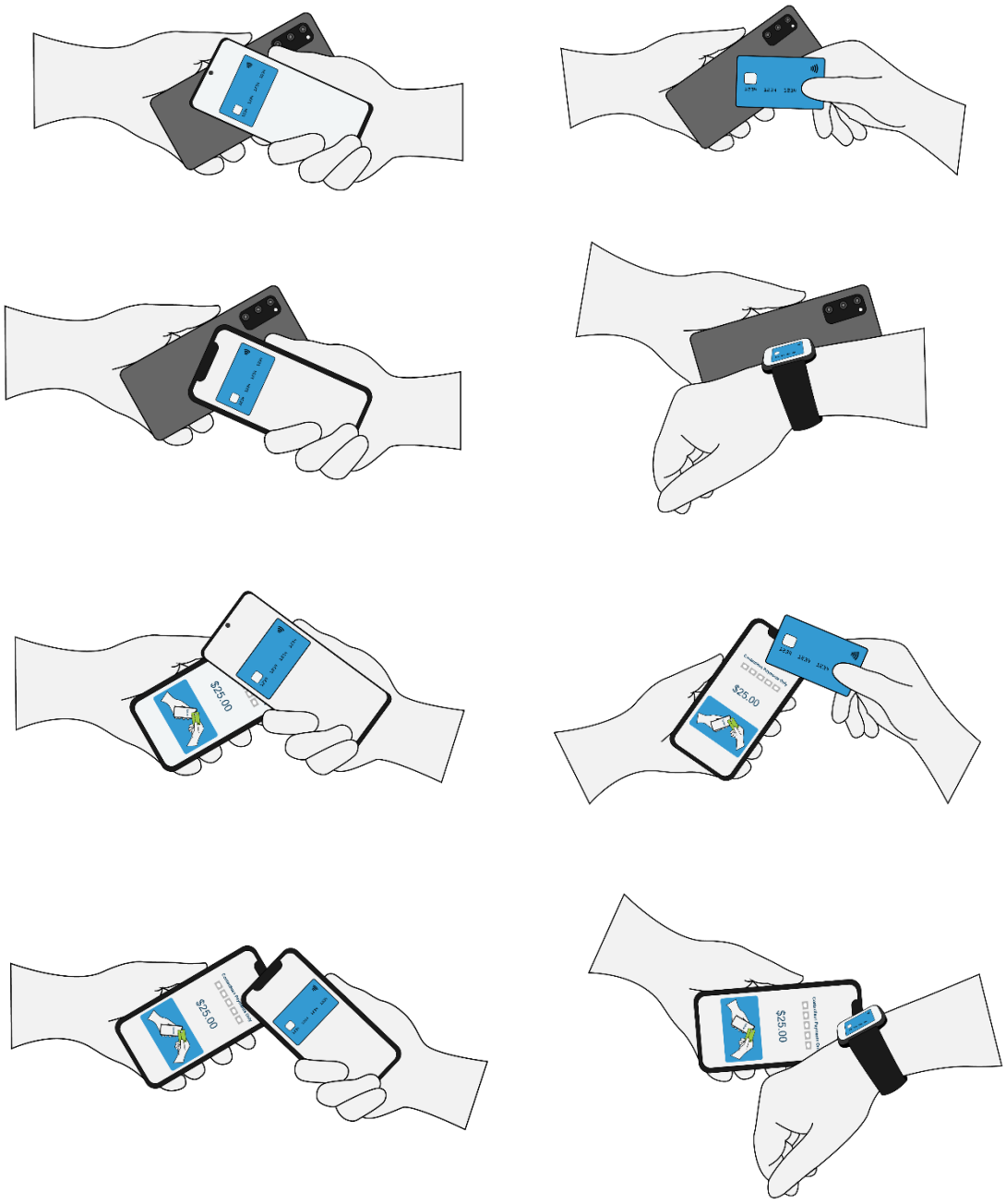
Due to constraints on some Cardholder Device form factors (wearables, metallic cards and biometric cards), as well as imprecise placement when attempting a transaction, contactless payment transactions with TapToMobile Devices might be slower than normal or not work at all.

4.1 Merchant Training

Training materials could include printed guidelines, or videos or animations within the start-up or Help section of the TapToMobile Application, demonstrating correct use of the TapToMobile Device with a variety of Cardholder Device form factors (cards, tags, wearables, common mobile devices used for contactless payments) and provide direction indicating that the Merchant should:

- Tell the Cardholder when the Cardholder Device has been successfully read.
- Warn the Cardholder that for certain Cardholder Device form factors (wearables, metallic cards and biometric cards), the transaction might take longer than normal or is known not to work at all in this environment.

The following are a select, non-exhaustive set of illustrated images that could be provided to demonstrate correct usage of various Cardholder Devices:



4.2 Guidance for Developers

The TapToMobile Application should provide audio and visual animation on transaction progress. The animation should indicate the following steps in the transaction assuming that each step completes successfully:

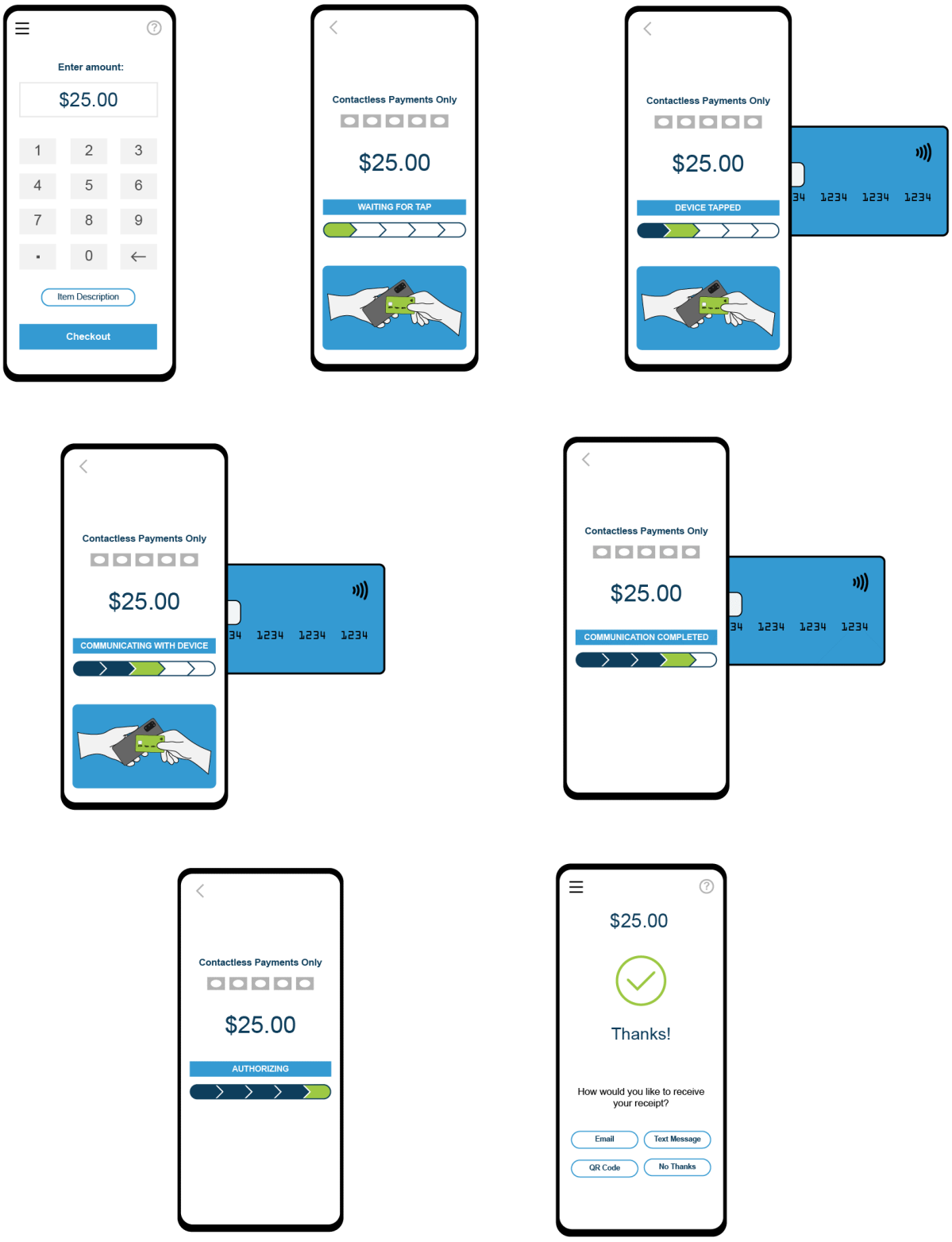
- An initial prompt to tap.
- That communication between the Cardholder Device and the TapToMobile Device is in progress (e.g., start, communication failure, restarting, completion).
- That an authorisation request has been sent.
- That an authorisation response has been received

To avoid the Cardholder Device being removed from the operating field too early there should be a visual and audible indication that shows that the exchange between the TapToMobile Device and the Cardholder Device is progressing.

The TapToMobile Application should be designed so that the status indicator is clearly visible to the Cardholder when a Cardholder Device has been presented and a transaction is in progress.

The TapToMobile Application may use two audio indications, a success tone and an alert tone (failure) to indicate the outcome of the transaction. The indications should be clearly audible and may be complemented by haptics or light to account for the typical background noise of the environment.

The following images illustrate the screen flow and presence of an example progress bar and label that indicate the steps involved in a successful transaction (Note that the white ovals in grey boxes are intended to represent acceptance marks):



5 Cardholder Verification

Under certain circumstances, e.g. when the terminal CVM required limit has been exceeded, Cardholder verification will be required to complete the transaction.

The growing use of mobile devices for payment transactions has enabled CVM to be performed on the Cardholder Device, via passcodes, passwords and patterns, as well as through biometrics such as fingerprint, iris, voice and facial recognition. This type of CVM on a Cardholder Device is known as CDCVM and may alleviate the need for an additional CVM.

However, there are certain markets that may not recognize a CDCVM as an acceptable CVM as well as more traditional Cardholder Devices such as cards and tags that do not support CDCVM. In these cases, Traditional Terminals typically have dedicated peripheral devices, such as PIN pads, for capturing an Online PIN or a printer to print a receipt on which a Cardholder signature can be captured. TapToMobile Devices do not have these peripheral devices but still need to be able to perform these same functions.

Cardholders should be encouraged to continue to protect their CVM (i.e., access to their mobile device or their Online PIN) as sensitive information and therefore would expect to receive the same sense of surety when conducting a TapToMobile Transaction as they would at a Traditional Terminal.

5.1 Online PIN Entry

Support for Online PIN is dependent on market regulations and the required underlying infrastructure. Vendors providing solutions that support Online PIN capture should provide training informing Merchants what to do when this occurs through physical documentation, online documentation, installation guidance, first time occurrence, on each occurrence, etc.

A PIN Pad interface provided by the TapToMobile Application should emulate what the Cardholder is familiar with from Traditional Terminals or ATMs when prompted to enter their PIN. Therefore, as the PIN would be entered on the screen of the TapToMobile Device, it is recommended that the graphical rendering is familiar and should offer a similar experience to those Traditional Terminals.

The following image illustrates an Online PIN entry screen:

(optional screen)

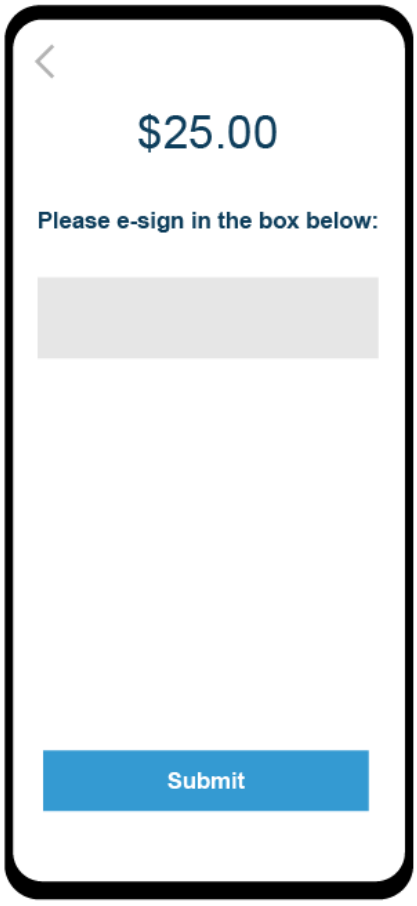
5.2 Signature

In certain markets, signature capture may be the required form of CVM and – if enabled by the TapToMobile Application and when prompted for – will have to occur on the screen of the TapToMobile Device.

Vendors providing solutions that support capture of signature should provide training informing Merchants what to do when this occurs through physical documentation, online documentation, installation guidance, first time occurrence, on each occurrence, etc.

A signature interface provided by the TapToMobile Application should emulate what the Cardholder is familiar with from Traditional Terminals that support signature capture on screen.

The following image illustrates a signature capture screen:



(optional screen)

6 Receipts

A Traditional Terminal has a dedicated printer for providing receipts. As TapToMobile Devices cannot offer the same capability, TapToMobile Applications need to enable a mechanism by which Cardholders can receive receipts for their transactions. Receipts may be in either digital or paper form and the Cardholder should have the ability to request or opt-out of receiving a receipt.

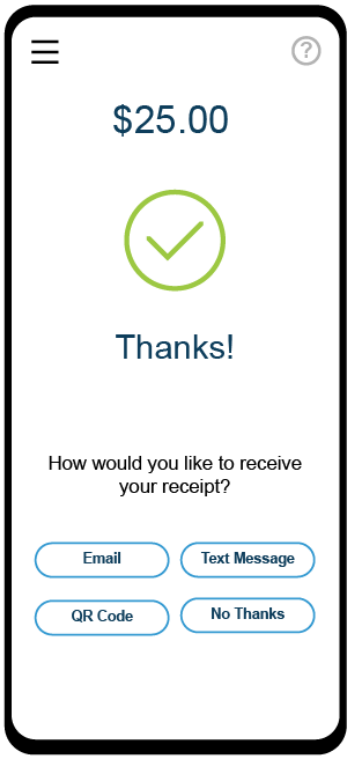
If digital receipts are implemented, the TapToMobile Application will need mechanisms for:

- Generating a digital receipt
- Obtaining the Cardholder's details and delivering the receipt to the Cardholder (e.g. by SMS, email or providing a link to the receipt by QR Code[1]).

There may also to be an option for delivery of paper receipts to allow for:

- Written receipts
- Paper receipts printed using a wireless printer connected to the TapToMobile Device.

The following image illustrates a final screen with receipt options:



[1] QR Code is a registered trademark of DENSO WAVE INCORPORATED.

7 Physical Limitations

7.1 Screen Sharing

Traditional Terminals have a screen facing the Cardholder when a contactless transaction is occurring. This provides information regarding the transaction (amount, instructions, progress, outcome, etc.) to the Cardholder leading up to, during, and on completion of the contactless transaction.

For TapToMobile Transactions, there is typically a single screen for both Merchant and Cardholder use.

Due to the physical limitation, the TapToMobile Device screen is initially Merchant-facing and unlikely to be visible to the Cardholder. After the Merchant has set up the payment, the Cardholder will need access to the display to view and confirm the payment amount and read instructions on how to pay with the TapToMobile Device.

Depending on the location of the Hotspot (e.g. when this at the back of the device) it might not be possible for the Cardholder to view the display while tapping the TapToMobile Device and therefore the Cardholder would have difficulty following payment information such as payment progress, payment completion, etc.

Considering this restriction, a TapToMobile Application design should be Cardholder-friendly making good use of the mobility of TapToMobile Devices.

The TapToMobile Application should provide for the display to transition from Merchant-facing (initiating the transaction and finalising the transaction) to Cardholder-facing. Prior to tapping the TapToMobile Device and the Cardholder Device, the Cardholder should be able to view the display, the transaction amount, transaction details and transaction status (ready to start). For ease of understanding, these details should be presented in an easily recognisable way to the Cardholder and should mirror what the Cardholder currently expects to see at a Traditional Terminal.

Following the transaction completion, the Cardholder should be able to view the transaction outcome. For example, the final transaction amount and the transaction result should be displayed and presented to the Cardholder regardless of success/failure.

7.2 No Chip or Magstripe Reader as Fallback

As a TapToMobile Device has only a contactless interface, there is no option to dip a card for a chip transaction or swipe a card for a magstripe transaction as with a Traditional Terminal. A Cardholder that does not have a Mobile Wallet or contactless card can either be directed to another pay point or directed to use a different payment method.

Vendors should provide training informing Merchants what to do when this occurs through physical documentation, online documentation, installation guidance, first time occurrence, on each occurrence, etc.

8 Mobile Interactions

A Traditional Terminal is designed specifically for performing payments. However, a TapToMobile Device is a multi-functional device which could perform both payment and non-payment functions, such as voice calls, messaging, or other entertainment applications simultaneously. There is a risk of cross interference (e.g. when a non-payment function/notification starts during a transaction and vice versa) that may or may not result in transaction failure. This failure is dependent on a number of factors including but not limited to:

- Operating System handling of simultaneous multiple communication channels and functions (e.g. whether the device prioritizes NFC channel-based functions to allow a transaction to complete when a call or other notification is received).
- The timing of non-payment functions that could start during a transaction (e.g. an incoming call that occurs during Online PIN entry might result in a different transaction status).
- User behaviour if alerted to non-payment functions during a transaction might influence the transaction result (e.g. the Merchant withdrawing the device to answer a call could terminate the communication between the TapToMobile Device and Cardholder Device).

TapToMobile Application developers should be aware of all such interactions that might interrupt, or occur while, the TapToMobile Application is in the foreground. The TapToMobile Application should wherever possible supress these interactions.