Contactless Limits and EMV Transaction Processing

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About the U.S. Payments Forum

The U.S. Payments Forum, formerly the EMV Migration Forum, is a cross-industry body focused on supporting the introduction and implementation of EMV chip and other new and emerging technologies that protect the security of, and enhance opportunities for payment transactions within the United States. The Forum is the only non-profit organization whose membership includes the entire payments ecosystem, ensuring that all stakeholders have the opportunity to coordinate, cooperate on, and have a voice in the future of the U.S. payments industry. Additional information can be found at http://www.uspaymentsforum.org.

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1. Introduction

The U.S. Payments Forum publishes industry guidance on best practices for EMV implementations. The Forum developed this resource for merchants, independent software vendors (ISVs), value-added resellers (VARs), acquirers/processors, and issuers to provide guidance on how contactless limits are used during EMV contactless transaction processing in the U.S.

With the increasing use of contactless transactions in the U.S. market to promote a cleaner payment experience and meet consumer preferences, some consumers have experienced confusion at the point of sale (POS) once EMV contactless functionality is enabled. Similar to enabling EMV contact functionality at the POS, merchants can configure functionality differently, leading to many different consumer experiences. However, unlike EMV contact, many of the varying consumer experiences result from the configuration of contactless limits and the contactless consumer device (e.g., card, mobile phone, wearable) that is being used. As an example, cardholder verification method (CVM) contactless limits can be configured to always require a cardholder to provide a CVM (e.g., PIN) or to only require a CVM over a certain dollar amount. These configurations can lead to different payment experiences and cause consumer confusion.

Throughout the white paper the terms "payment networks," "global payment networks," and "contactless specification" are used. This document uses the following definitions for those terms:

1. Payment networks: Are entities that connect acquirers with issuers and route transactions for payment products that they support. Payment networks include global payment networks and the U.S. debit payment networks.
2. Global payment networks: Are the payment networks that operate globally, such as American Express, Discover, JCB, Mastercard, UnionPay, and Visa.
3. Contactless specifications: Are created and published by each global payment network to define its own terminal and consumer device specifications that support contactless payments. The terminal specifications are used to develop and configure the payment terminal to accept contactless transactions. The consumer contactless device specifications are used for development and for personalizing contactless devices for payment. These specifications have been licensed to the U.S. debit payment networks for enabling contactless transaction processing using the U.S. Common Debit AID.

This white paper was developed to provide guidance to help merchants, acquirers and issuers improve the contactless consumer experience at the POS and address the confusion that is seen in the market. It clarifies the definition of contactless limits for EMV contactless transactions and the differences in implementation requirements for the individual payment networks. The white paper does not discuss EMV contact transactions and their associated limits.

2. Unique Challenges for Contactless Transaction Limits

Each contactless specification defines a unique kernel[1] and implementation, unlike contact EMV, where a single kernel is used. This means that the terminal's payment application uses a separate kernel for each global payment network; each of these kernels may have independent configurations.

2.1 Contactless Specification Differences from Contact Specifications

Each contactless specification is unique and is used to support the requirements of the various payment networks that use these specifications. This uniqueness is most evident in the following aspects:

1. Contactless consumer device risk management capabilities.
2. Contactless reader transaction flow.
3. U.S. Common Debit AID processing. U.S. debit payment networks must support each of the contactless specifications.

These differences impact how a contactless transaction can be identified and processed. For contact EMV transactions, the transaction flow is common for all payment networks (i.e., one kernel works for all). For contactless EMV, the transaction flow differs based on each contactless terminal specification.

With these high-level distinctions in mind, merchants are advised to talk to their acquirers to get information on the applicable terminal configuration settings.

2.2 Contactless Limits in the Reader

Three terminal limits (described below) are applicable for contactless payments as of the date of this paper's publication. Merchants should check with their acquirers and payment network representatives to establish current applicable limits.

- Contactless floor limit: Transactions above this amount require an online authorization by the card issuer. This limit is set to zero in the U.S. for all payment networks.

- CVM limit: Transactions above this limit require cardholder verification to be performed with the complete capabilities of the terminal for a given contactless AID.[2] Transactions below this limit may still require a CVM to be performed, dependent upon the contactless consumer device profile settings for a specific payment network and the payment network requirements. If a CVM is not performed, acquirers may have a liability impact for transactions above the CVM limit. Additional information can be found in the payment network definitions for CVM limits in Section 3.1 and Section 3.2.

- Contactless transaction limit: Transactions above this amount cannot be processed using the contactless interface. Additional information can be found in the payment network definitions for contactless transaction limits in Section 3.1 and Section 3.2.

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[1] An EMV kernel is a set of functions that provides the processing logic and data that is required to perform an EMV contact or contactless transaction.

[2] An AID is an alpha numeric representation of the application defined within ISO 7816 and a data label that differentiates payment systems and products. The card issuer uses the data label to identify an application on the card or terminal. Cards and terminals use AIDs to determine which applications are mutually supported, as both the card and the terminal must support the same AID to initiate a transaction. Both cards and terminals may support multiple AIDs. An AID consists of two components, a registered application identifier (RID) and a proprietary application identifier extension (PIX).

2.3 Issuer-Managed Contactless Limits

Aside from the contactless reader limits covered in Section 2.2, issuers may implement additional contactless limits with their contactless consumer devices or authorization practices. Contactless consumer device limits can be used to limit the use of contactless devices without cardholder verification being performed. Although this practice is not common for U.S. market issuers, it is widely used by international issuers, at times due to regulatory requirements such as Payment Services Directive 2 (PSD2) requirements in the European Union (E.U.) and European Economic Area (EEA). These limits may be set at market or issuer levels. U.S. merchants should take issuer-managed contactless limits into consideration, as they may lead to a different contactless consumer experience.

Where contactless consumer device or authorization limits are used, issuers may restrict the number of consecutive contactless transactions, or the cumulative contactless transaction amount, for transactions without cardholder verification. Once the defined thresholds have been exceeded, the following may occur:

- PIN entry without a re-presentment of the contactless consumer device may be requested (currently not supported for U.S. merchants).

- The cardholder may be requested to perform a CVM for transactions under the contactless CVM limit.

- The cardholder may be requested to continue the transaction by inserting the chip card to complete the transaction after a contactless tap.

- The transaction may be declined.

The outcome will be dependent on the payment network's rules; specific response codes may be used for this purpose. Merchants should work with their acquirers and payment networks to implement proper measures to handle issuer responses.

2.4 Merchant-Supported CVMs

When CVM processing is supported, merchants should try to support all applicable CVMs allowed by the payment networks they support. In cases where the CVMs supported by the contactless consumer device are not supported by the reader, "switch interface" may be invoked. Switch interface refers to a process where a dual-interface card (which has both contact and contactless interfaces) is used first with the contactless interface, but cannot complete the transaction with that interface. When a switch interface is invoked, the reader will request the cardholder to complete the transaction using the card's contact interface.

For example, switch interface may be invoked for the following scenario. CVM processing is enforced by the reader, but the reader is not configured to support the signature CVM. If a signature CVM is returned by the contactless consumer device, switch interface may be invoked. Refer to the tables in Section 3.1 and Section 3.2 for a list of supported CVMs for each payment network.

Note: While payment networks may allow signature prompting and capture to be optional, the signature CVM should still be configured in the reader when the reader supports CVM processing; this will prevent switch interface to contact chip processing. However, merchants should consult with their acquirer and/or solution providers to determine if signature prompting can be disabled if not required by the network.

Note: When using a mobile device for transactions over the contactless CVM limit, Cardholder Device CVM (CDCVM) processing should be enabled in the reader for each supported AID to prevent potential acceptance issues.

2.5 Differences Among Contactless Consumer Devices

During a contactless transaction, the reader may identify the type of contactless consumer device that is being used (e.g., card, mobile phone, wearable). The type of device may have an impact on the transaction processing outcome as it relates to CVM methods, CVM limits, and interface switching capabilities.

Table 1. Contactless Consumer Device Differences

	Card	**Mobile/Wearable**
CVM Methods	Online PIN, Signature and/or No CVM[3] may be supported.	CDCVM, Online PIN, Signature and/or No CVM[2] may be supported.[4]
Contactless Limits	No payment network difference for contactless cards and mobile devices.	
Switch Interface Capabilities[5]	Under certain conditions (based on the profile settings defined by the issuer on the chip and/or contactless limit settings), either the card or the terminal may trigger a switch to the contact interface.	Not applicable

2.6 Transaction Processing Differences Between Contact and Contactless

EMV contact transactions are defined by EMVCo in several specifications[6] which describe how a single kernel on the terminal interacts with the various chip card applications. A card and terminal will follow the same general transaction flow for each payment network. (Note that this applies to both full EMV and Faster EMV[7] solutions.)

Contactless transactions differ from EMV contact transactions; the requirements and transaction processing are defined by each contactless specification. As a result, a contactless reader will have a separate kernel for each contactless specification application supported. Although each contactless application may have different transaction processing flows, they all have similar considerations with slight variations:

1. Contactless transactions will always have the contactless consumer device removed prior to online processing.
2. Each contactless kernel may have different limits and risk management steps so different configurations may be needed for each kernel and AID supported.

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[3] For transactions above the terminal contactless CVM limit, No CVM is not applicable.

[4] Note that additional CVMs may be prompted even if CDCVM is performed.

[5] Different circumstances for capability to switch interfaces are dependent on global payment network application capabilities.

[6] EMVCo specifications for EMV contact can be found at https://www.emvco.com/emv-technologies/contact/.

[7] Additional information on Faster EMV can be found in the U.S. Payments Forum white paper, "Optimizing Transaction Speed at the Point of Sale," https://www.uspaymentsforum.org/optimizing-transaction-speed-at-the-point-of-sale/.

3. A contactless reader may not request a CVM if the transaction amount is below the kernel-defined contactless CVM limit; however, a contactless consumer device may request a CVM based on its own risk management settings (e.g., CDCVM).

Contactless limits play a key role in determining how contactless transactions will be processed and processing can vary by payment network. In addition to configuring the contactless limits for each payment network for online/offline processing and understanding the impact on merchant stand-in/store-and-forward, merchants should also examine other implementation considerations. Functionality such as cash back, money orders, discounting per card type, AID, or any other merchant-defined functions that could require card information which could alter the payment amount or transaction type may result in EMV contactless transactions performing differently than EMV contact transactions. Merchants should consult with their acquirers and/or solution providers to determine any potential impacts.

3. Payment Network U.S. Contactless Limits

Contactless specifications, terminal parameters, and AIDs all have limits, parameters, and implementation considerations. In addition, each payment network has its own operating rules, restrictions for limits, liability, and other considerations. Table 2 and Table 3 include information from each of the payment networks participating in this white paper. Merchants are advised to consult with their acquirers and each supported payment network to get current information.

Payment network limits and considerations may include:

- Contactless floor limit
- Contactless CVM limit
- Contactless transaction limit
- Cash back
- CVM types supported
- Liability

Notes:
- The contactless CVM values listed in the tables are current production settings and may not reflect values used for EMV Level 3 certification. Merchants should talk to the acquirers and/or solution providers to determine the correct values for each AID supported.
- All values listed in Table 2 and Table 3 are in U.S. dollars.
- Merchant Category Code (MCC) restrictions are defined in each payment network's operating regulations.

It is also important to note that there may be liability implications associated with contactless limits. Please refer to the U.S. Payments Forum white paper, "Understanding Fraud Liability for EMV Contact and Contactless Transactions in the U.S."[8]

3.1   Attended Transactions – U.S.

Table 2 includes payment network contactless limits and implementation considerations for attended transactions in the U.S.

Note: For debit networks, support for No CVM contactless transactions require merchants and acquiring processors to be registered and enabled for PIN-less transactions.

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[8] https://www.uspaymentsforum.org/understanding-the-u-s-emv-fraud-liability-shifts/

Table 2. Payment Network Contactless Limits and Considerations – U.S. Attended Transactions

Payment Network	Contactless Limits (For All Contactless Consumer Device Types)			Cash Back Considerations	CVM Types Supported Under CVM Limit[9]	CVM Types Supported Over CVM Limit[9]
	Contactless Floor Limit	Contactless CVM Limit	Contactless Transaction Limit			
American Express	Zero	$200.01 A CVM is required for transaction amounts equal to and above this limit. Signature is not required for any card-present EMV transaction.	The highest possible technical limit in the terminal (e.g., 999999.99)	N/A	CDCVM No CVM required Online PIN Signature	CDCVM Online PIN Signature
Discover Network	Zero Discover Network does not mandate a contactless floor limit.	$100 Signature is not required for any card-present transaction. Discover Network does not mandate a CVM Limit, but transactions above $100 are subject to dispute if PIN or CDCVM is not obtained.	N/A This can be set to the maximum value technically possible. Discover Network does not mandate a contactless transaction limit.	Acquirers may not permit merchants assigned some MCCs listed in Discover Network's Operating Regulations to offer cash at checkout. The maximum amount of cash at checkout that a merchant may disburse to a cardholder is $100.00, unless otherwise provided in the acquirer agreement. The merchant may, in its discretion, establish a lower limit on the amount of cash at checkout that such merchant will provide as cash at checkout to a cardholder. Cash at checkout may only be dispensed in card-present card sales, but not in card-present recurring payments transactions. Refer to Discover Network's Operating Regulations for	CDCVM Online PIN No CVM Signature	CDCVM Online PIN No CVM Signature

[9] CVM types are listed in alphabetical order, and not priority order.

Payment Network	Contactless Limits (For All Contactless Consumer Device Types)			Cash Back Considerations	CVM Types Supported Under CVM Limit[9]	CVM Types Supported Over CVM Limit[9]
	Contactless Floor Limit	Contactless CVM Limit	Contactless Transaction Limit			
				further information on cash at checkout.		
Mastercard	Zero	CVM limit defines when CVM processing is required. Applied CVM may be any method, not necessarily limited to PIN. Under the CVM limit, the terminal should only support No CVM. CVM limit for the U.S. market is $100. Signature collection is optional for all transactions.	N/A Set to the maximum value allowed on other interfaces.	Online PIN is required for cash back transactions.	No CVM is the only CVM supported for transactions under CVM limit	CDCVM Online PIN Signature
Visa	Zero	No (CVM) limit is required for EMV terminals in the U.S. If a merchant elects to use a limit, use a high value (i.e., $200). Signature is optional for all chip transactions.	N/A Set to the maximum value allowed	Online PIN is required for cash back transactions.	CVM processing bypassed. This is how No CVM is supported on contactless. No liability shift for Visa.	CDCVM Online PIN Signature
JCB	Refer to Discover Network input for JCB requirements.			Not allowed	Refer to Discover Network input for JCB requirements.	
NYCE Payment Network	Zero	PIN is optional for all chip transactions. Signature is optional for all chip transactions.	N/A Set to the maximum value allowed.	PIN is required for cash back.	No CVM Online PIN	No CVM (includes Signature) Online PIN
STAR	Zero	PIN is an optional CVM for all transactions. Signature is an optional CVM for all transactions.	N/A Set to the maximum value permitted.	Online PIN is required for cash back.	No CVM Online PIN Signature	No CVM Online PIN Signature

Payment Network	Contactless Limits (For All Contactless Consumer Device Types)			Cash Back Considerations	CVM Types Supported Under CVM Limit[9]	CVM Types Supported Over CVM Limit[9]
	Contactless Floor Limit	Contactless CVM Limit	Contactless Transaction Limit			
Armed Forces Financial Network (AFFN)	Zero	PIN is optional for all chip transactions. Signature is optional for all chip transactions,	N/A Set to the maximum value allowed.	PIN is required for cash back.	No CVM Online PIN	No CVM (includes Signature) Online PIN
CUliance	Zero	PIN is optional for all chip transactions. Signature is optional for all chip transactions.	N/A Set to the maximum value allowed.	PIN is required for cash back.	No CVM Online PIN	No CVM (includes Signature) Online PIN
PULSE	Zero	No limit	No limit	PIN is required on all cash back transactions.	No CVM (including Signature via No CVM option) Online PIN	No CVM (including Signature via No CVM option) Online PIN
UnionPay International	Zero	$100.00 Signature is not required.	$9,999,999,999.99 No limit	N/A	CDCVM No Signature PIN Signature	CDCVM No Signature PIN Signature
SHAZAM	Zero	No limit Above $100, if PIN is not obtained, transactions are subject to dispute with valid fraud reason.	No limit	PIN is required.	No CVM (including Signature via No CVM option) Online PIN	No CVM (including Signature via No CVM option) Online PIN
Accel	Zero	PIN is an optional CVM for all transactions. Signature is an optional CVM for all transactions.	N/A Set to the maximum value allowed	Online PIN is required for cash back.	No CVM (including signature option via CVM type of No CVM) Online PIN	No CVM (including signature option via CVM type of No CVM) Online PIN

3.2 Unattended Transactions – U.S.

Cardholder activated terminals (CATs) are unattended terminals that are frequently installed at train and subway ticketing stations, gas stations, toll roads, parking garages and other sites where there is no attendant. The cardholder is typically guided through the payment process by a series of requests displayed on the terminal's screen.

Contactless CVM limits and contactless transaction limits for unattended transactions generally vary depending on the CAT level.

The main types of cardholder activated terminals are the following:
- Dual CAT (1/2): Automatic Fuel Machines
- CAT Level 1: Automated Dispensing Machines
- CAT Level 2: Self-Service Terminals
- CAT Level 3: Limited Amount Terminals
- CAT Level 4: In-Flight Commerce (IFC) Terminals

Table 3 includes payment network limits and implementation considerations for unattended transactions in the U.S.

Note: For debit networks, support for No CVM contactless transactions require merchants and acquiring processors to be registered and enabled for PIN-less transactions.

Table 3. Payment Network Contactless Limits and Considerations – U.S. Attended Transactions

Payment Network	Contactless (For All Contactless Consumer Device Types)			Cash Back Considerations	CVM Types Supported Under CVM Limit[10]	CVM Types Supported Over CVM Limit[10]
	Contactless Floor Limit	Contactless CVM Limit	Contactless Transaction Limit			
American Express	No difference for unattended. Please see attended requirements in Table 2.					
Discover Network	Zero Discover Network does not mandate a contactless floor limit.	$100 Signature is not required for any card-present transaction. Discover Network doesn't mandate a CVM limit, but transactions above $100 are subject to dispute if PIN or CDCVM is not obtained.	N/A This can be set to the maximum value technically possible. Discover Network does not mandate a contactless transaction limit	If an acquirer's merchants first offer cash at checkout on or after April 15, 2011, the acquirer shall ensure that their merchants do not offer cash at checkout at self-service terminals. An acquirer's merchants that offer cash at checkout before April 15, 2011 may use self-service terminals to offer cash at checkout under the conditions described in Discover	CDCVM No CVM Online PIN	CDCVM No CVM Online PIN

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[10] CVM types are listed in alphabetical order, and not priority order.

Payment Network	Contactless (For All Contactless Consumer Device Types)			Cash Back Considerations	CVM Types Supported Under CVM Limit[10]	CVM Types Supported Over CVM Limit[10]
	Contactless Floor Limit	Contactless CVM Limit	Contactless Transaction Limit			
				Network's Operation Regulations. Acquirers may not permit merchants assigned some MCCs listed in Discover Network's Operation Regulations to offer cash at checkout. The maximum amount of cash at checkout that a merchant may disburse to a cardholder is $100.00, unless otherwise provided in the acquirer agreement. The merchant may, in its discretion, establish a lower limit on the amount of cash at checkout that such merchant will provide as cash at checkout to a cardholder. Cash at checkout may only be dispensed in card-present card sales, but not in card-present recurring payments transactions. Refer to Discover Network's Operating Regulations for further information on cash at checkout.		
Mastercard	Mastercard has specific transaction processing rules for unattended terminals based on the CAT level of terminal. Please refer to Mastercard documentation for details.					
Visa	No difference for unattended. Please see attended requirements in Table 2.					
JCB	Refer to Discover Network input for JCB requirements.					
NYCE	No difference for unattended. Please see attended requirements in Table 2.					
AFFN	No difference for unattended. Please see attended requirements in Table 2.					
CUliance	No difference for unattended. Please see attended requirements in Table 2.					

Payment Network	Contactless (For All Contactless Consumer Device Types)			Cash Back Considerations	CVM Types Supported Under CVM Limit[10]	CVM Types Supported Over CVM Limit[10]
	Contactless Floor Limit	Contactless CVM Limit	Contactless Transaction Limit			
STAR	No difference for unattended. Please see attended requirements in Table 2.					
PULSE	Zero	No limit	No limit	PIN is required on all cash back transactions.	No CVM (including Signature via No CVM option) Online PIN	No CVM (including Signature via No CVM option) Online PIN
UnionPay International	Zero	$100.00 Signature is not required.	$9,999,999,999.99 No limit.	N/A	CDCVM No CVM PIN	CDCVM No CVM PIN
SHAZAM	Zero	No limit Above $100, if PIN is not obtained, transactions are subject to dispute with valid fraud reason.	No limit	PIN is required.	No CVM (including Signature via No CVM option) Online PIN	No CVM (including Signature via No CVM option) Online PIN
Accel	No difference for unattended. Please see attended requirements in Table 2					

4. Conclusions

EMV contactless payment transactions are increasing in the U.S. market, both from consumer preference and from the payments industry promoting contactless as an approach to achieve a faster and cleaner payment experience during the COVID-19 pandemic.

Unlike contact EMV, contactless implementations use a unique kernel for each contactless specification. As a result, the experience at the POS can vary and create consumer confusion. Key factors in this variation are the different limits set for contactless transactions by each payment network.

This white paper documents the various contactless limits required by the participating payment networks that merchants and consumer contactless devices use, along with considerations for implementation. These considerations also highlight the challenge in setting specific limits for contactless debit transactions where multiple payment networks use the same U.S. Common Debit AID but have different contactless CVM limits. For transactions that use a global AID, the tables in Section 3 specify the relevant global payment network limits that should be set.

The goal was to provide a resource that merchants, ISVs, VARs, acquirers, and issuers can consult to assess how to implement a more consistent consumer experience. Merchants are advised to consult with their acquirers, solution providers and payment network representatives to get the most up-to-date information and to discuss the implications for their implementation.

5. Legal Notice

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