

# **EMV<sup>®\*</sup>**

# **Contactless Specifications for Payment Systems**

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## **Book C-3**

## **Kernel 3 Specification**

Version 2.1  
March 2011

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# **EMV Contactless Specifications for Payment Systems**

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### **Kernel 3 Specification**

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# Contents

|          |                                                        |           |
|----------|--------------------------------------------------------|-----------|
| <b>1</b> | <b>General .....</b>                                   | <b>1</b>  |
| 1.1      | Scope.....                                             | 1         |
| 1.2      | Audience.....                                          | 1         |
| 1.3      | Volumes of the Contactless Specifications.....         | 1         |
| 1.4      | Reference Materials.....                               | 2         |
| 1.5      | Terminology .....                                      | 4         |
| 1.5.1    | Implementation and Support Terminology .....           | 4         |
| 1.5.2    | “Else” with Parenthesized Text .....                   | 5         |
| 1.5.3    | Legacy References .....                                | 5         |
| 1.6      | Flowcharts .....                                       | 5         |
| 1.7      | Format of Indicators.....                              | 5         |
| 1.8      | Outcomes .....                                         | 5         |
| 1.9      | Overview.....                                          | 6         |
| <b>2</b> | <b>Overview of the Kernel 3 Approach .....</b>         | <b>7</b>  |
| 2.1      | EMV Mode Configuration.....                            | 8         |
| 2.2      | Mag-Stripe Mode Configuration.....                     | 9         |
| 2.3      | Kernel 3 Processing Overview.....                      | 9         |
| 2.3.1    | First or Second Presentment .....                      | 11        |
| 2.4      | New Transaction Processing Sequence .....              | 12        |
| 2.4.1    | Initiate Application Processing .....                  | 12        |
| 2.4.2    | Read Application Data .....                            | 13        |
| 2.4.3    | Card Read Complete .....                               | 13        |
| 2.4.4    | Processing Restrictions (EMV Mode) .....               | 13        |
| 2.4.5    | Offline Data Authentication (EMV Mode) .....           | 13        |
| 2.4.6    | Cardholder Verification (EMV Mode) .....               | 14        |
| 2.4.7    | Online Processing (EMV Mode).....                      | 14        |
| 2.4.8    | Completion (EMV Mode).....                             | 15        |
| 2.5      | Issuer Update Processing.....                          | 16        |
| 2.5.1    | Issuer Update Processing (Optional for EMV Mode) ..... | 16        |
| <b>3</b> | <b>Requirements in Support of Kernel 3 .....</b>       | <b>17</b> |
| 3.1      | POS System Assumptions.....                            | 17        |
| 3.2      | Messaging Requirements in Support of Kernel 3 .....    | 18        |
| 3.2.1    | EMV Mode Requirements.....                             | 18        |
| 3.2.2    | Mag-Stripe Mode Requirements .....                     | 19        |

|          |                                                                                             |           |
|----------|---------------------------------------------------------------------------------------------|-----------|
| 3.3      | Reader Configuration Requirements .....                                                     | 21        |
| 3.3.1    | General Configuration Requirements .....                                                    | 21        |
| 3.3.2    | Configuration Requirements for Readers Supporting Both<br>EMV Mode and Mag-Stripe Mode..... | 23        |
| 3.4      | Processing Requirements in Support of Kernel 3.....                                         | 24        |
| 3.4.1    | Requirements for Different Types of Transaction .....                                       | 24        |
| <b>4</b> | <b>Overall Processing Requirements .....</b>                                                | <b>27</b> |
| 4.1      | General Requirements.....                                                                   | 27        |
| 4.2      | End Application.....                                                                        | 30        |
| 4.3      | Display Available Offline Spending Amount .....                                             | 31        |
| 4.4      | New Transaction vs. Issuer Update Processing .....                                          | 32        |
| <b>5</b> | <b>New Transaction Kernel Requirements.....</b>                                             | <b>33</b> |
| 5.1      | Dynamic Reader Limits (DRL) Functionality .....                                             | 34        |
| 5.1.1    | Reader Limit Set .....                                                                      | 35        |
| 5.1.2    | Dynamic Reader Limits (DRL) Processing.....                                                 | 36        |
| 5.1.3    | Contactless Application Allowed Check.....                                                  | 38        |
| 5.2      | Initiate Application Processing.....                                                        | 40        |
| 5.2.1    | GET PROCESSING OPTIONS (GPO) Command.....                                                   | 40        |
| 5.2.2    | Initiate Application Processing .....                                                       | 40        |
| 5.3      | Read Application Data .....                                                                 | 47        |
| 5.3.1    | READ RECORD Command.....                                                                    | 47        |
| 5.3.2    | Read Application Data .....                                                                 | 47        |
| 5.4      | Card Read Complete .....                                                                    | 48        |
| 5.4.1    | Cardholder Messaging .....                                                                  | 48        |
| 5.4.2    | Mandatory and Redundant Data.....                                                           | 49        |
| 5.4.3    | EMV Mode Path Processing – Determine Card Transaction<br>Disposition .....                  | 50        |
| 5.4.4    | Mag-Stripe Mode Path Processing – Online Disposition .....                                  | 51        |
| 5.5      | Processing Restrictions .....                                                               | 53        |
| 5.5.1    | EMV Mode Path Processing .....                                                              | 53        |
| 5.6      | Offline Data Authentication .....                                                           | 58        |
| 5.6.1    | EMV Mode Path Processing .....                                                              | 58        |
| 5.7      | Cardholder Verification .....                                                               | 60        |
| 5.7.1    | Cardholder Verification – EMV Mode Path Processing.....                                     | 60        |
| 5.8      | Online Processing.....                                                                      | 65        |
| 5.8.1    | Online Processing – EMV Mode Path Processing .....                                          | 65        |

|                |                                                                                           |            |
|----------------|-------------------------------------------------------------------------------------------|------------|
| 5.9            | Offline Completion .....                                                                  | 68         |
| 5.9.1          | Offline Completion – EMV Mode Path Processing .....                                       | 68         |
| <b>6</b>       | <b>Issuer Update Processing Reader Requirements .....</b>                                 | <b>71</b>  |
| 6.1            | Issuer Update Processing Commands .....                                                   | 72         |
| 6.2            | Issuer Update Processing.....                                                             | 73         |
| <b>Annex A</b> | <b>Kernel 3 Data Elements .....</b>                                                       | <b>77</b>  |
| A.1            | Data Element Descriptions .....                                                           | 77         |
| A.1.1          | Requirements.....                                                                         | 77         |
| A.1.2          | Name Column .....                                                                         | 77         |
| A.1.3          | Requirement Column .....                                                                  | 78         |
| A.1.4          | Retrieval Column .....                                                                    | 79         |
| A.2            | Data Elements by Name.....                                                                | 80         |
| A.3            | Data Elements by Tag .....                                                                | 114        |
| A.4            | Data Elements Reader Provides to Kernel 3.....                                            | 117        |
| <b>Annex B</b> | <b>Online Messages and Clearing Records .....</b>                                         | <b>119</b> |
| B.1            | EMV Mode Acquirers.....                                                                   | 119        |
| B.1.1          | Data Elements for Acquirers Supporting EMV Mode.....                                      | 119        |
| B.1.2          | EMV Mode Acquirer Requirements .....                                                      | 122        |
| B.2            | Mag-Stripe Mode Acquirers .....                                                           | 123        |
| B.2.1          | Data Elements for Acquirers Supporting<br>CVN17 Mag-Stripe Mode Transactions .....        | 123        |
| B.2.2          | Data Elements for Acquirers Supporting<br>Only Standard Mag-Stripe Mode Transactions..... | 128        |
| B.2.3          | Mag-Stripe Mode Acquirer Requirements.....                                                | 129        |
| <b>Annex C</b> | <b>Fast Dynamic Data Authentication (fDDA) .....</b>                                      | <b>131</b> |
| C.1            | Dynamic Signature Verification.....                                                       | 132        |
| <b>Annex D</b> | <b>Supported Commands .....</b>                                                           | <b>135</b> |
| D.1            | GET PROCESSING OPTIONS (GPO).....                                                         | 135        |
| D.2            | READ RECORD .....                                                                         | 135        |
| D.3            | EXTERNAL AUTHENTICATE .....                                                               | 135        |
| <b>Annex E</b> | <b>Creating Track 1 and Track 2.....</b>                                                  | <b>137</b> |
| E.1            | Creating Track 1 .....                                                                    | 137        |
| E.1.1          | Field 5 .....                                                                             | 140        |
| E.1.2          | Field 10.1 .....                                                                          | 140        |
| E.1.3          | Fields 10.2 through 12.3 in Error Situations.....                                         | 140        |

E.1.4 Examples of Assembling Track 1.....140

E.2 Creating Track 2 .....147

**Annex F Glossary .....149**

## Figures

|                                                            |     |
|------------------------------------------------------------|-----|
| Figure 2-1: Sample Transaction Flow.....                   | 10  |
| Figure 5-1: Initiate Application Processing (Reader) ..... | 41  |
| Figure 6-1: Issuer Update Processing (Reader) .....        | 73  |
| Figure C-1: Fast DDA (fDDA) EMV Mode Example .....         | 134 |
| Figure E-1: Constructing Track 1 Data – Example 1 .....    | 141 |
| Figure E-2: Constructing Track 1 Data – Example 2 .....    | 143 |
| Figure E-3: Constructing Track 1 Data – Example 3 .....    | 145 |

## Tables

|                                                                        |     |
|------------------------------------------------------------------------|-----|
| Table A-1: Kernel 3 Data Elements .....                                | 80  |
| Table A-2: Data Elements Tags .....                                    | 114 |
| Table A-3: Data Elements Reader Provides to Kernel 3 .....             | 117 |
| Table B-1: Acquirers Supporting EMV Mode .....                         | 119 |
| Table B-2: Acquirers Supporting CVN17 Mag-Stripe Mode .....            | 124 |
| Table B-3: Acquirers Supporting Mag-Stripe Mode Legacy-Only .....      | 128 |
| Table C-1: Terminal Dynamic Data for Input to DDA Hash Algorithm ..... | 132 |
| Table E-1: Data Elements Required for Track 1 and Track 2 .....        | 137 |
| Table E-2: Track 1 Format .....                                        | 138 |
| Table E-3: Example 1 of Track 1 Format .....                           | 142 |
| Table E-4: Example 2 of Track 1 Format .....                           | 144 |
| Table E-5: Example 3 of Track 1 Format .....                           | 146 |
| Table E-6: Data Content for Track 2 Equivalent Data .....              | 147 |
| Table E-7: Mapping Track 2 to Track 2 Equivalent Data .....            | 147 |

## Requirements

|                                                                                         |     |
|-----------------------------------------------------------------------------------------|-----|
| Requirements – Receipts .....                                                           | 17  |
| Requirements – EMV Mode Requirements .....                                              | 18  |
| Requirements – Mag-Stripe Mode Requirements .....                                       | 19  |
| Requirements – General Configuration Requirements.....                                  | 21  |
| Requirements – Combined EMV Mode and Mag-Stripe Mode Requirements .....                 | 23  |
| Requirements – Transaction Type Requirements .....                                      | 24  |
| Requirements – Transaction Type Requirements .....                                      | 25  |
| Requirements – Overall Requirements .....                                               | 27  |
| Requirements – End Application .....                                                    | 30  |
| Requirements – Display AOSA .....                                                       | 31  |
| Requirements – Distinguish between New Transaction and Issuer Update<br>Processing..... | 32  |
| Requirements – Reader Limit Set .....                                                   | 35  |
| Requirements – DRL Processing .....                                                     | 37  |
| Requirements – Contactless Application Allowed Check .....                              | 39  |
| Requirements – GPO Command.....                                                         | 40  |
| Requirements – Initiate Application Processing .....                                    | 42  |
| Requirements – READ RECORD Command .....                                                | 47  |
| Requirements – Read Application Data .....                                              | 47  |
| Requirements – Cardholder Messaging .....                                               | 48  |
| Requirements – Mandatory and Redundant Data .....                                       | 49  |
| Requirements – EMV Mode – Determine Card Transaction Disposition.....                   | 50  |
| Requirements – Mag-Stripe Mode – Online Disposition.....                                | 51  |
| Requirements – Processing Restrictions – EMV Mode Path Processing.....                  | 53  |
| Requirements – Offline Data Authentication – EMV Mode Path Processing .....             | 58  |
| Requirements – Cardholder Verification – EMV Mode Path Processing.....                  | 61  |
| Requirements – Online Processing – EMV Mode Path Processing .....                       | 66  |
| Requirements – Offline Completion – EMV Mode Path Processing.....                       | 68  |
| Requirements – Issuer Update Processing Commands.....                                   | 72  |
| Requirements – Issuer Update Processing .....                                           | 74  |
| Requirements – Data Elements.....                                                       | 77  |
| Requirements – EMV Mode Acquirer Requirements.....                                      | 122 |
| Requirements – Mag-Stripe Mode Acquirer Requirements.....                               | 129 |



# 1 General

This chapter contains information that helps the reader understand and use this specification.

## 1.1 Scope

This document, the *EMV Contactless Specifications for Payment Systems, Kernel 3 Specification*, describes one of several kernels defined for use with Entry Point.

## 1.2 Audience

This specification is intended for use by system designers in payment systems and financial institution staff responsible for implementing financial applications.

## 1.3 Volumes of the Contactless Specifications

This specification is part of a seven-volume set:

*Book A: Architecture and General Requirements*

*Book B: Entry Point Specification*

*Book C-1: Kernel 1 Specification*

*Book C-2: Kernel 2 Specification*

*Book C-3: Kernel 3 Specification*

*Book C-4: Kernel 4 Specification*

*Book D: Contactless Communication Protocol*

## 1.4 Reference Materials

The following specifications and standards contain provisions that are referenced in this specification. The latest version shall apply unless a publication date is explicitly stated.

If any provision or definition in this specification differs from those in the listed specifications and standards, the provision or definition herein shall take precedence.

|                  |                                                                                                                                                                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [EMV 4.2]        | <i>EMV Integrated Circuit Card Specifications for Payment Systems</i> , Version 4.2, June 2008, including:                                                                                                                                                                                                                 |
| [EMV 4.2 Book 1] | <i>EMV Integrated Circuit Card Specifications for Payment Systems</i> , Book 1, Application Independent ICC to Terminal Interface Requirements                                                                                                                                                                             |
| [EMV 4.2 Book 2] | <i>EMV Integrated Circuit Card Specifications for Payment Systems</i> , Book 2, Security and Key Management                                                                                                                                                                                                                |
| [EMV 4.2 Book 3] | <i>EMV Integrated Circuit Card Specifications for Payment Systems</i> , Book 3, Application Specification                                                                                                                                                                                                                  |
| [EMV 4.2 Book 4] | <i>EMV Integrated Circuit Card Specifications for Payment Systems</i> , Book 4, Cardholder, Attendant, and Acquirer Interface Requirements                                                                                                                                                                                 |
| [ISO 639-1]      | Codes for the representation of names of languages – Part 1: Alpha-2 Code<br><br><b>Note:</b> This standard is updated continuously by ISO. Additions and changes are available on:<br><a href="http://www.loc.gov/standards/iso639-2/php/code_changes.php">http://www.loc.gov/standards/iso639-2/php/code_changes.php</a> |
| [ISO 3166]       | Codes for the representation of names of countries and their subdivisions                                                                                                                                                                                                                                                  |
| [ISO 4217]       | Codes for the representation of currencies and funds                                                                                                                                                                                                                                                                       |
| [ISO 7813]       | Identification cards – Financial transaction cards                                                                                                                                                                                                                                                                         |
| [ISO 7816-4]     | Identification cards – Integrated circuit cards – Part 4: Organization, security and commands for interchange                                                                                                                                                                                                              |
| [ISO 7816-5]     | Identification cards – Integrated circuit cards – Part 5: Registration of application providers                                                                                                                                                                                                                            |

|                 |                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------|
| [ISO 8583:1987] | Bank card originated messages – Interchange message specifications – Content for financial transactions |
| [ISO 8859]      | Information processing – 8-bit single-byte coded graphic characters sets                                |
| [ISO 14443]     | Identification cards – Contactless integrated circuit cards – Proximity cards                           |

## 1.5 Terminology

This specification uses the following terminology.

### 1.5.1 Implementation and Support Terminology

This specification uses the following terminology to describe the implementation and configuration requirements for kernel functionality:

|                               |                                                                                                                                                     |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Implementation-Mandatory      | <i>Kernel shall implement this functionality.</i>                                                                                                   |
| Implementation-Conditional    | <i>Kernel shall implement this functionality if the defined conditions are met. Conditions vary based on the functionality in question.</i>         |
| Implementation-Optional       | <i>Kernel may implement this functionality, at the discretion of the implementer.</i>                                                               |
| Acquirer-Merchant-Conditional | <i>Acquirer-merchant shall enable this functionality if the defined conditions are met. Conditions vary based on the functionality in question.</i> |
| Acquirer-Merchant-Optional    | <i>Acquirer-merchant may enable this functionality, at their discretion.</i>                                                                        |

The reader functionality defined in this specification is *Implementation-Mandatory*, except where explicitly stated otherwise. This specification may also explicitly reiterate that specific functionality is *Implementation-Mandatory* to avoid potential ambiguity.

When used to describe requirements and conditions for kernel functionality, the following terminology may be used:

|                      |                                                                                                                |
|----------------------|----------------------------------------------------------------------------------------------------------------|
| <i>Implement(ed)</i> | <i>Kernel is capable of performing the functionality. The phrase “implement support for” may also be used.</i> |
| <i>Enable(d)</i>     | <i>Kernel functionality has been activated (i.e. turned on).</i>                                               |
| <i>Disable(d)</i>    | <i>Kernel functionality has been deactivated (i.e. turned off).</i>                                            |
| <i>Support(ed)</i>   | <i>Kernel functionality is both implemented and acquirer-merchant enabled.</i>                                 |

### 1.5.2 “Else” with Parenthesized Text

Parenthesized text following the word “Else” is provided as supplemental information, and does not denote a condition that must be satisfied.

Ex. If Condition, then the kernel shall...

Else (Text), the kernel shall...

In the example above, the parenthesized “(Text)” is merely supplemental information, and does not constitute a condition that must be satisfied.

### 1.5.3 Legacy References

Within requirements, italic numbers in square brackets are legacy references to an earlier version of this specification.

## 1.6 Flowcharts

Flowcharts are used to provide a high-level illustration of the processing. The flowcharts may be simplified to illustrate a concept, and may not include all the steps that are performed. Implementations are not required to strictly follow the flowcharts, and are instead required to comply with the requirements in the related text. In the case of a discrepancy between the flowchart and the related text, the text shall take precedence.

## 1.7 Format of Indicators

Although the indicators used in this specification are explicitly assigned the values of 0 or 1, the format of these internal indicators within an implementation is at the discretion of the implementer.

Performance and security considerations should both be weighed when deciding on the implementation of internal indicators.

## 1.8 Outcomes

Kernel 3 concludes its processing via the Outcomes as defined in *Book A*. When an Outcome is provided – specified with the words “...provide a **xxx** Outcome with the following parameters:” – Kernel 3 executes no further processing except to hand over control to Entry Point, passing the Outcome and its parameters.

## 1.9 Overview

This volume includes the following chapters and annexes:

**Chapter 1** contains general information that helps the reader understand and use this specification.

**Chapter 2** provides an overview of the Kernel 3 approach, including configuration for EMV mode and for mag-stripe mode, Kernel 3 processing overview, new transaction processing sequence, and Issuer Update Processing.

**Chapter 3** defines general functionality and requirements in support of Kernel 3, including messaging requirements, reader configuration requirements, and processing requirements.

**Chapter 4** defines overall functionality and requirements for Kernel 3, culminating in the decision of whether to perform new transaction processing or Issuer Update Processing.

**Chapter 5** describes requirements for new transaction processing.

**Chapter 6** describes requirements for Issuer Update Processing.

**Annex A** defines the data elements used in this specification for financial transaction interchange.

**Annex B** details the data elements required for online messages and clearing records.

**Annex C** describes fast Dynamic Data Authentication (fDDA).

**Annex D** lists supported commands.

**Annex E** describes how the kernel creates Track 1 and Track 2 for mag-stripe mode transactions.

**Annex F** is a glossary of terms and abbreviations used in this specification.

## 2 Overview of the Kernel 3 Approach

The Kernel 3 approach supports two principle configurations: EMV mode and mag-stripe mode. These configurations reflect the acceptance infrastructure that the transaction data is delivered to.

- The EMV mode configuration supports the EMV minimum set of data elements for clearing messages and for authorisation messages, when used. See section B.1.1. This configuration is for both offline and online transactions with cardholder verification support.
- The mag-stripe mode configuration supports both Track 1 and Track 2 equivalence, with the option of including a cryptogram and other supporting data elements. See section B.2.1 and section B.2.2. All transactions are online, with cardholder verification out of scope of the Kernel 3 transaction, but according to the acceptance environment.

A reader vendor can choose to implement only one of the modes or to implement both modes in their products. Which mode(s) to support depend(s) on the market for which the products are targeted.

A reader is configured to support either a chip based (EMV mode) or a magnetic-stripe based (mag-stripe mode) acceptance environment. For migration, readers in a chip based environment may be configured to also accept mag-stripe mode card products.

## 2.1 EMV Mode Configuration

The EMV mode configuration uses EMV commands and constructs with usage adapted for speed and to allow cryptographic operations to be done at the heart of the transaction, rather than when the card might be leaving the field. It features:

- An offline transaction flow for below floor limit transactions, with offline data authentication and a clearing cryptogram.
- An online transaction flow with online card authentication and an option for a second re-presentment of the card for issuer updating of card parameters.
- Cardholder verification support by means of online PIN or signature, when required by the transaction conditions.
- Support for consumer device form factors (e.g. mobile phones) acting as card products, including support for the Consumer Device CVM. The Consumer Device CVM is a CVM performed on, and validated by, the consumer's payment device, independent of the kernel.

The EMV mode configuration uses the output of Entry Point Pre-Processing and Combination Selection, resulting in the response to the SELECT command and the following data elements and indicators being available at the start of Kernel 3 processing:

- Amount, Authorised
- Unpredictable Number
- Terminal Transaction Qualifiers
- Copy of TTQ (here referred to as TTQ)

An accelerated offline data authentication method, fast Dynamic Data Authentication (fDDA), is provided through use of the GPO command to initiate the dynamic signature. A DDOL is not used and the results of the authentication are not provided online to the issuer within the TVR or protected by the online authorisation or clearing cryptograms.

The EMV mode configuration uses the data elements defined in section A.2 and provides data for online messages and clearing records as defined in section B.1.1.

## 2.2 Mag-Stripe Mode Configuration

The mag-stripe mode configuration offers a magnetic stripe payment service using either Track 2 or Track 1. The card's Track 2 Equivalent Data is used for Track 2, whilst Track 1 is constructed from various data elements from the card, as described in section E.1.

For acceptance environments with enhanced data support (e.g. Field 55), the magnetic-stripe configuration is supplemented with a cryptogram and supporting/additional data.

The mag-stripe mode configuration uses the data elements defined in section A.2 and provides data for online messages and clearing records as defined in section B.2.1 and section B.2.2.

The transaction flow is the same as for the chip-based configuration, with minor differences in the detailed processing.

## 2.3 Kernel 3 Processing Overview

A new transaction requires the contactless card to be presented once to complete a transaction that is authorised either offline or online. A new transaction can be of the following types:

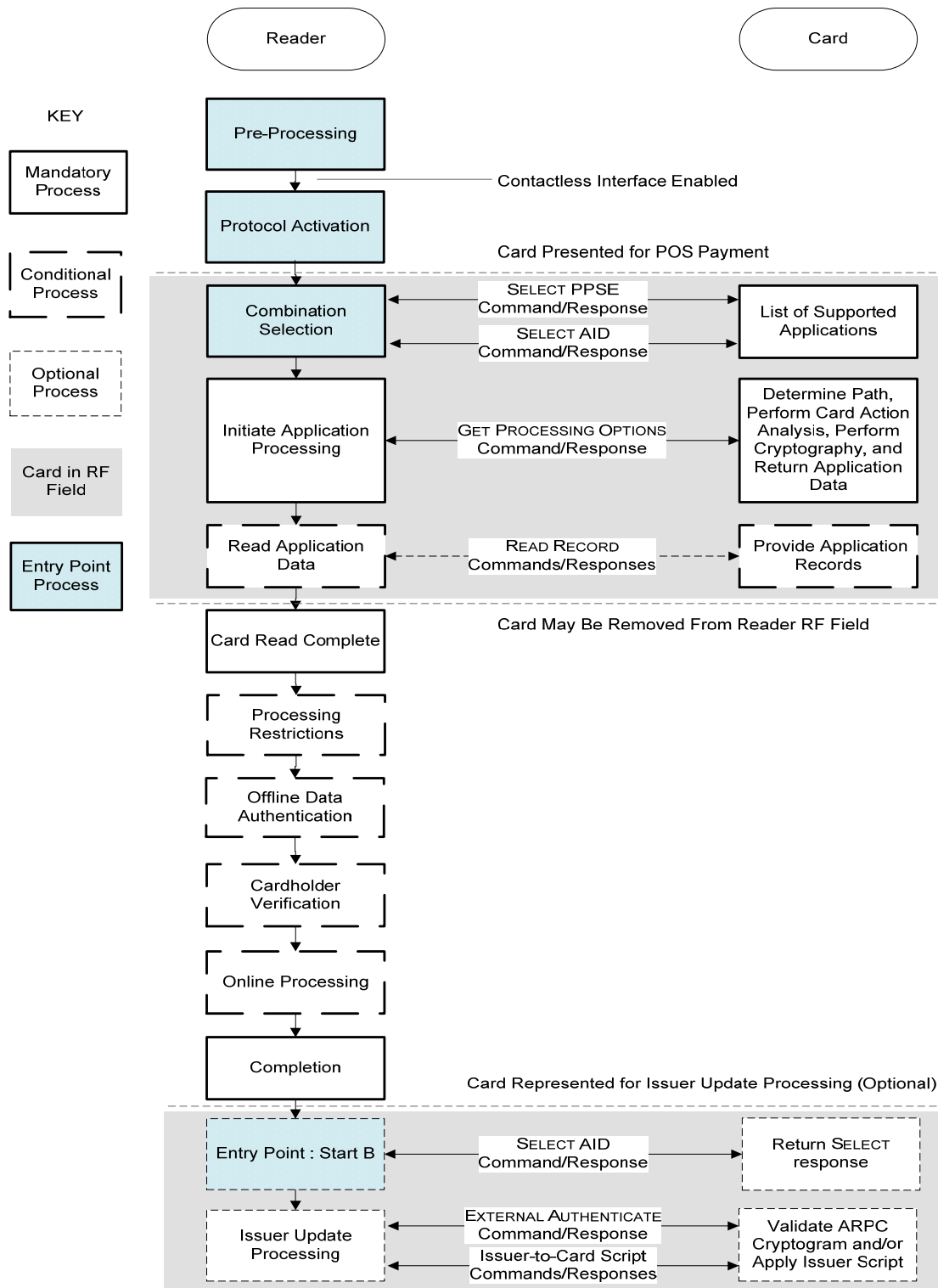
- purchase transaction,
- cash withdrawal, or
- refund.

The new transactions will constitute the majority of transactions and will require no further card interaction. The new transaction processing flow is further outlined in section 2.4

However in some situations a secondary presentment may be beneficial in support of card parameter updates. This function – named issuer update processing – is applicable only for an EMV mode reader and it is optional for both card and reader. The issuer update processing is further outlined in section 2.5.

A full overview of the Processing flow is outlined in Figure 2-1.

**Figure 2-1: Sample Transaction Flow**



**Note:** Processing as defined by the shaded shapes is performed by Entry Point.

### 2.3.1 First or Second Presentment

The cycling of a transaction for both a first and a second presentment is handled by Entry Point. If the first presentment results in an **Online Request** Outcome, the card indicates via the Outcome parameters whether a second presentment is supported.

When activated by Entry Point, Kernel 3 checks for the availability of Issuer Update Data:

- If Issuer Update Data is not present, Kernel 3 performs a standard new transaction (section 2.4).
- If Issuer Update Data is present, Kernel 3 performs Issuer Update Processing (section 2.5).

The Issuer Update Processing commands need to be delivered to the same card that was presented for the new transaction. Thus the expectation is that once a card is discovered, Entry Point will directly select the AID used in the previous new transaction in order to deliver the Issuer Update Processing commands to the correct card. If a card with a different AID is presented, then the selection will fail. If a different card is presented using the same AID, then the selection will succeed, but the updates will fail. In practice it is not expected that either situation will occur on a regular basis.

For both new transactions and issuer update processing, the reader in combination with the POS system has a time-out that abandons the transaction if no card is presented.

## 2.4 New Transaction Processing Sequence

This section provides an overview of a Kernel 3 transaction, showing the order in which functions are performed and the commands sent by the reader to the card. The transaction starts at the handover from Entry Point, which has performed:

- for EMV mode transactions: Pre-Processing, Protocol Activation, Combination Selection, and Kernel Activation
- for mag-stripe mode transactions: Protocol Activation, Combination Selection, and Kernel Activation.

### 2.4.1 Initiate Application Processing

The status word from the response to the SELECT AID command has been evaluated by Entry Point, thus only a successful SELECT AID response including the Processing Options Data Object List (PDOL) will be passed to Kernel 3.

Kernel 3 processing for a transaction starts with sending a GET PROCESSING OPTIONS (GPO) command to the card. This includes the data elements requested by the card in the PDOL returned in the response to the SELECT command, which will include the Terminal Transaction Qualifiers.

In the GPO response, the kernel is expected to receive data elements from the card that are appropriate to the conditions indicated in the Terminal Transaction Qualifiers:

- For EMV mode – a cryptogram with supporting/additional data, Track 2 Equivalent Data, and for offline approved transactions, a signature and pointer to supporting/additional data (AFL). Signatures that would cause the response data to exceed its data size limit are not included, but are instead provided in a record which is indicated as a record entry in the AFL.
- For mag-stripe mode – a pointer (AFL) to a record containing Track 2 Equivalent Data, or a cryptogram with supporting/additional data and Track 2 Equivalent Data.

Note that the reader is expected to handle situations where the data elements – or some of them – are received during the Read Application Data function.

If the conditions for usage of the card application have not been fulfilled, the reader must retry or end the transaction.

### 2.4.2 Read Application Data

If an Application File Locator (AFL) was returned during Initiate Application Processing, the kernel reads card application data from the records indicated in the AFL. This may include the signature if placed in a record due to size limitations as above.

After Read Application Data, the kernel is expected to be in possession of all the data elements necessary to complete the transaction – some data is obtained from the GPO response and if necessary (that is, if the AFL is present) some is obtained from records.

### 2.4.3 Card Read Complete

During Card Read Complete, the kernel indicates to the cardholder that exchange of data between the reader and the card is complete, and the card may be removed from the field.

The kernel makes the following checks on the available data and terminates the transaction if either check fails:

- That all mandatory data elements were returned by the card.
- That no primitive data element was returned more than once during Initiate Application Processing and Read Application Data.

For mag-stripe mode transactions, an **Online Request** Outcome is requested at this point and subsequent transaction processing is outside the scope of this specification.

For EMV mode transactions, subsequent transaction processing includes all the remaining functions in this chapter (section 2.4.4 thru section 2.5).

### 2.4.4 Processing Restrictions (EMV Mode)

If supported by the kernel for EMV mode configurations, the kernel checks the application expiration date and application usage, and may need to check whether the card is on the Terminal Exception File.

### 2.4.5 Offline Data Authentication (EMV Mode)

Offline Data Authentication is implemented for readers supporting offline transactions and is performed for card requested offline transactions. The kernel verifies the dynamic signature returned by the card and authenticates the data from the card.

The success or failure is indicated by means of the appropriate Outcome during Completion.

### **2.4.6 Cardholder Verification (EMV Mode)**

Cardholder Verification is implemented for readers implementing EMV mode transactions. During Cardholder Verification, the kernel determines the Cardholder Verification Method to be performed (if any) and makes the necessary request by means of the Outcome and parameters.

Kernel 3 is not involved with any CVM processing for mag-stripe mode. This is determined solely by the terminal and acceptance conditions.

### **2.4.7 Online Processing (EMV Mode)**

Online Processing is implemented for EMV mode readers supporting online transactions. The kernel indicates the need for online processing by means of the Outcome and parameters.

The data provided by the kernel for an online authorisation includes an Application Cryptogram – either an ARQC, or a TC if the card has been configured to indicate that this is preferred if Offline Data Authentication fails.

## 2.4.8 Completion (EMV Mode)

Completion concludes transaction processing and the kernel will indicate the Outcome of the transaction and the need for any further action to Entry Point.

The available Outcomes to Entry Point and the expectations for further actions are as below:

- **Select Next** – The kernel has determined that the selected Combination is unsuitable and the next Combination (if any) should be tried.
- **Try Again** – The kernel requires that the device be presented again; this may be a result of an error, such as tearing, that could resolve if the transaction is attempted again.
- **Approved** – The kernel is satisfied that the transaction is acceptable to the selected contactless card application and wants the transaction to be approved. This is the expected Outcome for a successful offline transaction, but could also occur following re-selection of a kernel after an online response.
- **Declined** – The kernel has found that the transaction is not acceptable to the selected contactless card application and wants the transaction to be declined. This Outcome could also occur following re-selection of a kernel after an online response.
- **Online Request** – The transaction requires an online authorisation to determine the approved or declined status.
- **Try Another Interface** – The kernel is unable to complete the transaction with the selected contactless card application, but knows from the configuration data that another interface (e.g. contact or magnetic-stripe) is available. The kernel could indicate a preference for the alternate interface.
- **End Application** – The kernel experienced an application error, such as missing data, that will not resolve if the transaction is attempted again with the same selected contactless card application.

## 2.5 Issuer Update Processing

Issuer Update Processing is an optional feature within Kernel 3 for situations where the issuer utilizing a specific terminal environment wishes to manage the risk parameters within a card by means of issuer authentication and/or script processing over the contactless interface.

If an online authorisation response following a new transaction includes Issuer Update Data and both reader and card support Issuer Update Processing, then the cardholder can be instructed to present their card for a second time. During the second presentment the reader can deliver the ARPC and/or forward the Issuer Scripts.

This functionality is solely used for updates of card parameters and all new transaction processing will take place during the first presentment.

### 2.5.1 Issuer Update Processing (Optional for EMV Mode)

Issuer Update Processing is an implementation and acquirer-merchant option for EMV mode configurations. If supported by both card and reader, Issuer Update Processing is performed when the authorisation response message contains Issuer Authentication Data and/or an Issuer Script Template. When the card is re-presented, Entry Point re-activates the kernel and the availability of Issuer Update Data indicates to the kernel that it should branch to this section.

If Issuer Authentication Data is present in the Issuer Update Data, the kernel sends an EXTERNAL AUTHENTICATE command to the card, which performs issuer authentication and updates risk management parameters (e.g. counter reset) as configured in the card by the issuer.

If an Issuer Script Template is present in the Issuer Update Data, the kernel extracts the Script Command(s) and forwards to the card for processing.

## 3 Requirements in Support of Kernel 3

This section defines general functionality and requirements in support of Kernel 3.

### 3.1 POS System Assumptions

---

#### Requirements – Receipts

---

##### 3.1.1.1 (Receipts) [5.4]

Receipts are not detailed in this specification, however the following applies:

POS systems in support of Kernel 3 shall provide receipts as required by payment system rules (both international and regional).

---

Information about POS systems supporting transactions over multiple interfaces are defined in *Book A v2.1*, Requirements – Multiple Interfaces (8.1.1.11). [5.5]

## 3.2 Messaging Requirements in Support of Kernel 3

### 3.2.1 EMV Mode Requirements

The following requirements apply when Kernel 3 is installed in an EMV mode POS system.

---

#### Requirements – EMV Mode Requirements

---

##### 3.2.1.1 (EMV mode Message Requirements) [5.6]

**If** the reader supports EMV mode,  
**then** data for inclusion in EMV mode online messages and clearing records shall be as specified in section B.1.

---

##### 3.2.1.2 (EMV mode – FFI and CED) [5.7]

**If** the reader supports EMV mode,  
**and** the card application returns the Form Factor Indicator and/or Customer Exclusive Data,  
**then** the kernel shall make the returned data element(s) available for inclusion in messages to the acquirer. See also section B.1.1.

Please check with your payment system representative regarding the required support for these data elements in acquirer messaging.

*Note:* A reader that is enabled for mag-stripe mode always supports inclusion of the Form Factor Indicator and Customer Exclusive Data in CVN17 mag-stripe mode online messages. See section B.2.1.

---

## 3.2.2 Mag-Stripe Mode Requirements

The following requirements apply when Kernel 3 is installed in a mag-stripe mode POS system.

Readers supporting mag-stripe mode can, by default, process CVN17 mag-stripe mode transactions and standard mag-stripe mode transactions (see Annex F: Glossary for the definition of CVN17 mag-stripe mode and standard mag-stripe mode). However, the acquirer-merchant is able to disable support for CVN17 mag-stripe mode transactions.

---

### Requirements – Mag-Stripe Mode Requirements

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#### 3.2.2.1 (Disable CVN17 Mag-Stripe Mode Functionality) [5.9]

*Implementation-Conditional:*

**If** mag-stripe mode is implemented in the reader,  
**then** the kernel shall have a configurable option to disable support for CVN17 mag-stripe mode transactions.

*Acquirer-Merchant-Optional:*

**If** mag-stripe mode is implemented in the reader,  
**then** it shall be an acquirer-merchant configurable option to enable or disable support for CVN17 mag-stripe mode transactions.

*Note:* Disabling/enabling CVN17 mag-stripe mode support has impact on the data requirements for mag-stripe mode online messages and clearing records (see requirement 3.2.2.2).

*Note:* Unless CVN17 mag-stripe mode support is disabled, the mag-stripe mode reader is able to process CVN17 mag-stripe mode transactions, regardless of the setting of 'Online cryptogram required' (TTQ byte 2 bit 8).

---

---

## Requirements – Mag-Stripe Mode Requirements

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### 3.2.2.2 (Mag-Stripe Mode Messaging Requirements) [5.10]

**If** mag-stripe mode is implemented in the reader,  
**then**:

- **If** CVN17 mag-stripe mode functionality is disabled on the reader (see requirement 3.2.2.1),  
**then** data requirements for mag-stripe mode online messages and clearing records shall be as specified in section B.2.2.
- **Else** data requirements for mag-stripe mode online messages and clearing records shall be as specified in section B.2.1.

---

### 3.2.2.3 (Mag-Stripe Mode Messages – TTQ) [5.11]

*Implementation-Conditional:*

**If** mag-stripe mode is implemented in the reader,  
**then** this functionality shall be implemented.

**If** CVN17 mag-stripe mode is enabled on the reader (see requirement 3.2.2.1),  
**then** the kernel shall make the TTQ available for inclusion in messages to the acquirer.

Please check with your payment system representative regarding the required support for this data element in acquirer messaging.

---

## 3.3 Reader Configuration Requirements

This section defines some of the configuration requirements necessary for Kernel 3. Configuration of the reader shall conform to these requirements for AIDs supported by this kernel, but the reader or kernel need not enforce configuration requirements.

### 3.3.1 General Configuration Requirements

Readers are only required to support either EMV mode or mag-stripe mode, but are not precluded from supporting both. Readers supporting both EMV mode and mag-stripe mode (i.e. concurrently enabled) may be desired for some migration situations.

---

#### Requirements – General Configuration Requirements

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##### 3.3.1.1 (EMV Mode and Mag-Stripe Mode Support) [5.12]

**If** a reader includes Kernel 3,  
**then** the reader shall support either EMV mode or mag-stripe mode, and may support both.

**If** a reader supports mag-stripe mode,  
**then** the reader shall indicate that mag-stripe mode is supported by setting TTQ byte 1 bit 8 to 1b.

**If** a reader supports EMV mode,  
**then** the reader shall indicate that EMV mode is supported by setting TTQ byte 1 bit 6 to 1b.

---

##### 3.3.1.2 (Mag-Stripe Mode CVN17) [5.13]

**If** a reader supports only mag-stripe mode  
**and** CVN17 mag-stripe mode functionality is enabled,  
**then** the reader shall indicate that an online cryptogram is required by setting TTQ byte 2 bit 8 to 1b.

---

##### 3.3.1.3 (Issuer Update Processing and Online Capability) [5.14]

**If** a reader supports Issuer Update Processing,  
**then** the reader shall indicate support for Issuer Update Processing by setting TTQ byte 3 bit 8 to 1b and shall indicate online capability by setting TTQ byte 1 bit 4 to 0b.

---

During Pre-Processing, Entry Point will use the reader risk parameters, configured in the EMV mode-enabled reader, to determine whether an EMV mode transaction with an amount of zero will result in an online transaction (if passed to this kernel) or will be conducted over another interface or passed to another kernel. [5.15]

### 3.3.2 Configuration Requirements for Readers Supporting Both EMV Mode and Mag-Stripe Mode

Readers supporting both EMV mode and mag-stripe mode shall adhere to the reader and kernel requirements for EMV mode and mag-stripe mode. If discrepancies are found between EMV mode and mag-stripe mode reader and kernel requirements, then EMV mode reader and kernel requirements shall take precedence.

Following are additional requirements for readers with both EMV mode and mag-stripe mode supported at the same time.

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#### Requirements – Combined EMV Mode and Mag-Stripe Mode Requirements

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##### 3.3.2.1 (EMV Mode and Mag-Stripe Mode Supported: Online Cryptogram Not Required) [5.16]

**If** a reader supports both EMV mode and mag-stripe mode active at the same time,

**then** requirement 3.3.1.2 (Mag-Stripe Mode CVN17) shall not apply.

*Note:* In this situation, reader requests for an online cryptogram shall be set only as a result of Entry Point Pre-Processing as specified for EMV mode as per *Book B*.

---

##### 3.3.2.2 (EMV Mode and Mag-Stripe Mode Configurations) [5.17]

**If** a reader supports both EMV mode and mag-stripe mode active at the same time,

**then** the reader shall be configurable to support EMV mode-only, mag-stripe mode-only, and both EMV mode and mag-stripe mode.

---

## 3.4 Processing Requirements in Support of Kernel 3

### 3.4.1 Requirements for Different Types of Transaction

Readers may support different type of transactions. Depending on the transaction type, certain parameters shall be set up accordingly as outlined in this section.

---

#### Requirements – Transaction Type Requirements

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##### 3.4.1.1 (Purchase Transactions) [5.18]

*Implementation-Conditional:* Implementation support for the purchase of goods and services is *Implementation-Mandatory*. However, the associated cashback functionality is *Implementation-Conditional* on reader support for cashback.

For transactions to purchase goods or services, with or without cashback, the EMV mode-enabled kernel shall use:

- Transaction Type '00'.
- Amount, Authorised shall be the sum of the purchase amount and the cashback amount (if present).
- Amount, Other shall be the cashback amount (if present).

*Note:* Acquirers-merchants may wish to use a different Terminal Transaction Qualifiers (TTQ) value and different reader risk parameters for purchase transactions with cashback than is used for purchase transactions without cashback. The reader should allow the acquirer-merchant to configure the TTQ and reader risk parameters for purchase transactions with cashback independently from purchase transactions without cashback.

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## Requirements – Transaction Type Requirements

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### 3.4.1.2 (Cash Transactions) [5.19]

*Implementation-Conditional:*

**If** the reader supports cash transactions,  
**then** this functionality shall be implemented.

For cash transactions, the EMV mode-enabled kernel shall use:

- Transaction Type '01'.
- Amount, Authorised shall be the transaction amount.

*Note:* Acquirers-merchants may wish to use a different Terminal Transaction Qualifiers (TTQ) value and different reader risk parameters for cash transactions than is used for purchase transactions (with or without cashback). The reader should allow the acquirer-merchant to configure the TTQ and reader risk parameters for cash transactions independently from purchase transactions.

---

EMV mode transactions directly result in the purchase of goods or services and/or in the disbursement of cash. Refunds and credits are commonly employed to support the retail or cash disbursement environment, but do not directly result in the purchase of goods or services, nor in the disbursement of cash. Kernel 3 functionality can be used to support refunds and credits, and shall comply with the following requirement for the Transaction Type and Amount, Authorised values used. However, all other reader processing for refunds and credits is outside the scope of this specification.

*Note:* An offline decline (CID indicates an AAC) returned by the card application for a refund or credit simply indicates completion of card action analysis, and should not be treated as a “decline” of the refund.

---

## Requirements – Transaction Type Requirements

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### 3.4.1.3 (Refund Transactions) [5.20]

*Implementation-Conditional:*

**If** the reader supports refunds/credits,  
**then** this functionality shall be implemented.

For refunds and credits, the EMV mode-enabled kernel shall use:

- Transaction Type '20'
- Amount, Authorised shall be the refunded/credited amount.



## 4 Overall Processing Requirements

This section defines overall functionality and requirements for Kernel 3.

### 4.1 General Requirements

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#### Requirements – Overall Requirements

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##### 4.1.1.1 (Form Factor Indicator) [5.21]

**If** EMV mode is enabled in the kernel,  
**and** the card application returns the Form Factor Indicator (FFI),  
**then** the kernel shall replace FFI byte 4 bits 4-1 with the value 0000b (indicating that the transaction was conducted using [ISO 14443]) prior to making the FFI available for inclusion in messages to the acquirer.

---

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## Requirements – Overall Requirements

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### 4.1.1.2 (Unrecoverable [EMV CL] Error) [5.23]

**If** a Transmission, Protocol, or Timeout error as defined in *Book D* is reported to the kernel,  
**then** the kernel shall discard the current transaction data and provide a ***Try Again*** Outcome with the following parameters:

***Try Again:***

- **Start:** B
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** No
- **UI Request on Restart Present:** No
- **Data Record Present:** No
- **Discretionary Data Present:** No
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will cause Entry Point to return to Protocol Activation.

---

---

## Requirements – Overall Requirements

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### 4.1.1.3 (Cardholder Messaging) [5.24]

For contactless transactions, the reader (or terminal) shall clearly communicate to the cardholder and merchant:

- Present the card
- The progress of the transaction
- The outcome of the transaction – approve, decline, or terminate

Recommended cardholder messages and indications for various transaction status are defined in *Book A*.

**If** the card provides the Available Offline Spending Amount, **then** the EMV mode-enabled reader may display this when it indicates a successful card read and may print it on the transaction receipt.

*Note:* This specification indicates when communication with the cardholder and merchant occurs, but does not specify the means of communication. User interface requirements are specified on a payment system, regional, or country basis.

---

### 4.1.1.4 (Erroneous Data) [5.25]

It is the responsibility of the issuer to ensure that data in the card is formatted correctly, and no format checking other than that specifically defined is required on the part of the kernel.

However, **if** in the course of normal processing the kernel recognizes that data is incorrectly formatted, **then** the kernel shall, unless otherwise specified, terminate the transaction by providing an **End Application** Outcome as defined in requirement 4.2.1.1.

Incorrectly formatted data includes, but is not limited to, the bulleted list provided in [EMV 4.2 Book 3], section 7.5.

---

## 4.2 End Application

If the kernel wishes to terminate the transaction with an **End Application** Outcome, the following Outcome and parameters is returned to Entry Point.

---

### Requirements – End Application

---

#### 4.2.1.1 (End Application) *[new]*

The kernel shall provide an **End Application** Outcome with the following parameters:

**End Application:**

- **Start:** N/A
  - **Online Response Data:** N/A
  - **CVM:** N/A
  - **UI Request on Outcome Present:** Yes
    - o Message Identifier: '1C' ("Insert, swipe or try another card")
    - o Status: Processing Error
  - **UI Request on Restart Present:** No
  - **Data Record Present:** No
  - **Discretionary Data Present:** No
  - **Alternate Interface Preference:** N/A
  - **Receipt:** N/A
  - **Field Off Request:** N/A
  - **Removal Timeout:** Zero
-

## 4.3 Display Available Offline Spending Amount

If, during a successful Outcome, the kernel wishes to have the Available Offline Spending Amount (AOSA) displayed or printed, the UI Request parameters will be passed as part of the Outcome.

---

### Requirements – Display AOSA

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#### 4.3.1.1 (Display AOSA) *[new]*

**If** the card returns Available Offline Spending Amount (AOSA),  
**and** the reader supports displaying or printing the AOSA,  
**then:**

- The reader shall display or, if a receipt is printed, print the AOSA.
- The kernel shall include the following UI Request parameters in the Outcome:
  - o Value Qualifier: “Balance”
  - o Value: AOSA (Tag '9F5D' from card)
  - o Currency Code: Transaction Currency Code
- The kernel shall set the Outcome parameter Discretionary Data Present to Yes and include AOSA in the kernel Discretionary Data.

**Else** the kernel shall not include the UI Request parameters Value Qualifier, Value, and Currency Code in the Outcome

---

## 4.4 New Transaction vs. Issuer Update Processing

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### Requirements – Distinguish between New Transaction and Issuer Update Processing

---

#### 4.4.1.1 (New Transaction vs. Issuer Update Processing) *[New]*

**If** Issuer Update Data is present when the kernel is activated,  
**then** the kernel shall perform the transaction as defined in  
Chapter 6 (Issuer Update Processing Reader Requirements).

**Else** (Issuer Update Data is not present), the kernel shall perform  
the transaction as defined in Chapter 5 (New Transaction Kernel  
Requirements).

---

## 5 New Transaction Kernel Requirements

The typical contactless experience is one presentment of the contactless card to the reader during which the capture of card data for a standard new transaction takes place. After capturing the card data, the reader can then evaluate the transaction disposition and no further presentment of the card is necessary. This chapter defines the requirements for this standard new transaction flow. A new transaction can be a purchase transaction, a cash withdrawal, or a refund transaction.

The processing assumes that the card in question has been selected and has returned SW1 SW2 = '9000' in response to the SELECT command issued by Entry Point. The kernel will have available the FCI from Entry Point as well as the necessary data relevant for the transaction (e.g. Amount, Authorised).

New transaction processing is performed if Issuer Update Data is not present when Entry Point hands over control to Kernel 3 – as outlined in requirement 4.4.1.1.

## 5.1 Dynamic Reader Limits (DRL) Functionality

*Implementation-Optional:* Implementers may implement support for DRL functionality for EMV mode readers.

*Acquirer-Merchant-Optional:* If implemented, DRL functionality shall be acquirer-merchant configurable to be enabled or disabled. If enabled, the acquirer-merchant shall be able to configure the number of Application Program IDs to use.

DRL functionality allows the kernel to apply different reader risk parameters for different card applications, allowing the kernel to vary reader limits and checks on a transaction by transaction basis.

For example, a kernel may apply one set of reader risk parameters for domestic credit applications, and another set for international credit applications.

A Reader Limit Set is comprised of the following reader risk parameters as defined in *Book A*:

- Status Check Support flag
- Zero Amount Allowed flag
- Reader Contactless Transaction Limit
- Reader Contactless Floor Limit
- Reader CVM Required Limit

DRL processing is performed to determine the Reader Limit Set applicable to the selected application.

The Application Program Identifier (Application Program ID) is the optional payment system proprietary card application data element that identifies the Reader Limit Set applicable to the selected application. The kernel examines the Application Program ID returned by the card in the SELECT response and applies the corresponding Reader Limit Set.

If DRL functionality is enabled, then the kernel performs DRL processing to determine the reader risk parameters (see requirement 5.1.1.1 and *Book B v2.1*, section 3.1) to use for the selected application.

## 5.1.1 Reader Limit Set

The value of limits used in reader risk parameters checking, and whether individual checks are enabled or disabled, are specified in a Reader Limit Set. The Reader Limit Set indicates whether each of the individual checks are enabled or disabled, and the value of the limit when the corresponding check is enabled.

---

### Requirements – Reader Limit Set

---

#### 5.1.1.1 (Reader Risk Parameters) [5.52]

Each Reader Limit Set shall allow the acquirer-merchant to configure the following kernel-specific reader risk parameters<sup>1</sup>:

- Status Check Support – Configurable to indicate whether this check is enabled or disabled.
  - Zero Amount Allowed – Configurable to indicate whether this check is enabled or disabled and the setting of the Zero Amount Allowed flag when enabled.
  - Reader Contactless Transaction Limit Check – Configurable to indicate whether this check is enabled or disabled, and the value of the Reader Contactless Transaction Limit when enabled.
  - Reader Contactless Floor Limit Check – Configurable to indicate whether this check is enabled or disabled, and the value of the Reader Contactless Floor Limit when enabled.
  - Reader CVM Required Limit Check – Configurable to indicate whether this check is enabled or disabled, and the value of the Reader CVM Required Limit when enabled.
- 

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<sup>1</sup> Similar to the configuration data described in *Book A*, Table 5-2.

---

## Requirements – Reader Limit Set

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### 5.1.1.2 (Reader Limit Sets) [5.53]

The reader supports a default Reader Limit Set, which is used during the Entry Point Pre-Processing phase (see *Book B*).

In addition to this default Reader Limit Set, the kernel shall implement support for a minimum of four unique Application Program IDs and four corresponding Reader Limit Sets. Implementations may optionally support more than four Application Program IDs and corresponding Reader Limit Sets.

---

## 5.1.2 Dynamic Reader Limits (DRL) Processing

DRL Processing is performed to determine the Reader Limit Set applicable to the selected application. When a matching Application Program ID is returned by the card application, the kernel replaces the results of reader risk parameters checking that used the default Reader Limit Set (performed during the Pre-Processing phase of Entry Point) with the results of reader risk parameters checking using the matching Reader Limit Set.

If DRL functionality is supported, the kernel shall perform the following procedure:

---

## Requirements – DRL Processing

---

### 5.1.2.1 (Application Program ID) [5.54]

**If** DRL functionality is supported,  
**then** the kernel shall examine the Application Program ID returned in the SELECT response to determine which Reader Limit Set to apply.

During DRL processing, the card Application Program ID matches an Application Program ID in the reader:

- **If** the card Application Program ID has the same length and value as the reader Application Program ID (full match),
- **or** the card Application Program ID begins with the entire reader Application Program ID (partial match)

**If** no Application Program ID is returned  
**or** the Application Program ID does not match any reader-supported Application Program ID,  
**then** the kernel shall use the results of the Entry Point Pre-Processing phase and shall continue processing the transaction without any DRL functionality.

**Else** (the Application Program ID matches one or more supported reader Application Program IDs), the kernel shall:

- Reset the 'Contactless Application Not Allowed' indicator to 0 and the transient bits of the TTQ (byte 2 bits 8-7) to 0b.
  - Perform reader risk parameters checking as defined in *Book B v2.1*, section 3.1.1, using the Reader Limit Set that corresponds to the longest matching reader Application Program ID (instead of the default Entry Point Configuration Data subset). The result of this process will be a set of indicators for the specific Reader Limit Set similar to the indicators described in *Book A v2.1*, Table 5-2, to be used in subsequent processing.
  - Proceed with the Contactless Application Allowed Check (section 5.1.3).
-

*Note:* To minimize the processing performed while the card is in the reader field, it is recommended that readers perform reader risk parameters checking for each supported Application Program ID during the Pre-Processing phase of Entry Point. The value of the reader risk parameters and flags as defined in *Book B* as Entry Point Configuration Data are then stored for each Application Program ID, and used by the reader if the corresponding Application Program ID is returned by the card application. Such functionality must be accommodated alongside similar functionality that may be required for other kernels.

### 5.1.3 Contactless Application Allowed Check

*Implementation-Conditional:* This section shall be supported if Dynamic Reader Limit Processing is supported.

The kernel examines the 'Contactless Application Not Allowed' indicator to determine whether the selected application is allowed to transact over the contactless interface.

*Note:* This functionality can only happen if the Reader Contactless Transaction Limit for the specific Application Program ID is less than the default Reader Contactless Transaction Limit used during the Pre-Processing phase of Entry Point. Otherwise, the specific application would not in the first place have been selected during the Combination Selection phase of Entry Point.

---

## Requirements – Contactless Application Allowed Check

---

### 5.1.3.1 (Contactless Application Not Allowed)

**If** the ‘Contactless Application Not Allowed’ indicator is 1,  
**then** the kernel shall provide a **Select Next** Outcome with the following parameters:

**Select Next:**

- **Start:** C
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** No
- **UI Request on Restart Present:** No
- **Data Record Present:** No
- **Discretionary Data Present:** No
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will cause Entry Point to remove the current combination from the candidate list and return to Entry Point Start C, in Combination Selection.

**Else** (the ‘Contactless Application Not Allowed’ indicator is 0), the kernel shall continue processing the transaction.

---

## 5.2 Initiate Application Processing

During Initiate Application Processing, the reader issues the GET PROCESSING OPTIONS (GPO) command to the card, and includes any data that the card has requested in the PDOL during Final Combination Selection by Entry Point. Application data necessary to process the transaction is returned by the card application during Initiate Application Processing, and may also be returned during Read Application Data.

### 5.2.1 GET PROCESSING OPTIONS (GPO) Command

---

#### Requirements – GPO Command

---

##### 5.2.1.1 (GPO Command) [5.56]

The kernel shall support the GET PROCESSING OPTIONS (GPO) command, as defined in Annex D of this specification.

Data Object List (DOL) coding is performed according to [EMV 4.2 Book 3], section 5.4. The kernel shall be able to provide the value of reader data elements (defined in Annex A) requested by the card application.

---

##### 5.2.1.2 (Format 1 and Format 2) [5.57]

The kernel shall support GPO responses in EMV Format 1 and EMV Format 2 as defined in Annex D of this specification.

---

##### 5.2.1.3 (Recognized and Unrecognized Data) [5.58]

The kernel shall store all recognized data elements read, whether mandatory or optional, for later use in transaction processing. Data elements that are not recognized by the kernel (that is, their tags are unknown by the kernel) may be ignored and do not need to be stored.

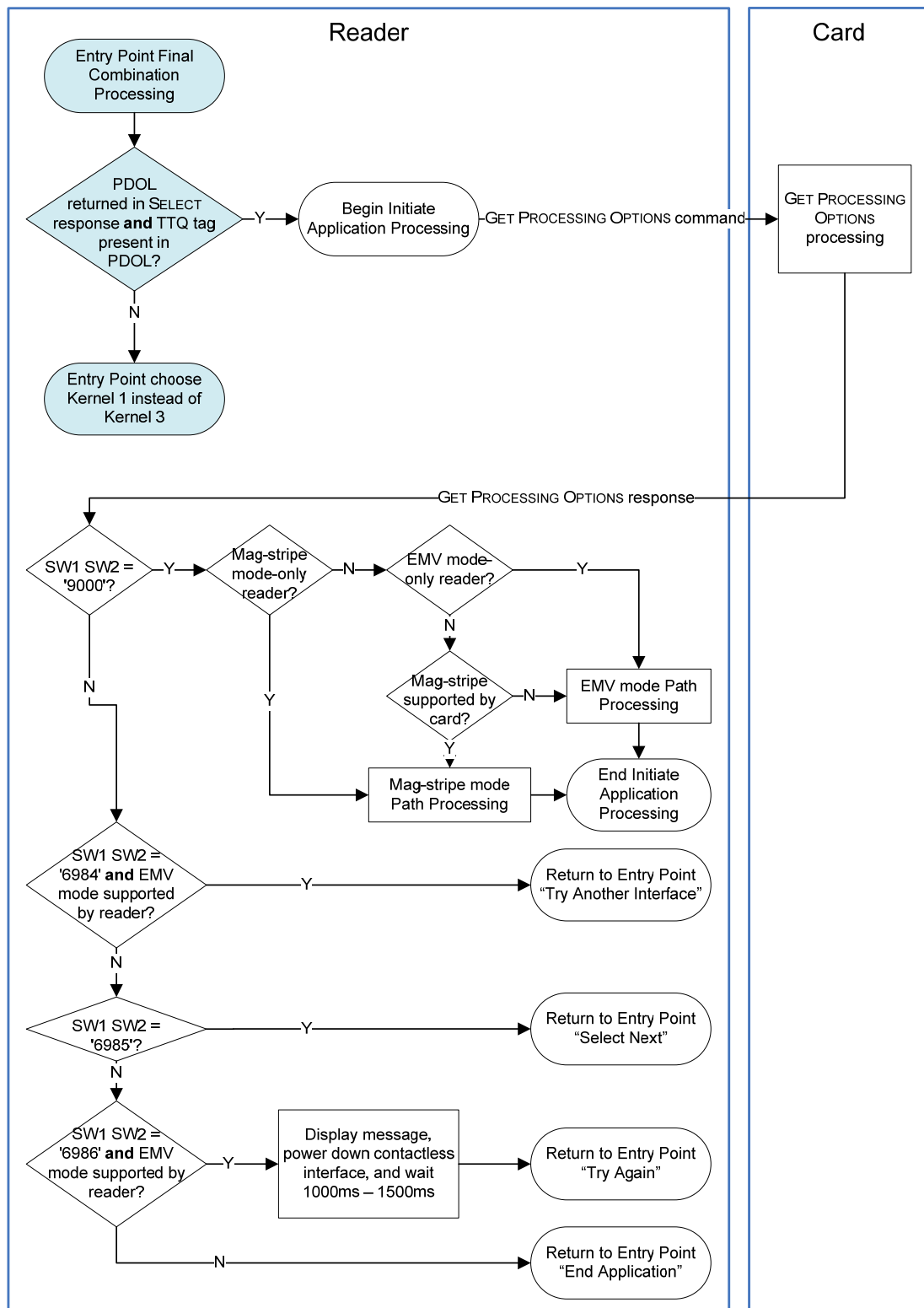
*Note:* As the card application may return application data in both the GPO response and in records, the kernel shall not check for the presence of mandatory data elements until Card Read Complete processing.

---

### 5.2.2 Initiate Application Processing

Figure 5-1 outlines Initiate Application Processing.

Figure 5-1: Initiate Application Processing (Reader)



Prior to initiating the transaction with the card, Entry Point checked the SELECT response for the presence of the Processing Options Data Object List (PDOL, Tag '9F38'), and for the presence of the Terminal Transaction Qualifiers (TTQ, Tag '9F66') in the PDOL.

*Note:* If the PDOL (Tag '9F38') is not present in the SELECT response or TTQ (Tag '9F66') is not present in the PDOL, Kernel 3 will not be activated as Entry Point will activate Kernel 1 instead (see *Book B v2.1*, requirement 3.3.3.6.) [5.59]

The kernel shall perform the following procedure to initiate the transaction with the card.

---

### Requirements – Initiate Application Processing

---

#### 5.2.2.1 (Issue GPO Command) [5.60]

The kernel shall issue the GET PROCESSING OPTIONS (GPO) command. The command data field is a data object coded according to the PDOL provided by the card, preceded by the Command Template tag (Tag '83') and length.

---

---

## Requirements – Initiate Application Processing

---

### 5.2.2.2 (GPO Response SW1 SW2) [5.61]

**If** the kernel receives SW1 SW2 = '9000' in response to the GPO command,

**then** the kernel shall continue with requirement 5.2.2.3.

**Else:**

- **If** the kernel receives SW1 SW2 = '6984' in response to the GPO command,  
**and** the reader supports EMV mode,  
**then** the kernel shall provide a **Try Another Interface** Outcome with the following parameters:

**Try Another Interface:**

- **Start:** N/A
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** Yes
  - Message Identifier: '1D' ("Please insert card")
  - Status: Processing Error
- **UI Request on Restart Present:** No
- **Data Record Present:** No
- **Discretionary Data Present:** No
- **Alternate Interface Preference:** Contact Chip
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will cause the reader to switch interfaces.

- **Else, if** the kernel receives SW1 SW2 = '6985' in response to the GPO command,  
**then** the kernel shall provide a **Select Next** Outcome with the following parameters:

---

## Requirements – Initiate Application Processing

---

***Select Next:***

- o **Start:** C
- o **Online Response Data:** N/A
- o **CVM:** N/A
- o **UI Request on Outcome Present:** No
- o **UI Request on Restart Present:** No
- o **Data Record Present:** No
- o **Discretionary Data Present:** No
- o **Alternate Interface Preference:** N/A
- o **Receipt:** N/A
- o **Field Off Request:** N/A
- o **Removal Timeout:** Zero

This will cause Entry Point to remove the current combination from the candidate list and return to Entry Point Start C, in Combination Selection.

- **Else, if** the kernel receives SW1 SW2 = '6986' in response to the GPO command,  
**and** the reader supports EMV mode,  
**then** the kernel shall provide a ***Try Again*** Outcome with the following parameters:

---

## Requirements – Initiate Application Processing

---

### *Try Again:*

- **Start:** B
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** Yes
  - Message Identifier: '20' ("See Phone for Instructions")
  - Status: Processing Error
  - Hold time: 13<sup>2</sup>
- **UI Request on Restart Present:** Yes
  - Status: Ready to Read
- **Data Record Present:** No
- **Discretionary Data Present:** No
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** 13<sup>2</sup>
- **Removal Timeout:** Zero

This will instruct the cardholder to refer to their payment device for further instructions and will interrupt the power for approximately 1300ms before Entry Point returns to Protocol Activation with the same message displayed to the cardholder.

- **Else** (SW1 SW2 does not match any of the above), the reader shall provide an **End Application** Outcome as defined in requirement 4.2.1.1. This will terminate the transaction.

---

<sup>2</sup> Kernel 3 testing will accept a range of 1 to 1.5 seconds.

---

## Requirements – Initiate Application Processing

---

### 5.2.2.3 (Contactless Path Determination) [5.62]

The kernel has received SW1 SW2 = '9000' in response to the GPO command, and determines the contactless path for the transaction.

**If** the reader is mag-stripe mode-enabled,  
**and** the reader is not EMV mode-enabled,  
**then** the kernel shall continue processing and for all subsequent kernel processing with different behaviour based on path, the kernel shall proceed with Mag-Stripe Mode Path Processing, as described in section 5.4.4.

**If** the reader is EMV mode-enabled  
**and** the reader is not mag-stripe mode-enabled,  
**then** the kernel shall continue processing and for all subsequent kernel processing with different behaviour based on path, the kernel shall proceed with EMV Mode Path Processing, as described in section 5.4.3.

**If** the reader is both mag-stripe mode-enabled and EMV mode-enabled,  
**then** the kernel shall examine the Application Interchange Profile (AIP, Tag '82') returned in the GPO response to determine subsequent processing:

- **If** the card indicates mag-stripe mode is supported (AIP byte 2 bit 8 is 1b),  
**then** the kernel shall continue processing and for all subsequent kernel processing with different behaviour based on path, the kernel shall proceed with Mag-Stripe Mode Path Processing, described in section 5.4.4.

**Else, if** the card indicates mag-stripe mode is not supported (AIP byte 2 bit 8 is 0b), the kernel shall continue processing and for all subsequent kernel processing with different behaviour based on path, the kernel shall proceed with EMV Mode Path Processing, described in section 5.4.3.

**Else** (the AIP was not returned in the GPO response or was incorrectly formatted), the kernel shall provide an

**End Application Outcome** as defined in requirement 4.2.1.1.  
This will terminate the transaction.

---

## 5.3 Read Application Data

The kernel performs Read Application Data if an Application File Locator (AFL) was returned during Initiate Application Processing, and proceeds to Card Read Complete processing if an AFL is not returned.

During Read Application Data, the kernel uses the READ RECORD command to retrieve the card data necessary to process the transaction.

### 5.3.1 READ RECORD Command

---

#### Requirements – READ RECORD Command

---

##### 5.3.1.1 (READ RECORD Command) [5.63]

The kernel shall support the READ RECORD command, as defined in Annex D of this specification.

---

### 5.3.2 Read Application Data

The kernel shall perform the following procedure to read the card application data.

---

#### Requirements – Read Application Data

---

##### 5.3.2.1 (Application File Locator) [5.64]

**If** the Application File Locator (AFL, Tag '94') is returned during Initiate Application Processing (section 5.2.2),  
**then** the kernel shall perform Read Application Data as specified in [EMV 4.2 Book 3], section 10.2.

**Else** (the AFL was not returned) the kernel shall proceed to Card Read Complete processing (section 5.4).

---

## 5.4 Card Read Complete

After Read Application Data has been completed, the reader indicates to the cardholder that card read is complete, and the cardholder should remove their card from the reader's RF field. The kernel checks the application data returned by the card to ensure that all mandatory data for the transaction has been returned, and that redundant primitive data was not returned. Primitive data elements are redundant if more than one occurrence of the same primitive data element was returned by the card during Initiate Application Processing and Read Application Data.

The kernel shall perform the procedure described in this section for Card Read Complete.

### 5.4.1 Cardholder Messaging

---

#### Requirements – Cardholder Messaging

---

##### 5.4.1.1 (Card Read Complete Cardholder Messaging) [5.65]

The kernel shall send a User Interface Request with the following parameters:

- Message Identifier: '17' ("Card Read OK")
  - Status: Card Read Successfully
- 

Depending on the configuration of the POS system, the reader may in conjunction with this message or the kernel Outcome turn the field off and/or perform a card removal procedure as defined in *Book D*. For instance an EMV mode reader may turn the field off, while a mag-stripe mode reader may do a card Removal Sequence before accepting the next card. This is managed by the POS system using the Autorun parameter as well as other configuration parameters. [5.66]

## 5.4.2 Mandatory and Redundant Data

The kernel examines application data returned by the card during Initiate Application Processing and Read Application Data to determine whether all mandatory data elements were returned, and whether redundant primitive data elements were returned.

---

### Requirements – Mandatory and Redundant Data

---

#### 5.4.2.1 (Mandatory Data) [5.67]

The kernel shall ensure that all mandatory data elements – as defined in section A.2 – are returned by the card. Whether data elements are mandatory depends upon the processing path (EMV mode or mag-stripe mode) determined by the kernel during Initiate Application Processing.

**If** any mandatory data element for the applicable path is not present,  
**then** the kernel shall provide an **End Application** Outcome as defined in requirement 4.2.1.1. This will terminate the transaction.

---

#### 5.4.2.2 (Redundant Data) [5.68]

Redundant primitive data elements are not permitted.

**If** the kernel encountered more than one occurrence of a single primitive data element while reading data from the card during Initiate Application Processing (section 5.2) and Read Application Data (section 5.3),  
**then** the kernel shall provide an **End Application** Outcome as defined in requirement 4.2.1.1. This will terminate the transaction.

---

### 5.4.3 EMV Mode Path Processing – Determine Card Transaction Disposition

The kernel shall perform the procedure defined in this section for EMV mode transactions.

---

#### Requirements – EMV Mode – Determine Card Transaction Disposition

---

##### 5.4.3.1 (Cryptogram Information Data) [5.69]

**If** the card does not return the Cryptogram Information Data (CID),  
**then** the kernel shall:

- Construct the CID and initialize it with a value of '00'.
- Set CID bits 8-7 to the value of Issuer Application Data byte 5 bits 6-5<sup>3</sup> using identical bit settings.

---

##### 5.4.3.2 (Cryptogram Type Transaction Disposition) [5.70]

The kernel examines the Cryptogram Information Data (CID) to determine the cryptogram type (TC, ARQC, or AAC).

**If** the card returns an Application Authentication Cryptogram (AAC),  
**then** the kernel shall set the Decline Required by Reader Indicator to 1.

**If** the card returns an Authorisation Request Cryptogram (ARQC),  
**or** 'Online Cryptogram Required' by the reader (TTQ byte 2 bit 8 is 1b),  
**then** the kernel shall set the Online Required by Reader Indicator to 1.

**If** the cryptogram type cannot be determined (that is, if the cryptogram is not identifiably TC, ARQC, or AAC),  
**then** the kernel shall set the Decline Required by Reader Indicator to 1.

*Note:* A reader indicator is not set when the cryptogram type is a TC.

---

<sup>3</sup> See section A.2 for the format of Issuer Application Data.

## 5.4.4 Mag-Stripe Mode Path Processing – Online Disposition

The kernel shall perform the procedure defined in this section for mag-stripe mode transactions.

Processing to determine the transaction disposition is not performed, as all mag-stripe mode transactions require online processing.

If needed, the following requirement allows for the Track 2 and Track 1 data to be formatted into a suitable magnetic stripe format.

---

### Requirements – Mag-Stripe Mode – Online Disposition

---

#### 5.4.4.1 (Formatting Track 2 Data) [5.71]

*Acquirer-Merchant-Optional:* This functionality shall be configurable to be enabled or disabled at acquirer-merchant discretion.

**If** formatting of Track 2 is enabled,  
**then** the kernel shall format the Track 2 data into the magnetic stripe format as defined in section E.2.

---

#### 5.4.4.2 (Constructing Track 1 Data) [5.72]

*Acquirer-Merchant-Optional:* This functionality shall be configurable to be enabled or disabled at acquirer-merchant discretion.

**If** construction of Track 1 is enabled,  
**then** the kernel shall construct the Track 1 data as defined in section E.1.

---

---

## Requirements – Mag-Stripe Mode – Online Disposition

---

### 5.4.4.3 (Subsequent Mag-Stripe Mode Processing) [5.73]

Subsequent mag-stripe mode transaction processing is outside the scope of this specification. However, mag-stripe mode transactions will always be online authorised.

The kernel shall provide an **Online Request** Outcome with the following parameters:

**Online Request:**

- **Start:** N/A
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** No
- **UI Request on Restart Present:** No
- **Data Record Present:** Yes

The minimum data requirements for mag-stripe mode online messages are specified in section B.2.1 and section B.2.2.

- **Discretionary Data Present:** No
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will result in an online authorisation request.

---

## 5.5 Processing Restrictions

The kernel performs Processing Restrictions to determine whether there are restrictions for the transaction. The kernel checks the Application Expiration date and Application Usage Control, and may check whether the card application is on the Terminal Exception File.

### 5.5.1 EMV Mode Path Processing

The kernel shall perform the procedure defined in this section for EMV mode transactions.

---

#### Requirements – Processing Restrictions – EMV Mode Path Processing

---

##### 5.5.1.1 (Application Expired Check) [5.74]

*Implementation-Conditional:* The Application Expired Check shall be implemented for readers supporting offline transactions.

**If** the card application returns a Transaction Certificate (TC),  
**and** the Terminal Transaction Date (local to the reader) is greater than the Application Expiration Date,  
**then** the application has expired and the kernel shall examine the Card Transaction Qualifiers (CTQ) to determine further processing:

- **If** 'Go online if application expired' indicated by card (CTQ byte 1 bit 4 is 1b),  
**then** the kernel shall set the Online Required by Reader Indicator to 1.  
  
**Else**, the kernel shall set the Decline Required by Reader Indicator to 1.
-

---

## Requirements – Processing Restrictions – EMV Mode Path Processing

---

### 5.5.1.2 (Terminal Exception File Check) [5.75]

*Implementation-Optional:* Terminal Exception File checking is an implementation option.

*Acquirer-Merchant-Optional:*

**If** the Terminal Exception File Check is implemented,  
**then** it shall be acquirer-merchant configurable to be enabled or disabled.

**If** the card application returns a Transaction Certificate (TC),  
**and** the Application PAN is present on the Terminal Exception File<sup>4</sup>,  
**then** the kernel shall set the Decline Required by Reader Indicator to 1.

---

### 5.5.1.3 (Application Usage Control – Cash Transactions) [5.76]

*Implementation-Conditional:*

**If** the reader supports cash transactions,  
**then** this functionality shall be implemented.

This check shall be performed for cash transactions.

**If either** of the following is true:

- Issuer Country Code matches the Terminal Country Code  
**and** the card application is 'Valid for domestic cash transactions' (AUC byte 1 bit 8 is 1b)
- **or** Issuer Country Code does not match the Terminal Country Code  
**and** the card application is 'Valid for international cash transactions' (AUC byte 1 bit 7 is 1b)

**then** the cash transaction is allowed and the kernel continues processing the transaction.

**Else** (application is not valid for the cash transaction, or Issuer Country Code or AUC is not returned by the card application), the kernel shall examine the Card Transaction Qualifiers to determine further processing:

---

<sup>4</sup> This check may be achieved using the Processing Data Exchange as referenced in *Book A*, requirement 8.1.1.12.

---

### Requirements – Processing Restrictions – EMV Mode Path Processing

---

- If ‘Switch interface for cash transactions’ supported by card (CTQ byte 1 bit 3 is 1b),  
**then** the kernel shall provide a ***Try Another Interface*** Outcome with the following parameters.

***Try Another Interface:***

- **Start:** N/A
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** Yes
  - Message Identifier: '18' ("Please insert or swipe card")
  - Status: Processing Error
- **UI Request on Restart Present:** No
- **Data Record Present:** No
- **Discretionary Data Present:** No
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will cause the reader to switch interface.

**Else** (‘Switch interface for cash transactions’ not supported by card or CTQ not returned), the kernel shall set the Decline Required by Reader Indicator to 1.

---

---

## Requirements – Processing Restrictions – EMV Mode Path Processing

---

### 5.5.1.4 (Application Usage Control – Cashback Transactions) [5.77]

*Implementation-Conditional:*

**If** the reader supports transactions with cashback,  
**then** this functionality shall be implemented.

This check shall be performed for transactions with cashback.

**If either** of the following is true:

- Issuer Country Code matches the Terminal Country Code  
**and** 'Domestic cashback allowed' by card application (AUC  
byte 2 bit 8 is 1b)
- **or** Issuer Country Code does not match the Terminal Country  
Code  
**and** 'International cashback allowed' by card application (AUC  
byte 2 bit 7 is 1b)

**then** the transaction with cashback is allowed and the kernel  
continues processing the transaction.

**Else** (application is not valid for the transaction with cashback, or  
Issuer Country Code or AUC is not returned by the card  
application), the kernel shall examine the Card Transaction  
Qualifiers to determine further processing:

---

### Requirements – Processing Restrictions – EMV Mode Path Processing

---

- If ‘Switch interface for cashback transactions’ supported by card (CTQ byte 1 bit 2 is 1b),  
**then** the kernel shall provide a ***Try Another Interface*** Outcome with the following parameters.

***Try Another Interface:***

- **Start:** N/A
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** Yes
  - Message Identifier: '18' ("Please insert or swipe card")
  - Status: Processing Error
- **UI Request on Restart Present:** No
- **Data Record Present:** No
- **Discretionary Data Present:** No
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will cause the reader to switch interface.

**Else** (‘Switch interface for cashback transactions’ not supported by card or CTQ not returned), the kernel shall set the Decline Required by Reader Indicator to 1.

---

## 5.6 Offline Data Authentication

Offline Data Authentication is performed by the kernel to verify the dynamic signature and authenticate the data from the card.

### 5.6.1 EMV Mode Path Processing

*Implementation-Conditional:* Offline Data Authentication shall be implemented for readers supporting offline transactions. Offline Data Authentication is performed for card requested offline transactions.

The kernel shall perform the procedure defined in this section for EMV mode transactions if the Online Required by Reader Indicator is 0 and the Decline Required by Reader Indicator is 0.

---

#### Requirements – Offline Data Authentication – EMV Mode Path Processing

---

##### 5.6.1.1 (Offline capable readers) [5.3]

Offline capable readers shall support fDDA as defined in Annex C.

---

##### 5.6.1.2 (fDDA Verification) [5.78]

The kernel shall verify the DDA dynamic signature according to [EMV 4.2 Book 2] and the definition of fDDA in Annex C.

**If** fDDA fails

**or** the kernel is unable to perform fDDA,

**then** the kernel shall examine the Card Transaction Qualifiers (CTQ) to determine further processing:

- **If** 'Go online if ODA fails' indicated by card (CTQ byte 1 bit 6 is 1b)

**and** Online supported by reader,

**then** the kernel shall set the Online Required by Reader Indicator to 1 and continue processing the transaction.

**Else:**

- o **If** 'Switch interface if ODA fails' indicated by card (CTQ byte 1 bit 5 is 1b)

**and** EMV contact chip supported by reader,

**then** the kernel shall provide a **Try Another Interface**

Outcome with the following parameters:

---

## Requirements – Offline Data Authentication – EMV Mode Path Processing

---

### *Try Another Interface:*

- **Start:** N/A
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** Yes
  - Message Identifier: '1D' ("Please insert card")
  - Status: Processing Error
- **UI Request on Restart Present:** No
- **Data Record Present:** No
- **Discretionary Data Present:** No
- **Alternate Interface Preference:** Contact Chip
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will switch interface with explicit indication that the contact chip interface is to be used.

**Else** (neither of the above or CTQ not returned), the kernel shall set the Decline Required by Reader Indicator to 1 and continue processing the transaction.

---

## 5.7 Cardholder Verification

The kernel determines if a Cardholder Verification Method (CVM) is to be performed. The CVMs that may be supported for Kernel 3 are Online PIN, Consumer Device CVM, and Signature.

*Note:* A Consumer Device CVM is a CVM performed on, and validated by, the consumer's payment device, independent of the reader.

### 5.7.1 Cardholder Verification – EMV Mode Path Processing

*Implementation-Mandatory:* Cardholder Verification shall be implemented for EMV mode-enabled readers.

*Acquirer-Merchant-Optional:* The acquirer-merchant shall be able to enable and disable the supported CVMs. However, support for the Consumer Device CVM shall be enabled (TTQ byte 3 bit 7 is 1b).

The kernel shall perform the procedure defined in this section for EMV mode transactions if the Decline Required by Reader Indicator is 0.

---

## Requirements – Cardholder Verification – EMV Mode Path Processing

---

### 5.7.1.1 (CTQ Not Returned by Card) [5.79]

**If** the kernel requires a CVM,  
**and** the payment application does not return the Card Transaction Qualifiers (CTQ, Tag '9F6C'),  
**then**:

- **If** the reader supports Signature,  
**then** the kernel shall request a signature in the Outcome.
- **If** the reader supports only the Consumer Device CVM and Online PIN,  
**then** the kernel shall request Online PIN in the Outcome.
- **If** the reader supports only the Consumer Device CVM,  
**then** the kernel shall set the Decline Required by Reader Indicator to 1.

*Note:* Reader support for the Consumer Device CVM is mandatory, as is indication of its support in the Terminal Transaction Qualifiers. In addition to supporting the Consumer Device CVM, the reader may optionally be configured to support Online PIN and/or Signature.

---

---

## Requirements – Cardholder Verification – EMV Mode Path Processing

---

### 5.7.1.2 (CTQ Returned by Card) [5.80]

**If** the payment application returns the CTQ (Tag '9F6C'),  
**then** the kernel shall examine the CTQ (in the order specified below) to determine the CVM to be performed:

- **If** Online PIN Required by card (CTQ byte 1 bit 8 is 1b)  
**and** Online PIN supported by reader,  
**then** the kernel shall:
  - o set the CVM parameter in the Outcome to Online PIN,
  - o not examine the remaining CTQ bits for CVM processing,  
and
  - o set the Online Required by Reader Indicator to 1, and
  - o conclude CVM processing.

**Else** (Online PIN not required or not supported),  
**if** Consumer Device CVM Performed by card (CTQ byte 2 bit 8 is 1b),  
**then**:

- o **If** the Card Authentication Related Data was returned during the transaction,  
**then**:
  - **If** Card Authentication Related Data bytes 6-7 match CTQ bytes 1-2 (respectively),  
**then** the kernel shall:
    - not examine the remaining CTQ bits for CVM processing,
    - set the CVM parameter in the Outcome to Confirmation Code Verified, and
    - conclude CVM processing.

---

## Requirements – Cardholder Verification – EMV Mode Path Processing

---

**Else** (Card Authentication Related Data bytes do not match CTQ bytes), the kernel shall:

- set the Decline Required by Reader Indicator to 1,
- not examine the remaining CTQ bits for CVM processing, and
- conclude CVM processing,

**Else** (Card Authentication Related Data was not returned during the transaction):

**If** the cryptogram type is an ARQC,  
**then** the kernel shall:

- not examine the remaining CTQ bits for CVM processing,
- set the CVM parameter in the Outcome to Confirmation Code Verified, and
- conclude CVM processing.

**Else** (cryptogram type is not an ARQC), the kernel shall:

- set the Decline Required by Reader Indicator to 1,
- not examine the remaining CTQ bits for CVM processing, and
- conclude CVM processing.

**Else** (neither Online PIN required nor Consumer Device CVM performed):

- o **If** Signature Required (CTQ byte 1 bit 7 is 1b),  
**and** the reader supports Signature (TTQ byte 1 bit 2 is 1b),  
**then** the kernel shall set the CVM parameter in the Outcome to Obtain Signature.

---

### Requirements – Cardholder Verification – EMV Mode Path Processing

---

**Else** (None of the above), a common CVM was not indicated in the CTQ and a CVM is not performed.

*Note:* Cardholder Verification processing to determine the CVM to perform for the transaction, if any, is performed in this section. However, actual performance of the CVM does not take place during this point in the transaction (e.g. acquiring a signature for the transaction).

---

#### 5.7.1.3 (CVM Required and CVM Not Performed) [5.81]

**If** the reader requires a CVM and a CVM will not be performed, **then** the kernel shall set the Decline Required by Reader Indicator to 1.

---

## **5.8 Online Processing**

The reader sends an authorisation request to the issuer host. Online Processing allows the issuer host to review and authorise or decline transactions using the issuer's host based risk management parameters.

### **5.8.1 Online Processing – EMV Mode Path Processing**

*Implementation-Conditional:* Online Processing shall be implemented for EMV mode readers supporting online transactions.

---

## Requirements – Online Processing – EMV Mode Path Processing

---

### 5.8.1.1 (EMV Mode Online Authorisation) [5.82]

**If** the Online Required by Reader Indicator is 1,  
**and** the Decline Required by Reader Indicator is 0,  
**then** the kernel shall provide an **Online Request** Outcome with the following parameters:

**Online Request:**

- **Start:** as defined in requirement 5.8.1.2
- **Online Response Data:** as defined in requirement 5.8.1.2
- **CVM:** as defined in section 5.7.1
- **UI Request on Outcome Present:** Yes
  - o depending on implementation, Message Identifier is either not present or set to '1B' ("Authorising, Please Wait")
  - o Value Qualifier, Value, and Currency Code: see requirement 4.3.1.1
- **UI Request on Restart Present:** as defined in requirement 5.8.1.2
- **Data Record Present:** Yes

The minimum data requirements for EMV mode online messages are specified in section B.1.1.
- **Discretionary Data Present:** see requirement 4.3.1.1

As defined in requirement 4.3.1.1, AOSA may be present in Discretionary Data.
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** as defined in requirement 5.8.1.2
- **Removal Timeout:** Zero

This will request an online transaction.

---

---

## Requirements – Online Processing – EMV Mode Path Processing

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### 5.8.1.2 (EMV Mode Online Processing Restart) [5.83]

If all of the following are true:

- an **Online Request** Outcome is being provided in response to requirement 5.8.1.1,
- **and** Issuer Update Processing is supported by the reader,
- **and** Issuer Update Processing is supported by the card (CTQ returned by card and CTQ byte 2 bit 7 is 1b),

Then the following parameters of the Outcome shall be:

- **Start:** B
- **Online Response Data:** EMV Data
- **UI Request on Restart Present:** Yes
  - o Message Identifier: '21' ("Present Card Again")
- **Field Off Request:** Zero

Else the following parameters of the Outcome shall be:

- **Start:** N/A
  - **Online Response Data:** N/A
  - **UI Request on Restart Present:** No
  - **Field Off Request:** N/A
-

## 5.9 Offline Completion

### 5.9.1 Offline Completion – EMV Mode Path Processing

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#### Requirements – Offline Completion – EMV Mode Path Processing

---

##### 5.9.1.1 (Cardholder Messaging for Approved) [5.85]

**If** the Online Required by Reader Indicator is 0,  
**and** the Decline Required by Reader Indicator is 0,  
**then** the kernel shall provide an **Approved** Outcome with the following parameters:

**Approved:**

- **Start:** N/A
- **Online Response Data:** N/A
- **CVM:** as defined in section 5.7.1
- **UI Request on Outcome Present:** Yes
  - o Message Identifier: '03' ("Approved")
  - o Value Qualifier, Value, and Currency Code:  
see requirement 4.3.1.1
- **UI Request on Restart Present:** No
- **Data Record Present:** Yes

The minimum data requirements for EMV mode clearing records are specified in section B.1.1.
- **Discretionary Data Present:** see requirement 4.3.1.1

As defined in requirement 4.3.1.1, AOSA may be present in Discretionary Data
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will indicate to the cardholder and merchant that the transaction has been approved.

---

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## Requirements – Offline Completion – EMV Mode Path Processing

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### 5.9.1.2 (Cardholder Messaging for Declined) [5.86]

**If** the Decline Required by Reader Indicator is 1,  
**then** the kernel shall provide a **Declined** Outcome with the following parameters:

**Declined:**

- **Start:** N/A
- **Online Response Data:** N/A
- **CVM:** No CVM
- **UI Request on Outcome Present:** Yes<sup>5</sup>
  - Message Identifier: '07' ("Not Authorised")
  - Value Qualifier, Value, and Currency Code:  
see requirement 4.3.1.1
- **UI Request on Restart Present:** No
- **Data Record Present:** No<sup>5</sup>
- **Discretionary Data Present:** see requirement 4.3.1.1  
As defined in requirement 4.3.1.1, AOSA may be present in Discretionary Data.
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will decline the transaction and indicate to the cardholder and merchant that the transaction has been declined.

---

### 5.9.1.3 (Do Not Reattempt Transaction for Declined) [5.87]

**If** Decline Required by Reader Indicator is 1,  
**then** the reader shall not attempt to perform the transaction over another interface.

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<sup>5</sup> Note that for non-purchase type of transactions, for instance a refund as defined in requirement 3.4.1.3, special transaction handling needs to take place.



## 6 Issuer Update Processing Reader Requirements

Whilst the standard new transaction processing only utilizes one card presentment, it is possible to request a second presentment in support of issuer update processing. This requires both card and reader to support a second presentment of a card after an issuer response to an online request. If so, and Issuer Update Data has been returned in an online authorisation response, the reader will request the cardholder to re-present the card. Once the card is re-presented, the Issuer Authentication and/or Issuer Script process will be performed. If the same card that was used for the new transaction is presented, then the Issuer Update Processing will complete. If a different card is presented, then either it will not be successfully selected by the reader using the same Combination as for the new transaction, or the Issuer Update Processing will fail.

The processing assumes that the same combination as used for the previous new transaction is used to select the card and that SW1 SW2 = '9000' has been returned in the response to the SELECT command issued by Entry Point. The kernel will have the FCI available as well as the necessary data relevant for the transaction (e.g. Issuer Update Data).

It is also assumed that the final transaction disposition presented to the cardholder as the result of the online authorisation is deferred until after the Outcome from the issuer update processing.

Issuer update processing is performed if Issuer Update Data is present when Entry Point hands over control to Kernel 3 – as outlined in requirement 4.4.1.1.

*Implementation-Optional:* Issuer Update Processing is an implementation option for readers implementing EMV mode, and if supported, must meet the requirements of both section 6.1 and section 6.2.

*Acquirer-Merchant-Optional:* If implemented, support for Issuer Update Processing is acquirer-merchant optional. Reader support for Issuer Update Processing is indicated to the card by setting 'Issuer Update Processing supported' by reader (TTQ byte 3 bit 8 to 1b).

If supported, Issuer Update Processing is conditionally performed for EMV Mode Path Processing

## 6.1 Issuer Update Processing Commands

To facilitate Issuer Update Processing, support for the EXTERNAL AUTHENTICATE command and issuer script processing is required.

---

### Requirements – Issuer Update Processing Commands

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#### 6.1.1.1 (EXTERNAL AUTHENTICATE Command) [5.88]

The kernel shall support the EXTERNAL AUTHENTICATE command, as defined in section D.3.

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#### 6.1.1.2 (Issuer Scripts) [5.89]

The kernel shall support Issuer Scripts according to [EMV 4.2 Book 3], section 10.10, and [EMV 4.2 Book 4], section 6.3.9, except for the following:

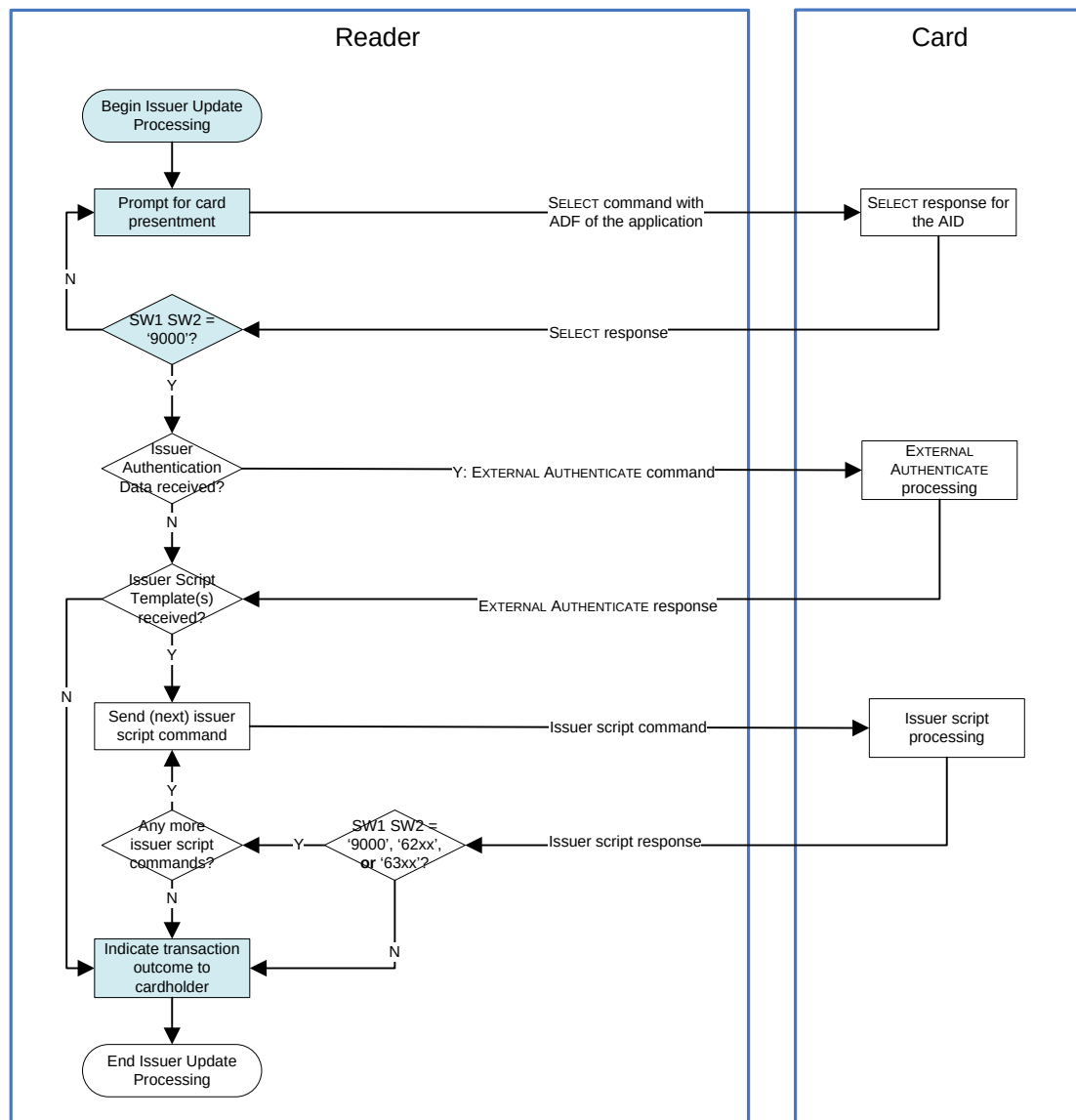
- Unlike [EMV 4.2], Issuer Script Templates with Tag '71' or Tag '72' are processed and issued by the kernel in the same manner. There is no GENERATE AC command, and Issuer Script Templates with Tag '71' and '72' are both processed during Issuer Update Processing.
  - No processing is performed on the Transaction Status Information (TSI) or Terminal Verification Results (TVR).
-

## 6.2 Issuer Update Processing

The reader performs Issuer Update Processing as defined in this section.

Figure 6-1 outlines reader processing to perform Issuer Update Processing.

**Figure 6-1: Issuer Update Processing (Reader)**



**Note:** Processing as defined by the shaded shapes is outside the scope of this kernel (e.g. performed by Entry Point).

The kernel shall perform the following procedure to perform Issuer Update Processing.

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## Requirements – Issuer Update Processing

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### 6.2.1.1 (EXTERNAL AUTHENTICATE Command) [5.92]

**If** Issuer Authentication Data was received in the authorisation response message,  
**then** the kernel shall issue an EXTERNAL AUTHENTICATE command using the Issuer Authentication Data received.

*Note:* The kernel does not perform processing based on the card response to the EXTERNAL AUTHENTICATE command. The kernel continues Issuer Update Processing regardless of the SW1 SW2 value returned by the card.

---

### 6.2.1.2 (Issuer Script Commands) [5.93]

**If** an Issuer Script Template was received in the authorisation response,  
**then** the kernel issues the issuer script command(s) as follows.

- Issuer Script Templates shall follow Issuer Script Template 1 or 2, and an Issuer Script Template may have multiple issuer script commands.
- The kernel shall parse all Issuer Script Templates received.
- The kernel shall parse each Issuer Script Template to retrieve each issuer script command, and shall transmit the commands to the card one by one.

**If** the response to an issuer script command is not SW1 SW2 = '9000', '62xx', or '63xx',  
**then** the kernel shall not send any further issuer script commands and shall discontinue Issuer Script Command(s) processing.

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## Requirements – Issuer Update Processing

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### 6.2.1.3 (Second Presentment Completed) [5.94]

After completing Issuer Update Processing, the kernel shall provide an **End Application** Outcome with the following parameters:

**End Application:**

- **Start:** N/A
- **Online Response Data:** N/A
- **CVM:** N/A
- **UI Request on Outcome Present:** No
- **UI Request on Restart Present:** No
- **Data Record Present:** No
- **Discretionary Data Present:** No
- **Alternate Interface Preference:** N/A
- **Receipt:** N/A
- **Field Off Request:** N/A
- **Removal Timeout:** Zero

This will terminate the transaction, allowing the final disposition (from the online authorisation response) to be presented to the cardholder.

*Note:* The POS system will indicate to the cardholder the transaction outcome based on the issuer authorisation response, regardless of the results of Issuer Update Processing.

*Note:* If the Available Offline Spending Amount (AOSA) is returned during Initiate Application Processing (section 5.2) or Read Application Data (section 5.3), then it is not included in the UI Request parameters for the second presentment.

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## Annex A Kernel 3 Data Elements

This annex defines the data elements used in this specification for financial transaction interchange and their mapping onto data objects.

Table A-1 on page 80 lists the data elements used in Kernel 3, sorted by name.

Table A-2 on page 114 lists the data elements by tag.

Table A-3 on page 117 lists the data elements that the reader must make available to Kernel 3 as specified in *Book A v2.1*, requirement 8.1.1.7.

### A.1 Data Element Descriptions

#### A.1.1 Requirements

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##### Requirements – Data Elements

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###### A.1.1.1 (Data Element Requirements) [D.1]

The kernel shall comply with the requirements, where specified and applicable, in Table A-1: Kernel 3 Data Elements.

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#### A.1.2 Name Column

The Name column of Table A-1 lists the name of the data element, and also includes the following:

- Format (F) of the data element. The [EMV 4.2] defined supported formats are as follows:
  - n (numeric)
  - cn (compressed numeric)
  - b (binary or bit string)
  - an (alphanumeric)
  - ans (alphanumeric special)
- Tag (T) of the data element in hexadecimal.

- Length (L) of the data element. The value of the length is shown in decimal. When the length defined for the data object is greater than the length of the actual data, the following rules apply:
  - A data element in format n is right-justified and padded with leading hexadecimal zeros
  - A data element in format cn is left-justified and padded with trailing hexadecimal 'F's
  - A data element in format an or format ans is left-justified and padded with trailing hexadecimal zeros

When data is moved from one entity to another (for example, card to reader), it shall always be passed in order from high order to low order, regardless of how it is internally stored. The same rules apply when concatenating data.

- Source (S) of the data element, indicated as “Card”, “Reader”, or “Issuer”.
- Path (P) for which the data element is applicable, indicating EMV mode (“E”), mag-stripe mode (“M”), or both (“E M”). Data elements that are not applicable for a given path shall be treated as unrecognized data elements when the kernel is processing for that path.

### A.1.3 Requirement Column

The Requirement column of Table A-1 lists the requirements for the data element:

- Mandatory – The data element must always be present and provided to the kernel if the source is the card. If the data element is not received by the kernel, then the kernel terminates the transaction as defined in requirement 5.4.2.1.
- Required – The data element must always be present, but the kernel does not terminate the transaction if the data element is not present.
- Conditional – The data element is necessary under the conditions specified.
- Optional – The data element is optional.

If the requirement is different for a data element applicable to both the EMV Mode Path and the Mag-Stripe Mode Path, two sets of requirements are specified in the Requirement column (one for each path).

#### A.1.4 Retrieval Column

The Retrieval column of Table A-1 lists the command(s) typically used to retrieve each data element that has the card as the source.

As defined in requirement 5.4.2.1, the reader shall not evaluate the presence of mandatory data elements per command, and shall only evaluate the presence of mandatory data when the reader/card interaction has been finalized.

The following values are used to indicate support for retrieval of card data elements:

- **N/A** indicates that the data element is not a card data element.
- **GPO** indicates that the data element may be retrieved as part of the data sent in the response to the GET PROCESSING OPTIONS command.
- **READ RECORD** indicates that retrieval of the data element is allowed using the READ RECORD command.
- **SELECT** indicates that the data element may be retrieved as part of the data sent in the response to the SELECT command.

## A.2 Data Elements by Name

Table A-1: Kernel 3 Data Elements

| Name (Format; Tag; Length; Source; Path)                                                   | Requirement                          | Description                                                                               | Retrieval | Values |
|--------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------|-----------|--------|
| <b>Amount, Authorised (Numeric)</b><br>F: n 12<br>T: '9F02'<br>L: 6<br>S: Reader<br>P: E M | Required                             | Authorised amount of the transaction (including Amount, Other and excluding adjustments). | N/A       |        |
| <b>Amount, Other (Numeric)</b><br>F: n 12<br>T: '9F03'<br>L: 6<br>S: Reader<br>P: E M      | Conditional<br>If cashback supported | Secondary amount associated with the transaction representing a cashback amount.          | N/A       |        |

| Name (Format; Tag; Length; Source; Path)                                                    | Requirement                                                                                             | Description                                                                                                                                                                                                                                                                                           | Retrieval   | Values |
|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------|
| <b>Application Cryptogram (AC)</b><br>F: b 64<br>T: '9F26'<br>L: 8<br>S: Card<br>P: E M     | EMV mode:<br>Mandatory<br>Mag-stripe mode:<br>Conditional<br>If Online<br>Cryptogram required by reader | Cryptogram returned by the card in response to the GPO command.                                                                                                                                                                                                                                       | GPO         |        |
| <b>Application Definition File (ADF) Name</b>                                               |                                                                                                         | See entry for "Application Identifier" (Tag '4F').                                                                                                                                                                                                                                                    |             |        |
| <b>Application Expiration Date</b><br>F: n 6 YYMMDD<br>T: '5F24'<br>L: 3<br>S: Card<br>P: E | Conditional<br>If fDDA supported                                                                        | Date after which the card application expires.<br>For transactions where Offline Data Authentication is performed, the Application Expiration Date is returned.<br>For transactions where Offline Data Authentication is not performed, the Application Expiration Date does not need to be returned. | READ RECORD |        |

| Name (Format; Tag; Length; Source; Path)                                                              | Requirement                                                 | Description                                                                                | Retrieval | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Application File Locator (AFL)</b><br>F: var.<br>T: '94'<br>L: var. up to 252<br>S: Card<br>P: E M | Conditional<br>If returning record data for the transaction | Indicates the location (SFI, range of records) of the AEFs related to a given application. | GPO       | For each file to be read, the Application File Locator contains the following four bytes:<br>Byte1<br>bits 8-4 = SFI<br>bits 3-1 = 000<br>Byte 2: First (or only) record number to be read for that SFI (never equal to zero)<br>Byte 3: Last record number to be read for that SFI (shall be greater than or equal to byte 2)<br>Byte 4: Number of consecutive records involved in authentication of static data, starting with record number in byte 2 (may range from zero to the value of the third byte minus the value of the second byte + 1) |

| Name (Format; Tag; Length; Source; Path)                                                           | Requirement | Description                                                                                                                                                                                      | Retrieval | Values                                          |
|----------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------|
| <b>Application Identifier (ADF Name)</b><br>F: b 40-128<br>T: '4F'<br>L: 5-16<br>S: Card<br>P: E M | Mandatory   | The ADF Name identifies the application as described in [ISO 7816-5]. The AID is made up of the Registered Application Provider Identifier (RID) and the Proprietary Identifier Extension (PIX). | SELECT    | Applicable AID as defined by the payment system |
| <b>Application Identifier (AID)</b><br>F: b 40-128<br>T: '9F06'<br>L: 5-16<br>S: Reader<br>P: E M  | Required    | Identifies the application as described in [ISO 7816-5].                                                                                                                                         | N/A       |                                                 |

| Name (Format; Tag; Length; Source; Path)                                                                                         | Requirement | Description                                                                                                                                                                                                                               | Retrieval | Values                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Application Interchange Profile (AIP)</b><br>F: b 16<br>T: '82'<br>L: 2<br>S: Card<br>P: E M                                  | Mandatory   | Indicates the capabilities of the card to support specific functions in the application.<br>Kernel 3 shall not act on AIP bit settings that are not supported for Kernel 3 or that are Reserved for Future Use (RFU).                     | GPO       | Byte 1<br>bit 8: RFU (0)<br>bit 7: Not used for Kernel 3<br>bit 6: 1 = DDA is supported for EMV mode<br>bit 5: Not used for Kernel 3<br>bit 4: Not used for Kernel 3<br>bit 3: Not used for Kernel 3<br>bit 2: RFU (0)<br>bit 1: Not used for Kernel 3<br>Byte 2<br>bit 8: 1 = Mag-stripe mode is supported<br>bits 7-1: RFU (0000000) |
| <b>Application Label</b><br>F: ans 1-16 *<br>T: '50'<br>L: 1-16<br>S: Card<br>P: E M<br>* (special characters limited to spaces) | Optional    | Mnemonic associated with AID according to [ISO 7816-5]. Used in application selection. Application Label is optional in the File Control Information (FCI) of an Application Definition File (ADF) and optional in an ADF directory entry | SELECT    |                                                                                                                                                                                                                                                                                                                                        |

| Name (Format; Tag; Length; Source; Path)                                                                                 | Requirement                      | Description                                                                                                                                                                                                                                               | Retrieval           | Values                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Application Preferred Name</b><br>F: ans 1-16<br>T: '9F12'<br>L: 1-16<br>S: Card<br>P: E M                            | Optional                         | Preferred mnemonic associated with the AID.                                                                                                                                                                                                               | SELECT              | The permitted characters for Application Preferred Name are the non-control characters defined in the ISO/IEC 8859 part designated in the Issuer Code Table Index associated with the Application Preferred Name |
| <b>Application Primary Account Number (PAN)</b><br>F: var. up to cn 19<br>T: '5A'<br>L: var. up to 10<br>S: Card<br>P: E | Conditional<br>If fDDA supported | Cardholder account number.<br>For transactions where Offline Data Authentication is performed, the Application PAN is returned.<br>For transactions where Offline Data Authentication is not performed, the Application PAN does not need to be returned. | READ RECORD         |                                                                                                                                                                                                                  |
| <b>Application Primary Account Number Sequence Number (PSN)</b><br>F: n 2<br>T: '5F34'<br>L: 1<br>S: Card<br>P: E M      | Optional                         | Identifies and differentiates card applications with the same PAN.                                                                                                                                                                                        | GPO,<br>READ RECORD | <i>Note:</i> Although this field is optional in the card, if it is present in the card it is sent in online messages. If it is not sent in online messages, the value is assumed to be 00 for key derivations.   |

| Name (Format; Tag; Length; Source; Path)                                                                     | Requirement                                                         | Description                                                                                                                                                                                                                                                                                                                                                                                              | Retrieval | Values                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Application Priority Indicator</b><br>F: b 8<br>T: '87'<br>L: 1<br>S: Card<br>P: E M                      | Conditional<br>If multiple contactless payment applications on card | Indicates the priority of a given application or group of applications in a directory.                                                                                                                                                                                                                                                                                                                   | SELECT    | bit 8: Not used for Kernel 3<br>bits 7-5: RFU (000)<br>bits 4-1:<br>0000 = No priority assigned<br>xxxx = Order in which the application is to be selected, ranging from 1 to 15, with 1 being the highest priority |
| <b>Application Program Identifier (Program ID)</b><br>F: b<br>T: '9F5A'<br>L: var. 1-16<br>S: Card<br>P: E M | Optional                                                            | Payment system proprietary data element identifying the Application Program ID of the card application.<br>When personalised, the Application Program ID is returned in the FCI Issuer Discretionary Data of the SELECT response (Tag 'BF0C').<br>EMV mode readers that support Dynamic Reader Limits (DRL) functionality examine the Application Program ID to determine the Reader Limit Set to apply. | SELECT    | As defined by the payment system                                                                                                                                                                                    |

| Name (Format; Tag; Length; Source; Path)                                                                       | Requirement                                                                                       | Description                                                                                                                                                                                                                                                                                                                   | Retrieval | Values                           |
|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------|
| <b>Application Program Identifier (Program ID)</b><br>F: b<br>T: '9F5A'<br>L: var. 1-16<br>S: Reader<br>P: E M | Optional                                                                                          | Proprietary data element used by the device during Dynamic Reader Limit processing to determine the Reader Limit Set to apply for the transaction.<br>EMV mode readers that support Dynamic Reader Limits (DRL) functionality support four or more Application Program Identifiers, each corresponding to a Reader Limit Set. | N/A       | As defined by the payment system |
| <b>Application Transaction Counter (ATC)</b><br>F: b 16<br>T: '9F36'<br>L: 2<br>S: Card<br>P: E M              | EMV mode: Mandatory<br>Mag-stripe mode: Conditional<br>if Application Cryptogram returned by card | Count of the number of transactions initiated since personalisation. Maintained by the application in the card.                                                                                                                                                                                                               | GPO       |                                  |

| Name (Format; Tag; Length; Source; Path)                                                                                    | Requirement                                                                               | Description                                                                                                    | Retrieval   | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Application Usage Control (AUC)</b><br>F: b 16<br>T: '9F07'<br>L: 2<br>S: Card<br>P: E                                   | Conditional<br>If supporting cash or cashback                                             | Indicates issuer-specified restrictions on the geographic usage and services allowed for the card application. | READ RECORD | <p>Byte 1</p> <p>bit 8: 1 = Valid for domestic cash transactions</p> <p>bit 7: 1 = Valid for international cash transactions</p> <p>bits 6-1: Not used for Kernel 3</p> <p>Byte 2</p> <p>bit 8: 1 = Domestic cashback allowed</p> <p>bit 7: 1 = International cashback allowed</p> <p>bits 6-1: RFU (000000)</p> <p><i>Note:</i> To determine whether Application Usage Control restrictions for “domestic” and “international” transactions have been met, the reader compares the Issuer Country Code to the Terminal Country Code.</p> |
| <b>Authorisation Code</b><br>F: ans 6 *<br>T: '89'<br>L: 6<br>S: Issuer<br>P: E<br>* (special characters limited to spaces) | Conditional<br>If Issuer Update Processing supported<br>(From issuer, not passed to card) | Nonzero value generated by the issuer for an approved transaction.                                             | N/A         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Name (Format; Tag; Length; Source; Path)                                                           | Requirement                                          | Description                                                                                                                                                                                                                               | Retrieval | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Authorisation Response Code (ARC)</b><br>F: an 2<br>T: '8A'<br>L: 2<br>S: Issuer/Reader<br>P: E | Conditional<br>If Issuer Update Processing supported | Indicates the transaction disposition of the transaction received from the issuer for online authorisations.                                                                                                                              | N/A       | <p>Codes generated by the issuer are as indicated in [ISO 8583:1987].</p> <p>00, 10, or 11 indicate an issuer approval.</p> <p>01 or 02 indicates an issuer referral.</p> <p>An ARC other than the ones listed above indicates an issuer decline.</p> <p>The following codes are generated by the reader or terminal for the following conditions:</p> <p>Y1 = Offline approved</p> <p>Z1 = Offline declined</p> <p>Y3 = Unable to go online (offline approved)</p> <p>Z3 = Unable to go online (offline declined)</p> |
| <b>Available Offline Spending Amount (AOSA)</b><br>F: n 12<br>T: '9F5D'<br>L: 6<br>S: Card<br>P: E | Optional                                             | Kernel 3 proprietary data element indicating the remaining amount available to be spent offline.<br>The AOSA is a calculated field used to allow the reader to print or display the amount of offline spend that is available on the card | GPO       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Name (Format; Tag; Length; Source; Path)                                                        | Requirement                      | Description                                                                                                                                                                                                                                                                        | Retrieval   | Values                                                                                                                       |
|-------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Card Authentication Related Data</b><br>F: b<br>T: '9F69'<br>L: var. 5-16<br>S: Card<br>P: E | Conditional<br>If fDDA supported | Contains the fDDA Version Number, Card Unpredictable Number, and Card Transaction Qualifiers.<br><br>For transactions where fDDA is performed, the Card Authentication Related Data is returned in the last record specified by the Application File Locator for that transaction. | READ RECORD | Byte 1: fDDA Version Number ('01')<br><br>Byte 2-5: (Card) Unpredictable Number<br><br>Byte 6-7: Card Transaction Qualifiers |

| Name (Format; Tag; Length; Source; Path)                                                    | Requirement                                                                                                                | Description                                                                                                                                | Retrieval | Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Card Transaction Qualifiers (CTQ)</b><br>F: b 16<br>T: '9F6C'<br>L: 2<br>S: Card<br>P: E | Conditional<br>If CVM supported or if issuer CTQ preferences supported or if Issuer Update Processing at the POS supported | In this version of the specification, used to indicate to the device the card CVM requirements, issuer preferences, and card capabilities. | GPO       | <p>Byte 1</p> bit 8: 1 = Online PIN Required<br>bit 7: 1 = Signature Required<br>bit 6: 1 = Go Online if Offline Data Authentication Fails and Reader is online capable.<br>bit 5: 1 = Switch Interface if Offline Data Authentication fails and Reader supports contact chip.<br>bit 4: 1 = Go Online if Application Expired<br>bit 3: 1 = Switch Interface for Cash Transactions<br>bit 2: 1 = Switch Interface for Cashback Transactions<br>bit 1: RFU (0)<br><p>Byte 2</p> bit 8: 1 = Consumer Device CVM Performed<br>bit 7: 1 = Card supports Issuer Update Processing at the POS<br>bits 6-1: RFU (000000) |

| Name (Format; Tag; Length; Source; Path)                                                        | Requirement                      | Description                                                                                                                                                                                                                                        | Retrieval           | Values                                                                                                                                   |
|-------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cardholder Name</b><br>F: ans 2-26<br>T: '5F20'<br>L: 2-26<br>S: Card<br>P: E M              | Optional                         | Indicates cardholder name according to [ISO 7813].                                                                                                                                                                                                 | GPO,<br>READ RECORD |                                                                                                                                          |
| <b>Certificate Authority Public Key</b><br>F: b<br>T: –<br>L: –<br>S: Reader<br>P: E            | Conditional<br>If fDDA supported | Payment system public key used for dynamic data authentication.                                                                                                                                                                                    | N/A                 | Value generated by the payment system CA and loaded to terminal by acquirer. Up to six public keys per payment system must be supported. |
| <b>Certificate Authority Public Key Check Sum</b><br>F: b<br>T: –<br>L: 20<br>S: Reader<br>P: E | Conditional<br>If fDDA supported | A check value calculated on the concatenation of all parts of the Certificate Authority Public Key (RID, Certificate Authority Public Key Index, Certificate Authority Public Key Modulus, Certificate Authority Public Key Exponent) using SHA-1. | N/A                 |                                                                                                                                          |

| Name (Format; Tag; Length; Source; Path)                                                                | Requirement                                             | Description                                                                                                                              | Retrieval   | Values                                 |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------------|
| <b>Certificate Authority Public Key Exponent</b><br>F: b<br>T: –<br>L: 1 or 3<br>S: Reader<br>P: E      | Conditional<br>If fDDA supported                        | Value of the exponent part of the Certificate Authority Public Key.                                                                      | N/A         |                                        |
| <b>Certificate Authority Public Key Index (PKI)</b><br>F: b 8<br>T: '8F'<br>L: 1<br>S: Card<br>P: E     | Conditional<br>If Offline Data Authentication supported | Identifies the Certificate Authority's public key in conjunction with the RID for use in offline data authentication.                    | READ RECORD | Values assigned by the payment system. |
| <b>Certificate Authority Public Key Index (PKI)</b><br>F: b 8<br>T: '9F22'<br>L: 1<br>S: Reader<br>P: E | Conditional<br>If fDDA supported                        | Identifies the Certificate Authority's public key in conjunction with the RID for use in offline static and dynamic data authentication. | N/A         | Values assigned by the payment system. |

| Name (Format; Tag; Length; Source; Path)                                                                               | Requirement                      | Description                                                                                                             | Retrieval | Values                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------|
| <b>Certificate Authority Public Key Modulus</b><br>F: b<br>T: –<br>L: N <sub>CA</sub> (up to 248)<br>S: Reader<br>P: E | Conditional<br>If fDDA supported | Value of the modulus part of the Certificate Authority Public Key.                                                      | N/A       |                                                                                                                   |
| <b>Command Template</b><br>F: b<br>T: '83'<br>L: var.<br>S: Reader<br>P: E M                                           | Required                         | Identifies the data field of a command message.                                                                         | N/A       |                                                                                                                   |
| <b>Cryptogram Information Data (CID)</b><br>F: b 8<br>T: '9F27'<br>L: 1<br>S: Card<br>P: E                             | Required                         | Indicates the type of cryptogram (TC, ARQC, or AAC) returned by the card and the actions to be performed by the reader. | GPO       | bits 8–7<br>00 = AAC<br>01 = TC<br>10 = ARQC<br>11 = RFU<br>bits 6-5: RFU (00)<br>bits 4-1: Not used for Kernel 3 |

| Name (Format; Tag; Length; Source; Path)                                                           | Requirement | Description                                                                                                                                                          | Retrieval        | Values                                                                                                                                          |
|----------------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Customer Exclusive Data (CED)</b><br>F: b<br>T: '9F7C'<br>L: var. up to 32<br>S: Card<br>P: E M | Optional    | Contains data for transmission to the issuer.                                                                                                                        | GPO, READ RECORD | Customer Exclusive Data, if personalised, consists of one or more proprietary Issuer elements.                                                  |
| <b>Decline Required by Reader Indicator</b><br>F: –<br>T: –<br>L: –<br>S: Reader<br>P: E           | Required    | Proprietary internal indicator used during transaction processing to indicate that internal reader processes have indicated that the transaction should be declined. | N/A              | This indicator is a transient value, initialized to a value of 0 at the beginning of the transaction.<br>1 = Offline decline required by reader |
| <b>Dedicated File (DF) Name</b><br>F: b 40-128<br>T: '84'<br>L: 5-16<br>S: Card<br>P: E M          | Required    | Identifies the name of the DF as described in [ISO 7816-4].                                                                                                          | SELECT           |                                                                                                                                                 |
| <b>Directory Entry</b><br>F: var.<br>T: '61'<br>L: var.<br>S: Card<br>P: E M                       | Mandatory   | Contains one or more data objects relevant to an application directory entry according to [ISO 7816-5].                                                              | SELECT           |                                                                                                                                                 |

| Name (Format; Tag; Length; Source; Path)                                                                                          | Requirement                                                                                             | Description                                                                                         | Retrieval   | Values                       |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------|------------------------------|
| <b>fDDA Version Number</b><br>F: b 8<br>T: part of '9F69'<br>L: 1<br>S: Card<br>P: E                                              | Conditional<br>If fDDA supported                                                                        | Contains the version number for the fDDA version supported by the card                              | READ RECORD | '01' = fDDA Version Number 1 |
| <b>File Control Information (FCI) Issuer Discretionary Data</b><br>F: var.<br>T: 'BF0C'<br>L: var. up to 222<br>S: Card<br>P: E M | PPSE:<br>Mandatory<br>ADF:<br>Conditional<br>If transaction logging or Application Program ID supported | Issuer discretionary part of the FCI.                                                               | SELECT      |                              |
| <b>File Control Information (FCI) Proprietary Template</b><br>F: var.<br>T: 'A5'<br>L: var.<br>S: Card<br>P: E M                  | Mandatory                                                                                               | Identifies the data objects proprietary to [EMV 4.2] in the FCI Template according to [ISO 7816-4]. | SELECT      |                              |

| Name (Format; Tag; Length; Source; Path)                                                                       | Requirement | Description                                                                                                                                                                                     | Retrieval           | Values                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>File Control Information (FCI) Template</b><br>F: var.<br>T: '6F'<br>L: var. up to 252<br>S: Card<br>P: E M | Mandatory   | Identifies the FCI template according to [ISO 7816-4].                                                                                                                                          | SELECT              |                                                                                                                                                                                                                                                                                 |
| <b>Form Factor Indicator (FFI)</b><br>F: b 32<br>T: '9F6E'<br>L: 4<br>S: Card (and reader)<br>P: E M           | Optional    | Indicates the form factor of the consumer payment device and the type of contactless interface over which the transaction was conducted. This information is made available to the issuer host. | GPO,<br>READ RECORD | Byte 1 thru 3: Out-of-scope of Kernel 3.<br>Byte 4: Payment Transaction Technology<br>bits 8-5: RFU (0000)<br>bits 4-1: Payment Transaction Technology<br>All values not currently defined are RFU.<br>0000 = Proximity Contactless interface using [ISO 14443] (including NFC) |

| Name (Format; Tag; Length; Source; Path)                                                                                    | Requirement                                                                          | Description                                                                                  | Retrieval   | Values |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------|--------|
| <b>Integrated Circuit Card (ICC) Public Key Certificate</b><br>F: b<br>T: '9F46'<br>L: $N_I$<br>S: Card<br>P: E             | Conditional<br>If fDDA supported                                                     | ICC Public Key certified by the issuer.                                                      | READ RECORD |        |
| <b>Integrated Circuit Card (ICC) Public Key Exponent</b><br>F: b<br>T: '9F47'<br>L: 1 or 3<br>S: Card<br>P: E               | Conditional<br>If fDDA supported                                                     | ICC Public Key Exponent used for the verification of the Signed Dynamic Application Data.    | READ RECORD |        |
| <b>Integrated Circuit Card (ICC) Public Key Remainder</b><br>F: b<br>T: '9F48'<br>L: $N_{IC} - N_I + 42$<br>S: Card<br>P: E | Conditional<br>If fDDA supported and entire public key does not fit into certificate | Digits of the ICC Public Key Modulus which do not fit within the ICC Public Key Certificate. | READ RECORD |        |

| Name (Format; Tag; Length; Source; Path)                                                           | Requirement                                                                                             | Description                                                                                    | Retrieval | Values                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Issuer Application Data (IAD)</b><br>F: b<br>T: '9F10'<br>L: var. up to 32<br>S: Card<br>P: E M | EMV mode:<br>Mandatory<br>Mag-stripe mode:<br>Conditional<br>if Application Cryptogram returned by card | Contains proprietary application data for transmission to the Issuer in an online transaction. | GPO       | Byte 1-4: Out of scope<br>Byte 5:<br>bits 8-7: Out of scope<br>bits 6-5:<br>00 = AAC returned in GPO<br>01 = TC returned in GPO<br>10 = ARQC returned in GPO<br>11 = RFU<br>bit 4-1 = Out of scope<br>Byte 6 - end: Out of scope |
| <b>Issuer Authentication Data</b><br>F: b 64-128<br>T: '91'<br>L: 8-16<br>S: Issuer<br>P: E        | Optional<br>Passed from the issuer through the reader                                                   | Issuer data transmitted to card for Issuer Authentication.                                     | N/A       |                                                                                                                                                                                                                                  |

| Name (Format; Tag; Length; Source; Path)                                                         | Requirement                                                  | Description                                                                                      | Retrieval   | Values                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Issuer Code Table Index</b><br>F: n 2<br>T: '9F11'<br>L: 1<br>S: Card<br>P: E M               | Conditional<br>If Application Preferred Name is personalised | Indicates the code table according to [ISO 8859] for displaying the Application Preferred Name.  | SELECT      | Values are:<br>01 = [ISO 8859] Part 1<br>02 = [ISO 8859] Part 2<br>03 = [ISO 8859] Part 3<br>04 = [ISO 8859] Part 4<br>05 = [ISO 8859] Part 5<br>06 = [ISO 8859] Part 6<br>07 = [ISO 8859] Part 7<br>08 = [ISO 8859] Part 8<br>09 = [ISO 8859] Part 9<br>10 = [ISO 8859] Part 10 |
| <b>Issuer Country Code</b><br>F: n 3<br>T: '5F28'<br>L: 2<br>S: Card<br>P: E                     | Conditional<br>If Application Usage Control is supported     | Indicates the country of the issuer, represented according to [ISO 3166].                        | READ RECORD |                                                                                                                                                                                                                                                                                  |
| <b>Issuer Public Key Certificate</b><br>F: b<br>T: '90'<br>L: N <sub>CA</sub><br>S: Card<br>P: E | Conditional<br>If Offline Data Authentication supported      | Issuer's public key certified by a certificate authority for use in offline data authentication. | READ RECORD |                                                                                                                                                                                                                                                                                  |

| Name (Format; Tag; Length; Source; Path)                                                           | Requirement                                                                                                 | Description                                                                                                                                            | Retrieval   | Values |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------|
| <b>Issuer Public Key Exponent</b><br>F: b<br>T: '9F32'<br>L: 1 or 3<br>S: Card<br>P: E             | Conditional<br>If Offline Data Authentication supported                                                     | Issuer public key exponent used for the verification of the ICC Public Key Certificate.                                                                | READ RECORD |        |
| <b>Issuer Public Key Remainder</b><br>F: b<br>T: '92'<br>L: $N_I - N_{CA} + 36$<br>S: Card<br>P: E | Conditional<br>If Offline Data Authentication supported and entire public key does not fit into certificate | Portion of the Issuer Public Key Modulus which does not fit into the Issuer PK Certificate.                                                            | READ RECORD |        |
| <b>Issuer Script Identifier</b><br>F: b 32<br>T: '9F18'<br>L: 4<br>S: Issuer<br>P: E               | Optional<br>From issuer to reader.<br>Not passed to card.                                                   | May be sent in authorisation response from issuer when response contains Issuer Script. Assigned by the issuer to uniquely identify the Issuer Script. | N/A         |        |

| Name (Format; Tag; Length; Source; Path)                                          | Requirement                                                   | Description                                                                                                                                                                                                                                                                | Retrieval | Values                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Issuer Script Results</b><br>F: b<br>T: '9F5B'<br>L: var.<br>S: Reader<br>P: E | Conditional<br>If Issuer<br>Update<br>Processing<br>supported | Indicates the results of Issuer Script processing.<br>When the reader/terminal transmits this data element to the acquirer, in this version of Kernel 3, it is acceptable that only byte 1 is transmitted, although it is preferable for all five bytes to be transmitted. | N/A       | Byte 1 (Issuer Script Result):<br>bits 8-5: Result of the Issuer Script processing performed by the kernel:<br>'0' = Issuer Script not performed<br>'1' = Issuer Script processing failed<br>'2' = Issuer Script processing successful<br>bits 4-1: Sequence number of the Issuer Script Command:<br>'0' = Not specified<br>'1'-'E' = Sequence number 1-14<br>'F' = Sequence number 15 or above<br>– continues – |

| Name (Format; Tag; Length; Source; Path)                                           | Requirement                                   | Description                                                                                                                                          | Retrieval | Values                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Issuer Script Results</b><br>– <i>continued</i> –                               |                                               |                                                                                                                                                      |           | <p>Bytes 2-5 (Issuer Script Identifier):<br/>Issuer Script Identifier received by the reader, if available; zero filled if not available. Mandatory if more than one Issuer Script Template was received by the reader.</p> <p>Bytes 1-5 are repeated for each Issuer Script Template processed by the kernel, although in this version of Kernel 3, only one Issuer Script Template may be transmitted in the response message.</p> |
| <b>Issuer Script Template 1</b><br>F: b<br>T: '71'<br>L: var.<br>S: Issuer<br>P: E | Optional<br>Passed from issuer through reader | Contains proprietary issuer data for transmission to the card. The format of the Issuer Script Template is shown in [EMV 4.2 Book 3], section 10.10. | N/A       | [EMV 4.2] specifies that terminals and networks must support a total length for all issuer scripts in an online response of up to 128 bytes. Issuers may send longer issuer scripts only when the issuer knows that longer issuer scripts are supported by all entities transporting the script back to the card.                                                                                                                    |

| Name (Format; Tag; Length; Source; Path)                                           | Requirement                                     | Description                                                                                                                                          | Retrieval | Values                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Issuer Script Template 2</b><br>F: b<br>T: '72'<br>L: var.<br>S: Issuer<br>P: E | Optional<br>Passed from issuer through reader   | Contains proprietary issuer data for transmission to the card. The format of the Issuer Script Template is shown in [EMV 4.2 Book 3], section 10.10. | N/A       | [EMV 4.2] specifies that terminals and networks must support a total length for all issuer scripts in an online response of up to 128 bytes. Issuers may send longer issuer scripts only when the issuer knows that longer issuer scripts are supported by all entities transporting the script back to the card. |
| <b>Language Preference</b><br>F: an 2<br>T: '5F2D'<br>L: 2-8<br>S: Card<br>P: E M  | Optional                                        | 1-4 languages stored in order of preference, each represented by 2 lower case alphabetical characters according to [ISO 639-1].                      | SELECT    |                                                                                                                                                                                                                                                                                                                   |
| <b>Log Entry</b><br>F: b<br>T: '9F4D'<br>L: 2<br>S: Card<br>P: E M                 | Conditional<br>If transaction logging supported | Data element indicating the location (SFI) and the maximum number of transaction log records.                                                        | SELECT    | Byte 1: SFI containing the cyclic transaction log file.<br>Byte 2: Maximum number of records in the transaction log file.                                                                                                                                                                                         |
| <b>Log Format</b><br>F: b<br>T: '9F4F'<br>L: var.<br>S: Card<br>P: E M             | Conditional<br>If transaction logging supported | List in tag and length format of data elements that are logged by the transaction                                                                    | GET DATA  |                                                                                                                                                                                                                                                                                                                   |

| Name (Format; Tag; Length; Source; Path)                                                               | Requirement             | Description                                                                                                                                                                  | Retrieval | Values                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Merchant Name and Location</b><br>F: ans<br>T: '9F4E'<br>L: var.<br>S: Reader<br>P: E               | Required<br>(at reader) | Indicates the name and location of the merchant. The reader shall return the value of the Merchant Name and Location when requested by the card in a Data Object List.       | N/A       |                                                                                                                                        |
| <b>Online Required by Reader Indicator</b><br>F: –<br>T: –<br>L: –<br>S: Reader<br>P: E                | Required                | Proprietary internal indicator used during transaction processing to indicate that internal reader processes have indicated that the transaction should be online requested. | N/A       | This indicator is a transient value, initialized to a value of 0 at the beginning of the transaction.<br>1 = Online required by reader |
| <b>Processing Options Data Object List (PDOL)</b><br>F: b<br>T: '9F38'<br>L: var.<br>S: Card<br>P: E M | Mandatory               | List of terminal/reader-related data objects (tags and lengths) requested by the card to be transmitted in the GET PROCESSING OPTIONS command.                               | SELECT    |                                                                                                                                        |

| Name (Format; Tag; Length; Source; Path)                                                    | Requirement                                            | Description                                                                                                                                                                                                                                                                                                                          | Retrieval | Values |
|---------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------|
| <b>Reader Contactless Floor Limit</b><br>F: n 12<br>T: –<br>L: 6<br>S: Reader<br>P: E       | Conditional<br>If Entry Point Pre-Processing supported | Indicates the contactless floor limit of the reader for a specific AID. If the transaction amount is greater than the Reader Contactless Floor Limit, then the reader requires online processing for the transaction. As defined in <i>Book B</i> .                                                                                  | N/A       |        |
| <b>Reader Contactless Transaction Limit</b><br>F: n 12<br>T: –<br>L: 6<br>S: Reader<br>P: E | Conditional<br>If Entry Point Pre-Processing supported | Indicates the contactless transaction limit of the reader for a specific AID.<br>If the transaction amount is greater than or equal to the Reader Contactless Transaction Limit, then a contactless transaction is not permitted.<br>Switching the transaction over to another interface is permitted. As defined in <i>Book B</i> . | N/A       |        |

| Name (Format; Tag; Length; Source; Path)                                                        | Requirement                                                | Description                                                                                                                                                                                                                         | Retrieval | Values |
|-------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------|
| <b>Reader CVM Required Limit</b><br>F: n 12<br>T: –<br>L: 6<br>S: Reader<br>P: E                | Conditional<br>If Entry Point<br>Pre-Processing supported  | Indicates the CVM limit of the reader for a specific AID.<br>If the transaction amount is greater than or equal to the Reader CVM Required Limit, then the reader requires a CVM for the transaction. As defined in <i>Book B</i> . | N/A       |        |
| <b>Response Message Template Format 1</b><br>F: var.<br>T: '80'<br>L: var.<br>S: Card<br>P: M   | Conditional<br>If Online Cryptogram not required by reader | Contains the data objects (without tags and lengths) returned by the card in response to a command.                                                                                                                                 | GPO       |        |
| <b>Response Message Template Format 2</b><br>F: var.<br>T: '77'<br>L: var.<br>S: Card<br>P: E M | Required                                                   | Contains the data objects (with tags and lengths) returned by the card in response to a command.                                                                                                                                    | GPO       |        |

| Name (Format; Tag; Length; Source; Path)                                                                    | Requirement                                                 | Description                                                                                                                                                                  | Retrieval        | Values                                                                                                             |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Short File Identifier</b><br>F: b 8<br>T: '88'<br>L: 1<br>S: Card<br>P: E M                              | Conditional<br>If returning record data for the transaction | Used in the commands related to an application elementary file (AEF) to identify the file. The SFI data object is a binary field with the three high-order bits set to zero. | N/A              | Values are:<br>1–10: Governed by joint payment systems<br>11–20: Payment system specific<br>21–30: Issuer specific |
| <b>Signed Dynamic Application Data (SDAD)</b><br>F: b<br>T: '9F4B'<br>L: N <sub>IC</sub><br>S: Card<br>P: E | Conditional<br>If fDDA supported                            | Dynamic signature generated by the card and validated by the reader during fDDA processing.                                                                                  | GPO, READ RECORD |                                                                                                                    |
| <b>Static Data Authentication (SDA) Tag List</b><br>F: –<br>T: '9F4A'<br>L: var.<br>S: Card<br>P: E         | Optional                                                    | Contains list of tags of primitive data objects whose value fields are to be included in the ICC Public Key Certificate hash result.                                         | READ RECORD      | The SDA Tag List may not contain tags other than the tag for Application Interchange Profile (AIP).                |

| Name (Format; Tag;<br>Length; Source; Path)                                      | Requirement                                                                                                                | Description                                                                | Retrieval | Values |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------|--------|
| <b>Terminal Country Code</b><br>F: n 3<br>T: '9F1A'<br>L: 2<br>S: Reader<br>P: E | Required                                                                                                                   | Indicates the country of the terminal represented according to [ISO 3166]. | N/A       |        |
| <b>Terminal Floor Limit</b><br>F: b 32<br>T: '9F1B'<br>L: 4<br>S: Reader<br>P: E | Conditional<br>If Entry Point<br>Pre-Processing<br>supported and<br>Reader<br>Contactless<br>Floor Limit is<br>not present | Indicates the floor limit in the terminal. As defined in <i>Book B</i> .   | N/A       |        |

| Name (Format; Tag; Length; Source; Path)                                                            | Requirement | Description                                                                                                                                                                                                                                                                                                                                    | Retrieval | Values                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Terminal Transaction Qualifiers (TTQ)</b><br>F: b 32<br>T: '9F66'<br>L: 4<br>S: Reader<br>P: E M | Required    | Indicates reader capabilities, requirements, and preferences to the card.<br><br>TTQ byte 2 bits 8-7 are transient values, and reset to zero at the beginning of the transaction. All other TTQ bits are static values, and not modified based on transaction conditions.<br><br>TTQ byte 3 bit 7 shall be set by the acquirer-merchant to 1b. | N/A       | Byte 1<br>bit 8: 1 = Mag-stripe mode supported<br>bit 7: RFU (0)<br>bit 6: 1 = EMV mode supported<br>bit 5: 1 = EMV contact chip supported<br>bit 4: 1 = Offline-only reader<br>bit 3: 1 = Online PIN supported<br>bit 2: 1 = Signature supported<br>bit 1: 1 = RFU (0)<br><i>Note:</i> Readers compliant to this specification set TTQ byte 1 bit 1 to 0b.<br>– continues – |

| Name (Format; Tag; Length; Source; Path)                                                      | Requirement | Description                                                                                                                                                               | Retrieval | Values                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Terminal Transaction Qualifiers (TTQ)</b><br><i>– continued –</i>                          |             |                                                                                                                                                                           |           | <p>Byte 2</p> <p>bit 8: 1 = Online cryptogram required</p> <p>bit 7: 1 = CVM required</p> <p>bit 6: 1 = (Contact Chip) Offline PIN supported</p> <p>bits 5-1: RFU (00000)</p> <p>Byte 3</p> <p>bit 8: 1 = Issuer Update Processing supported</p> <p>bit 7: 1 = Consumer Device CVM supported</p> <p>bits 6-1: RFU (000000)</p> <p>Byte 4</p> <p>RFU ('00')</p> |
| <b>Terminal Verification Results (TVR)</b><br>F: b 40<br>T: '95'<br>L: 5<br>S: Reader<br>P: E | Required    | Status of the different functions as seen from the reader/terminal.<br><br>For EMV mode transactions, all of the TVR bits sent online to the acquirer shall be set to 0b. | N/A       | Byte 1: Not used for Kernel 3 ('00')<br>Byte 2: Not used for Kernel 3 ('00')<br>Byte 3: Not used for Kernel 3 ('00')<br>Byte 4: Not used for Kernel 3 ('00')<br>Byte 5: Not used for Kernel 3 ('00')                                                                                                                                                           |

| Name (Format; Tag; Length; Source; Path)                                                   | Requirement | Description                                                                                                                                                                                          | Retrieval           | Values |
|--------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------|
| <b>Track 1 Discretionary Data</b><br>F: ans<br>T: '9F1F'<br>L: var.<br>S: Card<br>P: M     | Optional    | See section E.1                                                                                                                                                                                      | GPO,<br>READ RECORD |        |
| <b>Track 2 Equivalent Data</b><br>F: b<br>T: '57'<br>L: var. up to 19<br>S: Card<br>P: E M | Mandatory   | Contains the data elements of the Track 2 according to the [ISO 7813], excluding start sentinel, end sentinel, and LRC                                                                               | GPO,<br>READ RECORD |        |
| <b>Transaction Currency Code</b><br>F: n 3<br>T: '5F2A'<br>L: 2<br>S: Reader<br>P: E       | Required    | Indicates the currency code of the transaction according to [ISO 4217]. The implied exponent is indicated by the minor unit of currency associated with the Transaction Currency Code in [ISO 4217]. | N/A                 |        |
| <b>Transaction Date</b><br>F: n 6 YYMMDD<br>T: '9A'<br>L: 3<br>S: Reader<br>P: E           | Required    | Local date that the transaction was authorised.                                                                                                                                                      | N/A                 |        |

| Name (Format; Tag; Length; Source; Path)                                                           | Requirement                      | Description                                                                                                                                                                                                                                  | Retrieval   | Values |
|----------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------|
| <b>Transaction Type</b><br>F: n 2<br>T: '9C'<br>L: 1<br>S: Reader<br>P: E                          | Required                         | Indicates the type of transaction, represented by the values of the first two digits of Processing Code as defined by the payment system.                                                                                                    | N/A         |        |
| <b>Unpredictable Number (Card)</b><br>F: b 32<br>T: part of '9F69'<br>L: 4<br>S: Card<br>P: E      | Conditional<br>If fDDA supported | Contains the card unpredictable number generated by the card and signed for fDDA.<br><br>The Unpredictable Number (Card) is generated during GPO processing and returned in the last record as part of the Card Authentication Related Data. | READ RECORD |        |
| <b>Unpredictable Number (Reader-Terminal)</b><br>F: b 32<br>T: '9F37'<br>L: 4<br>S: Reader<br>P: E | Required                         | Value to provide variability and uniqueness to the generation of the application cryptogram.                                                                                                                                                 | N/A         |        |

## A.3 Data Elements by Tag

**Table A-2: Data Elements Tags**

| Tag    | Data Element                                             | Source        |
|--------|----------------------------------------------------------|---------------|
| '4F'   | Application Identifier (ADF Name)                        | Card          |
| '50'   | Application Label                                        | Card          |
| '57'   | Track 2 Equivalent Data                                  | Card          |
| '5A'   | Application Primary Account Number (PAN)                 | Card          |
| '5F20' | Cardholder Name                                          | Card          |
| '5F24' | Application Expiration Date                              | Card          |
| '5F28' | Issuer Country Code                                      | Card          |
| '5F2A' | Transaction Currency Code                                | Reader        |
| '5F2D' | Language Preference                                      | Card          |
| '5F34' | Application Primary Account Number Sequence Number (PSN) | Card          |
| '61'   | Directory Entry                                          | Card          |
| '6F'   | File Control Information (FCI) Template                  | Card          |
| '71'   | Issuer Script Template 1                                 | Issuer        |
| '72'   | Issuer Script Template 2                                 | Issuer        |
| '77'   | Response Message Template Format 2                       | Card          |
| '80'   | Response Message Template Format 1                       | Card          |
| '82'   | Application Interchange Profile (AIP)                    | Card          |
| '83'   | Command Template                                         | Reader        |
| '84'   | Dedicated File (DF) Name                                 | Card          |
| '87'   | Application Priority Indicator                           | Card          |
| '88'   | Short File Identifier                                    | Card          |
| '89'   | Authorisation Code                                       | Issuer        |
| '8A'   | Authorisation Response Code (ARC)                        | Issuer/Reader |
| '8F'   | Certificate Authority Public Key Index (PKI)             | Card          |
| '90'   | Issuer Public Key Certificate                            | Card          |
| '91'   | Issuer Authentication Data                               | Issuer        |
| '92'   | Issuer Public Key Remainder                              | Card          |
| '94'   | Application File Locator (AFL)                           | Card          |

| Tag    | Data Element                                         | Source |
|--------|------------------------------------------------------|--------|
| '95'   | Terminal Verification Results (TVR)                  | Reader |
| '9A'   | Transaction Date                                     | Reader |
| '9C'   | Transaction Type                                     | Reader |
| '9F02' | Amount, Authorised (Numeric)                         | Reader |
| '9F03' | Amount, Other (Numeric)                              | Reader |
| '9F06' | Application Identifier (AID)                         | Reader |
| '9F07' | Application Usage Control (AUC)                      | Card   |
| '9F10' | Issuer Application Data (IAD)                        | Card   |
| '9F11' | Issuer Code Table Index                              | Card   |
| '9F12' | Application Preferred Name                           | Card   |
| '9F18' | Issuer Script Identifier                             | Issuer |
| '9F1A' | Terminal Country Code                                | Reader |
| '9F1B' | Terminal Floor Limit                                 | Reader |
| '9F1F' | Track 1 Discretionary Data                           | Card   |
| '9F22' | Certificate Authority Public Key Index (PKI)         | Reader |
| '9F26' | Application Cryptogram (AC)                          | Card   |
| '9F27' | Cryptogram Information Data (CID)                    | Card   |
| '9F32' | Issuer Public Key Exponent                           | Card   |
| '9F36' | Application Transaction Counter (ATC)                | Card   |
| '9F37' | Unpredictable Number (Reader-Terminal)               | Reader |
| '9F38' | Processing Options Data Object List (PDOL)           | Card   |
| '9F46' | Integrated Circuit Card (ICC) Public Key Certificate | Card   |
| '9F47' | Integrated Circuit Card (ICC) Public Key Exponent    | Card   |
| '9F48' | Integrated Circuit Card (ICC) Public Key Remainder   | Card   |
| '9F4A' | Static Data Authentication (SDA) Tag List            | Card   |
| '9F4B' | Signed Dynamic Application Data (SDAD)               | Card   |
| '9F4D' | Log Entry                                            | Card   |
| '9F4E' | Merchant Name and Location                           | Reader |
| '9F5A' | Application Program Identifier (Program ID)          | Card   |
| '9F5B' | Issuer Script Results                                | Reader |
| '9F5D' | Available Offline Spending Amount (AOSA)             | Card   |

| Tag            | Data Element                                             | Source |
|----------------|----------------------------------------------------------|--------|
| '9F66'         | Terminal Transaction Qualifiers (TTQ)                    | Reader |
| '9F69'         | Card Authentication Related Data                         | Card   |
| part of '9F69' | fDDA Version Number                                      | Card   |
| part of '9F69' | Unpredictable Number (Card)                              | Card   |
| '9F6C'         | Card Transaction Qualifiers (CTQ)                        | Card   |
| '9F6E'         | Form Factor Indicator (FFI)                              | Card   |
| '9F7C'         | Customer Exclusive Data (CED)                            | Card   |
| 'A5'           | File Control Information (FCI) Proprietary Template      | Card   |
| 'BF0C'         | File Control Information (FCI) Issuer Discretionary Data | Card   |

## A.4 Data Elements Reader Provides to Kernel 3

**Table A-3: Data Elements Reader Provides to Kernel 3**

| <b>Data Element</b>                          | <b>Tag</b> |
|----------------------------------------------|------------|
| Amount, Authorised (Numeric)                 | '9F02'     |
| Amount, Other (Numeric)                      | '9F03'     |
| Certificate Authority Public Key             | —          |
| Certificate Authority Public Key Check Sum   | —          |
| Certificate Authority Public Key Exponent    | —          |
| Certificate Authority Public Key Index (PKI) | '9F22'     |
| Certificate Authority Public Key Modulus     | —          |
| Merchant Name and Location                   | '9F4E'     |
| Terminal Country Code                        | '9F1A'     |
| Terminal Transaction Qualifiers (TTQ)        | '9F66'     |
| Transaction Currency Code                    | '5F2A'     |
| Transaction Date                             | '9A'       |
| Transaction Type                             | '9C'       |
| Unpredictable Number (Reader-Terminal)       | '9F37'     |



## Annex B Online Messages and Clearing Records

POS systems will populate online messages and clearing records with the required data elements specified by the payment systems.

Of these data elements, this annex details the data elements specifically required for Kernel 3 contactless transactions. Some are data values to be set when Kernel 3 is the selected kernel and some are provided by Kernel 3 with the Outcome. The data elements are provided to the POS System in the Outcome data record described in *Book A*.

The necessary data elements depend on the acceptance configuration (EMV mode or mag-stripe mode), the support for CVN17 mag-stripe mode data when in mag-stripe mode, and the potential support for FFI and CED when in EMV mode.

### B.1 EMV Mode Acquirers

#### B.1.1 Data Elements for Acquirers Supporting EMV Mode

This section describes the data elements requirements for messages for acquirers that support EMV mode transactions.

Specific Kernel 3 EMV mode data element necessary for online messages and clearing records are as shown in Table B-1. The presence of a data element in this list – and thereby the data record – implies that it is the responsibility of the kernel to make the data element available for inclusion in the message to the acquirer. Depending on configuration, it may not actually be included in the message itself.

**Table B-1: Acquirers Supporting EMV Mode**

| Data                        | Tag    | Condition                 |
|-----------------------------|--------|---------------------------|
| Amount, Authorised          | '9F02' | Always                    |
| Amount, Other               | '9F03' | Conditional (if cashback) |
| Application Cryptogram (AC) | '9F26' | Always                    |

| <b>Data</b>                           | <b>Tag</b> | <b>Condition</b>                                                                                                                                                                                                                                                                     |
|---------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Application Interchange Profile (AIP) | '82'       | Always                                                                                                                                                                                                                                                                               |
| Application Transaction Counter (ATC) | '9F36'     | Always                                                                                                                                                                                                                                                                               |
| Application PAN Sequence Number       | '5F34'     | Conditional<br><br>If the Application PAN Sequence Number (PSN) is provided to the kernel by the card, this data shall be included in the data record.<br><br>Else (data not provided to the kernel by the card), the data is not included in the data record.                       |
| Customer Exclusive Data (CED)         | '9F7C'     | Conditional<br><br>If the Customer Exclusive Data (CED) is provided to the kernel by the card, this data may be included in the data record.<br><br>Else (data not provided to the kernel by the card), the data is not included in the data record.<br><br>See requirement 3.2.1.2. |
| Form Factor Indicator (FFI)           | '9F6E'     | Conditional<br><br>If the Form Factor Indicator (FFI) is provided to the kernel by the card, this data may be included in the data record.<br><br>Else (data not provided to the kernel by the card), the data is not included in the data record.<br><br>See requirement 3.2.1.2.   |
| Issuer Application Data (IAD)         | '9F10'     | Always                                                                                                                                                                                                                                                                               |

| Data                                   | Tag    | Condition                                                                                                                                                                                                |
|----------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POS Entry Mode                         | –      | Always<br>A value of 07 for EMV mode transactions.                                                                                                                                                       |
| Terminal Country Code                  | '9F1A' | Always                                                                                                                                                                                                   |
| Terminal Entry Capability              | –      | Always<br>A value of 5 (for POS systems that also support contact chip) or a value of 8 (for POS systems that do not also support contact chip). Check with your payment system regional representative. |
| Terminal Verification Results (TVR)    | '95'   | Always<br>For Kernel 3 transactions, the TVR shall have a value of all zeros when included in the data record.                                                                                           |
| Track 2 Equivalent Data                | '57'   | Always<br>The Track 2 data included in online and clearing messages is formatted as required by the payment system.                                                                                      |
| Transaction Currency Code              | '5F2A' | Always                                                                                                                                                                                                   |
| Transaction Date                       | '9A'   | Always                                                                                                                                                                                                   |
| Transaction Type                       | '9C'   | Always                                                                                                                                                                                                   |
| Unpredictable Number (Reader-Terminal) | '9F37' | Always                                                                                                                                                                                                   |

For EMV mode acquirers supporting CVN17 mag-stripe mode data, the required data elements are outlined in section B.2.1 for CVN17 mag-stripe mode. Acquirers may send these CVN17 data elements as a subset of the data elements outlined in Table B-1.

For EMV mode acquirers, who also support standard mag-stripe mode data, the required data for standard mag-stripe mode is outlined in section B.2.2.

## B.1.2 EMV Mode Acquirer Requirements

The following additional requirements are applicable to acquirers for EMV mode messages.

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### Requirements – EMV Mode Acquirer Requirements

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#### B.1.2.1 (Track 2) [K.3]

For EMV mode transactions, Track 2 shall be sent online in the authorisation.

---

#### B.1.2.2 (Primary Account Number and Expiration Date) [K.4]

The primary account number and application expiration date used in messaging shall be retrieved from Track 2 Equivalent Data.

---

## **B.2 Mag-Stripe Mode Acquirers**

### **B.2.1 Data Elements for Acquirers Supporting CVN17 Mag-Stripe Mode Transactions**

This section describes the data elements requirements for messages for acquirers that support CVN17 mag-stripe mode transactions (in addition to supporting standard mag-stripe mode transactions).

CVN17 mag-stripe mode data requirements for online messages and clearing records are the same as for traditional magnetic stripe transactions, with the addition of new values in existing fields and carrying new data (e.g. for the CVN17 Application Cryptogram) as shown in Table B-2.

Specific Kernel 3 CVN17 mag-stripe mode data elements necessary for online messages and clearing records are as shown in Table B-2. The presence of a data element in this list – and thereby the data record – implies that it is the responsibility of the kernel to make the data element available for inclusion in the message to the acquirer. Depending on configuration, it may not actually be included in the message itself.

**Table B-2: Acquirers Supporting CVN17 Mag-Stripe Mode**

| <b>Data</b>                 | <b>Tag</b> | <b>Condition</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Amount, Authorised          | '9F02'     | <p>Conditional</p> <p>Amount, Authorised is conditional for mag-stripe mode transactions.</p> <p>The real transaction amount may not be provided to the card in the Amount, Authorised for cryptogram generation. In this case, Kernel 3 provides a predefined Amount, Authorised value to the card.</p> <p>If the Amount, Authorised provided to the card has a non-zero value, then the POS system shall pass the Amount, Authorised to the acquirer.</p> <p>If the Amount, Authorised provided to the card has a value of all zeros, then the POS system shall pass the Amount, Authorised to the acquirer.</p> <p><i>Note:</i> When the Amount, Authorised is present in the message, the value of the Amount, Authorised is used for cryptogram validation. When the Amount, Authorised is not present in the message, the value is assumed to be zero for cryptogram validation.</p> |
| Application Cryptogram (AC) | '9F26'     | <p>Conditional</p> <p>If the Application Cryptogram is provided to the kernel by the card, then the data shall be included in the data record.</p> <p>Else (data not provided to the kernel by the card), the data is not included in the data record.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Data                                  | Tag    | Condition                                                                                                                                                                                                                                                     |
|---------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Application PAN Sequence Number       | '5F34' | Conditional<br><br>If the Application PAN Sequence Number (PSN) is provided to the kernel by the card, this data shall be present in the data record.<br><br>Else (data not provided to the kernel by the card), the data is not included in the data record. |
| Application Transaction Counter (ATC) | '9F36' | Conditional<br><br>If the Application Transaction Counter (ATC) is provided to the kernel by the card, this data shall be present in the data record.<br><br>Else (data not provided to the kernel by the card), the data is not included in the data record. |
| Customer Exclusive Data (CED)         | '9F7C' | Conditional<br><br>If the Customer Exclusive Data (CED) is provided to the kernel by the card, this data shall be present in the data record.<br><br>Else (data not provided to the kernel by the card), the data is not included in the data record.         |
| Form Factor Indicator (FFI)           | '9F6E' | Conditional<br><br>If the Form Factor Indicator (FFI) is provided to the kernel by the card, this data shall be present in the data record.<br><br>Else (data not provided to the kernel by the card), the data is not included in the data record.           |

| Data                                                  | Tag           | Condition                                                                                                                                                                                                                                            |
|-------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Issuer Application Data (IAD)                         | '9F10'        | Conditional<br><br>If the Issuer Application Data (IAD) is provided to the kernel by the card, this data shall be present in the data record.<br><br>Else (data not provided to the kernel by the card), the data is not included in the data record |
| POS Entry Mode                                        | –             | Always<br><br>A value of 91 for mag-stripe mode transactions.                                                                                                                                                                                        |
| Terminal Entry Capability                             | –             | Always<br><br>A value of 5 (for POS systems that also support contact chip) or a value of 8 (for POS systems that do not also support contact chip). Check with your payment system representative.                                                  |
| Terminal Transaction Qualifiers (TTQ)                 | '9F66'        | Conditional<br><br>If the POS system supports CVN17 mag-stripe mode transactions, this data element may be present in the data record (see also requirement 3.2.2.3).                                                                                |
| Track 1                                               | –             | Conditional.<br><br>At a minimum either Track 1 or Track 2 Equivalent Data/Track 2 shall be present in the data record                                                                                                                               |
| Track 2 Equivalent Data<br>or<br>Track 2 <sup>6</sup> | '57'<br><br>– | Conditional.<br><br>At a minimum either Track 1 or Track 2 Equivalent Data/Track 2 shall be present in the data record                                                                                                                               |

<sup>6</sup> Depending on kernel option for Track 2 format (see requirement 5.4.4.1), the data element might be included in the data record as Tag '57' format or in the traditional mag-stripe format

| Data                                   | Tag    | Condition                                                                                                                                                                                                                           |
|----------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unpredictable Number (Reader-Terminal) | '9F37' | Conditional<br><br>If the Application Cryptogram is provided to the kernel by the card, then the data element (Unpredictable Number) shall be present in the data record.<br><br>Else, the data is not included in the data record. |

## B.2.2 Data Elements for Acquirers Supporting Only Standard Mag-Stripe Mode Transactions

This section describes the data element requirements for messages for acquirers that only support standard mag-stripe mode transactions.

Standard mag-stripe mode data requirements for online messages and clearing records are the same as for traditional (swiped) magnetic stripe transactions.

Specific Kernel 3 standard mag-stripe mode data elements necessary for online messages and clearing records are as shown in Table B-3. The presence of a data element in this list – and thereby the data record – implies that it is the responsibility of the kernel to make the data element available for inclusion in the message to the acquirer. Depending on configuration, it may not actually be included in the message itself.

**Table B-3: Acquirers Supporting Mag-Stripe Mode Legacy-Only**

| Data                                                  | Tag       | Condition                                                                                                                                                                                                |
|-------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POS Entry Mode                                        | –         | Always<br>A value of 91 for mag-stripe mode transactions.                                                                                                                                                |
| Terminal Entry Capability                             | –         | Always<br>A value of 5 (for POS systems that also support contact chip) or a value of 8 (for POS systems that do not also support contact chip). Check with your payment system regional representative. |
| Track 1                                               | –         | Conditional.<br>At a minimum either Track 1 or Track 2 Equivalent Data/Track 2 shall be present in the data record                                                                                       |
| Track 2 Equivalent Data<br>or<br>Track 2 <sup>7</sup> | '57'<br>– | Conditional.<br>At a minimum either Track 1 or Track 2 Equivalent Data/Track 2 shall be present in the data record                                                                                       |

<sup>7</sup> Depending on kernel option for Track 2 format (see requirement 5.4.4.1), the data element might be included in the data record as Tag '57' format or in the traditional mag-stripe format

### B.2.3 Mag-Stripe Mode Acquirer Requirements

The following additional requirements are applicable for mag-stripe mode messages.

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#### Requirements – Mag-Stripe Mode Acquirer Requirements

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B.2.3.1 (Track 2 and Track 1) [K.1]

For mag-stripe mode transactions, either Track 2 and/or Track 1 shall be sent online in the authorisation.

*Note:* Track 1 construction is defined in section E.1.

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B.2.3.2 (Primary Account Number and Expiration Date) [K.2]

The primary account number and application expiration date used in messaging shall be retrieved from Track 2 Equivalent Data.

---



## **Annex C Fast Dynamic Data Authentication (fDDA)**

In most contactless payment environments, quick transaction speeds are a business requirement. A method of dynamic data authentication, called fDDA (based on DDA as defined in [EMV 4.2]) is therefore defined for offline protection against skimming.

In addition to signing the (Terminal) Unpredictable Number, which is signed in most EMV contact chip applications, fDDA also signs additional transaction dynamic data. The Amount, Authorised; Transaction Currency Code; and (card) Unpredictable Number are all signed using fDDA.

To optimize processing power and reduce transaction times, the fDDA dynamic signature is generated during the GPO command, rather than generating the dynamic signature at the end of the transaction when the card may be moving away from the reader field.

The card uses the PDOL to request data from the reader for fDDA. The card receives the requested data from the reader in the GPO command. The card uses these terminal data elements, along with card data, to create the dynamic signature.

The AFL returned in the GPO points to records containing the RSA certificates and data related to fDDA. Once the last record is read by the reader, the card need no longer remain in the field. The reader then validates the dynamic signature for fDDA. If the validation process fails, the transaction is declined offline, sent online for authorisation, or terminated, dependent on issuer preference (as indicated in the CTQ).

Other than the early creation of the dynamic signature, the card leaving the field before DDA is validated, and the lack of reporting of DDA results in authorisation and clearing messages; fDDA is EMV-compliant.

In order to accommodate the possibility of new fDDA algorithms and inputs, the card data element fDDA Version Number (part of Tag '9F69') is defined to identify the fDDA version used by the card. The fDDA Version Number is returned by the card and used by the reader to determine the fDDA version algorithm to perform.

For readers compliant to this version of the specification, only fDDA version '01' is allowed.

For fDDA version '01', the card includes the (Terminal) Unpredictable Number; Amount, Authorised; and Transaction Currency Code received from the reader in the PDOL, combined with the card ATC and Card Authentication Related Data into the calculation of the dynamic signature.

*Note:* The Static Data Authentication Tag List (Tag '9F4A') is supported as defined in [EMV 4.2 Book 3], section 10.3 and [EMV 4.2 Book 2], section 6 for fDDA processing.

## C.1 Dynamic Signature Verification

To verify the fDDA dynamic signature, the kernel must first retrieve the Certification Authority Public Key Index, as specified in [EMV 4.2 Book 2], section 6.2.

Retrieval of the Issuer Public Key shall then be performed by the kernel in accordance with [EMV 4.2 Book 2], section 6.3.

Retrieval of the ICC Public Key shall be performed by the kernel in accordance with [EMV 4.2 Book 2], section 6.4.

Verification of the dynamic signature shall then be performed by the kernel in accordance with [EMV 4.2 Book 2], section 6.5.2, with the following exception:

- The Terminal Dynamic Data elements input to the hash algorithm shall be as specified in Table C-1 instead of being specified in the DDOL (as the DDOL is not a recognized data element for Kernel 3). The kernel may treat the tags specified in Table C-1 as default DDOLs for fDDA version '01'.

**Table C-1: Terminal Dynamic Data for Input to DDA Hash Algorithm**

| Tag    | Data Element                     | Length  | Data Source |
|--------|----------------------------------|---------|-------------|
| '9F37' | Unpredictable Number (UN)        | 4 bytes | Terminal    |
| '9F02' | Amount, Authorised               | 6 bytes | Terminal    |
| '5F2A' | Transaction Currency Code        | 2 bytes | Terminal    |
| '9F69' | Card Authentication Related Data | var.    | Card        |

*Note:* The Card Authentication Related Data is variable length. The kernel shall use the full Card Authentication Related Data returned by the card for dynamic signature verification.

In any of the following cases, fDDA shall fail:

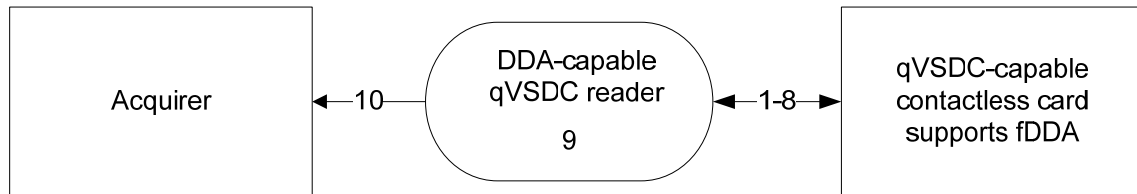
- The result of the verification of the dynamic signature process described above is not successful
- Application Interchange Profile (AIP) indicates that DDA is not supported by the card (AIP byte 1 bit 6 is 0b).

*Note:* Readers compliant to this specification do not perform fDDA dynamic signature verification for card application online approval requests.

- fDDA is supported and data required to support fDDA is missing.
- The version of fDDA requested by the card is not supported by the reader. fDDA version 01 is the only supported version of fDDA in this specification.
- The dynamic signature is using a Signed Data Format that is not '05'.

fDDA is illustrated in Figure C-1.

**Figure C-1: Fast DDA (fDDA) EMV Mode Example**



1. Reader SELECTs PPSE.
  2. Card responds with single AID.
  3. Reader SELECTs AID.
  4. Card responds requesting:
    - Terminal Transaction Qualifiers (Tag '9F66')
    - Unpredictable Number (Tag '9F37')
    - Amount, Authorised (Tag '9F02')
    - Transaction Currency Code (Tag '5F2A')
    - Other tags not related to fDDA
  5. Reader issues GET PROCESSING OPTIONS providing:
    - Tag '9F66' indicating EMV mode only
    - Tag '9F37' Unpredictable Number
    - Tag '9F02' Amount, Authorised
    - Tag '5F2A' Transaction Currency Code
    - Other card requested data not related to fDDA
  6. Card responds with:
    - Dynamic signature
    - AFL listing records related to Offline Data Authentication (fDDA)
    - Other data not related to fDDA
  7. Reader reads records indicated in AFL.
  8. Card provides RSA certificates and data to validate hash of static data along with Card Authentication Related Data in response to the last READ RECORD.
- Card may leave the field.
9. Reader validates dynamic signature.
  10. If fDDA fails, the transaction is declined, switched to another interface, or sent online depending on issuer settings.

## Annex D Supported Commands

### D.1 GET PROCESSING OPTIONS (GPO)

The GET PROCESSING OPTIONS command initiates the transaction within the card application.

The GET PROCESSING OPTIONS command and response shall be supported as described in [EMV 4.2 Book 3] with the following exception(s):

- Data retrievable using the GET PROCESSING OPTIONS command is not completely as defined in [EMV 4.2 Book 3], section 6.5.8.4 for Format 2 responses. The AFL and AIP are not always included, and the data field may include additional BER-TLV coded data elements. Inclusion of the AFL and AIP is conditional on card application processing.
- Status words (SW1 SW2) may have additional values.

### D.2 READ RECORD

The READ RECORD command reads a file record in a linear file.

The READ RECORD command and response shall be supported as described in [EMV 4.2 Book 3].

### D.3 EXTERNAL AUTHENTICATE

The EXTERNAL AUTHENTICATE command performs Issuer Authentication (by verifying a cryptogram) and conditionally resets card counters and indicators.

The EXTERNAL AUTHENTICATE command and response shall be supported as described in [EMV 4.2 Book 3].



## Annex E Creating Track 1 and Track 2

This appendix describes how a kernel shall create Track 1 and Track 2 for mag-stripe mode transactions using information personalised on a card.

### E.1 Creating Track 1

If Track 1 construction is enabled (see requirement 5.4.4.2), the kernel shall assemble Track 1 using information on the card, as described in this annex.

Issuers will personalise Track 2 Equivalent Data and may in addition personalise two other data elements – Cardholder Name and Track 1 Discretionary Data – that are used to assemble Track 1. If one or both additional data elements are not personalised on the card, the kernel will still be able to assemble Track 1 using data elements from Track 2 and default values as specified in this annex.

Track 1 is assembled using the data elements listed in Table E-1.

**Table E-1: Data Elements Required for Track 1 and Track 2**

| Tag    | Value                      | Format | Length   | Presence |
|--------|----------------------------|--------|----------|----------|
| '57'   | Track 2 Equivalent Data    | b      | Up to 19 | M        |
| '5F20' | Cardholder Name            | ans    | 2 to 26  | O        |
| '9F1F' | Track 1 Discretionary Data | ans    | var.     | O        |

For the content of Track 2 Equivalent Data (Tag '57'), see Table E-6 on page 147.

Before constructing Track 1, determine whether PVV is present in Track 2 Equivalent Data (Tag '57'). If the number of digits following separator 'D' is 20 (excluding a possible padding of 'F'), the PVV is present.

Table E-2 shows the format of Track 1 data and how to assemble it from the data elements mentioned in Table E-1, whether or not PVV is present in Track 2 Equivalent Data. Additional notes on selected fields follow the table.

The maximum length of Track 1 is 79 characters.

**Table E-2: Track 1 Format**

| Field #    | Field Name                               | Length             | Value If PVV Present in Track 2 Equivalent Data                            | Value If PVV Not Present in Track 2 Equivalent Data                        |
|------------|------------------------------------------|--------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Field 1    | Start Sentinel                           | 1                  | '%'                                                                        | '%'                                                                        |
| Field 2    | Format Code                              | 1                  | 'B'                                                                        | 'B'                                                                        |
| Field 3    | Application Primary Account Number (PAN) | var – up to 19     | Content of Tag '57', position 1 through last position before separator 'D' | Content of Tag '57', position 1 through last position before separator 'D' |
| Field 4    | Field Separator                          | 1                  | ' ^ '                                                                      | ' ^ '                                                                      |
| Field 5    | Cardholder Name                          | var – 2 to 26      | Content of Tag '5F20' or set to default value "space/" - '202F'            | Content of Tag '5F20' or set to default value "space/" - '202F'            |
| Field 6    | Field Separator                          | 1                  | ' ^ '                                                                      | ' ^ '                                                                      |
| Field 7    | Card Expiration Date                     | 4                  | Content of Tag '57', position 1 through 4 following separator 'D'          | Content of Tag '57', position 1 through 4 following separator 'D'          |
| Field 8    | Service Code                             | 3                  | Content of Tag '57', position 5 through 7 following separator 'D'          | Content of Tag '57', position 5 through 7 following separator 'D'          |
| Field 9    | PIN Verification field (PVKI & PVV)      | 5                  | Content of Tag '57', position 8 through 12 following separator 'D'         | Not present                                                                |
| Field 10.1 | Track 1 Discretionary Data               | see section E. 1.2 | Content of Tag '9F1F' or not present if Tag '9F1F' is not present          | Content of Tag '9F1F' or not present if Tag '9F1F' is not present          |
| Field 10.2 | Contactless Indicator                    | 1                  | Content of Tag '57', position 20 following separator 'D'                   | Content of Tag '57', position 15 following the separator 'D'               |

| Field #    | Field Name              | Length | Value If PVV Present in Track 2 Equivalent Data                     | Value If PVV Not Present in Track 2 Equivalent Data                 |
|------------|-------------------------|--------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| Field 11.1 | ATC part 1              | 2      | Content of Tag '57', position 16 through 17 following separator 'D' | Content of Tag '57', position 11 through 12 following separator 'D' |
| Field 11.2 | dCVV                    | 3      | Content of Tag '57', position 13 through 15 following separator 'D' | Content of Tag '57', position 8 through 10 following separator 'D'  |
| Field 11.3 | ATC part 2              | 2      | Content of Tag '57', position 18 through 19 following separator 'D' | Content of Tag '57', position 13 through 14 following separator 'D' |
| Field 11.4 | Payment system reserved | 1      | '0'                                                                 | '0'                                                                 |
| Field 11.5 | Payment system reserved | 3      | '000'                                                               | '000'                                                               |
| Field 12   | End Sentinel            | 1      | '?'                                                                 | '?'                                                                 |
| Field 13   | LRC                     | 1      |                                                                     |                                                                     |

### E.1.1 Field 5

The kernel shall construct field 5 as follows:

- If Tag '5F20' is present on the card, include the content of the tag in field 5 and set the length of field 5 to the length of the tag.
- If Tag '5F20' is not present on the card, include the default value '202F' (the value "space/") in field 5 and set the length of field 5 to 2.

### E.1.2 Field 10.1

The length of field 10.1 shall be set to the length portion of the TLV value for Tag '9F1F'. If Tag '9F1F' is not present on the card, the length shall be set to 0 and no data inserted into field 10.1.

The maximum length of field 10.1 depends on the length of field 3 and field 5 compared to a maximum length of 79 for Track 1, as described in this equation:

$$\text{Maximum length of field 10.1} = 79 - 30 - \text{length of field 3} - \text{length of field 5}$$

For example, if length of field 3 is 16 and length of field 5 is the maximum 26, the maximum length of field 10.1 is 7.

If the content of Tag '9F1F' cannot fit within the available space in Track 1, the content shall be right truncated.

### E.1.3 Fields 10.2 through 12.3 in Error Situations

If an incorrectly personalised card does not include dCVV, ATC, or Contactless Indicator in Track 2 Equivalent Data, the kernel shall nevertheless build Track 1 using all the following values (instead of any values that may be present for the dCVV, ATC, or Contactless Indicator): 000 for dCVV, 0000 for ATC, and 1 for Contactless Indicator.

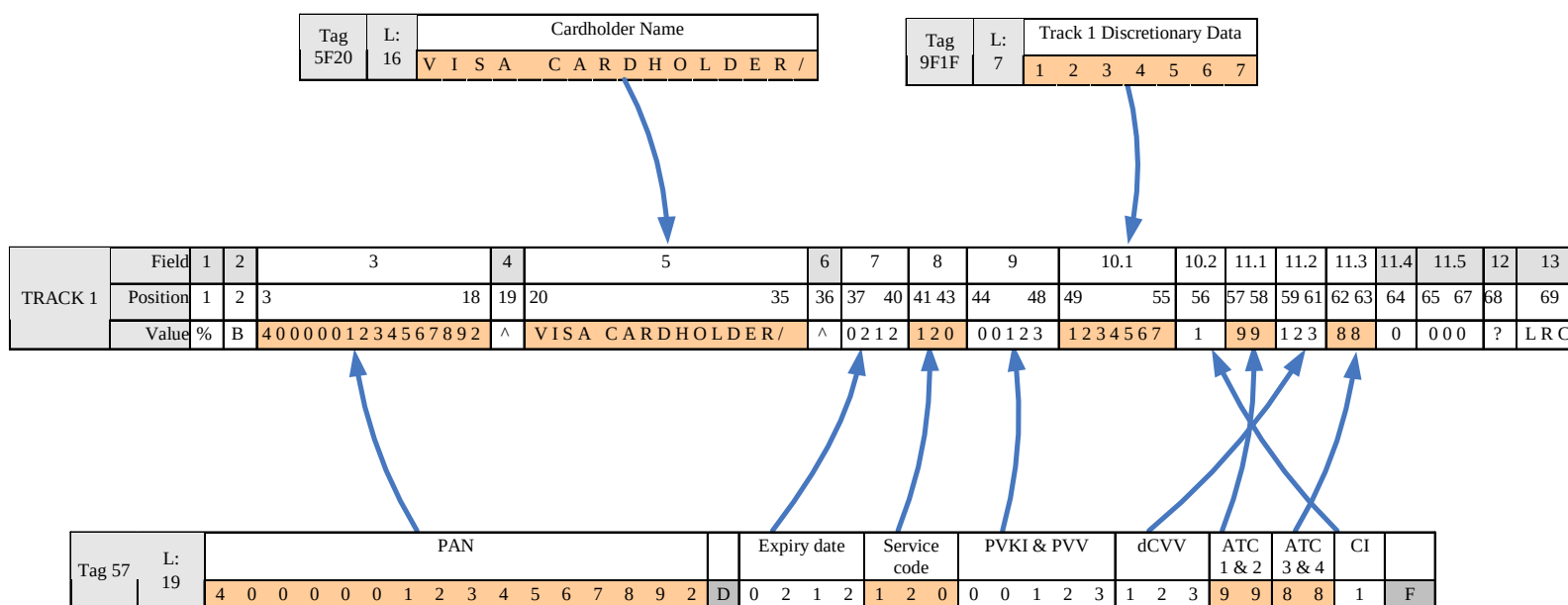
### E.1.4 Examples of Assembling Track 1

In order to illustrate how Track 1 is assembled, the following examples can be used. All of the examples are based on a PAN of 16 digits within Track 2 Equivalent Data.

## Example 1

The first example is outlined in Figure E-1 based on a Cardholder Name of 16 positions and a Track 1 Discretionary Data of 7 positions. This gives a Track 1 as outlined in Table E-3.

**Figure E-1: Constructing Track 1 Data – Example 1**



*Note:* Length of Tag '57' is measured in bytes while the actual digits are shown.

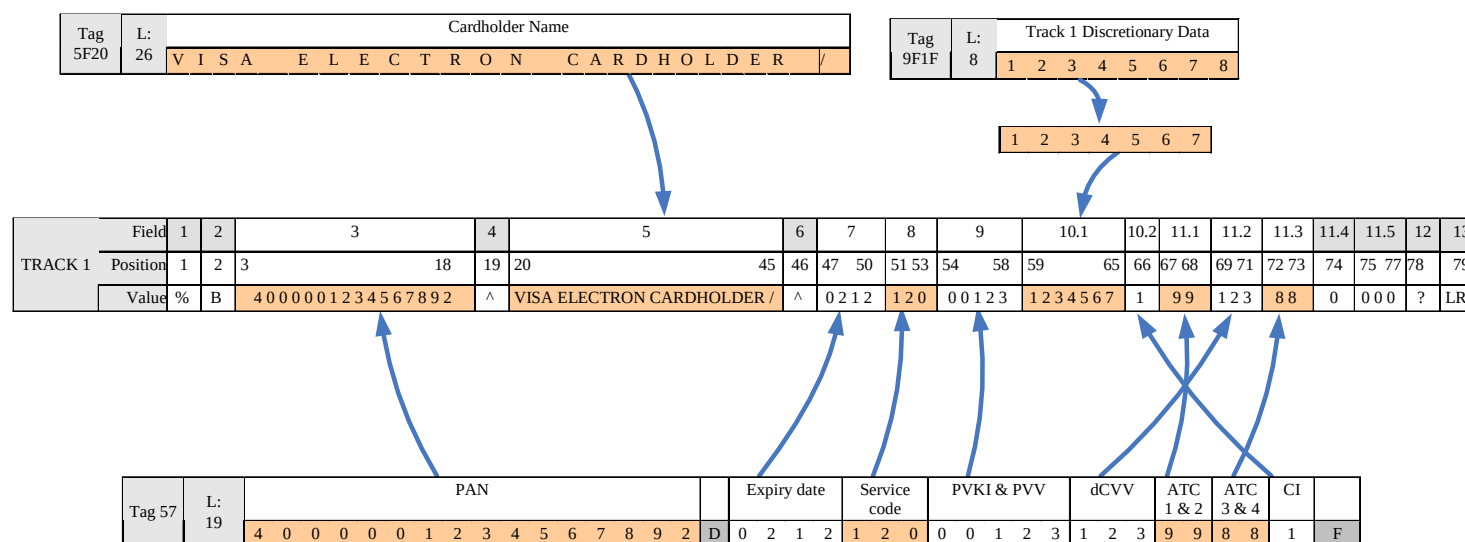
**Table E-3: Example 1 of Track 1 Format**

| Field #    | Field Name                               | Position | Length | Value                                       |
|------------|------------------------------------------|----------|--------|---------------------------------------------|
| Field 1    | Start Sentinel                           | 1        | 1      | '%'                                         |
| Field 2    | Format Code                              | 2        | 1      | 'B'                                         |
| Field 3    | Application Primary Account Number (PAN) | 3        | 16     | Content of Tag '57', position 1 through 16  |
| Field 4    | Field Separator                          | 19       | 1      | ' ^ '                                       |
| Field 5    | Cardholder Name                          | 20       | 16     | Content of Tag '5F20'                       |
| Field 6    | Field Separator                          | 36       | 1      | ' ^ '                                       |
| Field 7    | Card Expiration Date                     | 37       | 4      | Content of Tag '57', position 18 through 21 |
| Field 8    | Service Code                             | 41       | 3      | Content of Tag '57', position 22 through 24 |
| Field 9    | PIN Verification field (PVKI & PVV)      | 44       | 5      | Content of Tag '57', position 25 through 29 |
| Field 10.1 | Track 1 Discretionary Data               | 49       | 7      | Content of Tag '9F1F'                       |
| Field 10.2 | Contactless Indicator                    | 56       | 1      | Content of Tag '57', position 37            |
| Field 11.1 | ATC part 1                               | 57       | 2      | Content of Tag '57', position 33 through 34 |
| Field 11.2 | (d)CVV                                   | 59       | 3      | Content of Tag '57', position 30 through 32 |
| Field 11.3 | ATC part 2                               | 62       | 2      | Content of Tag '57', position 35 through 36 |
| Field 11.4 | Payment system reserved                  | 64       | 1      | '0'                                         |
| Field 11.5 | Payment system reserved                  | 65       | 3      | '000'                                       |
| Field 12   | End Sentinel                             | 68       | 1      | '?'                                         |
| Field 13   | LRC                                      | 69       | 1      |                                             |

## Example 2

The next example is outlined in Figure E-2, based on a Cardholder Name of 26 positions and a Track 1 Discretionary Data of 8 positions. Observe this example truncates the data in Tag '9F1F'. The result is outlined in Table E-4.

**Figure E-2: Constructing Track 1 Data – Example 2**



*Note:* Length of Tag '57' is measured in bytes while the actual digits are shown.

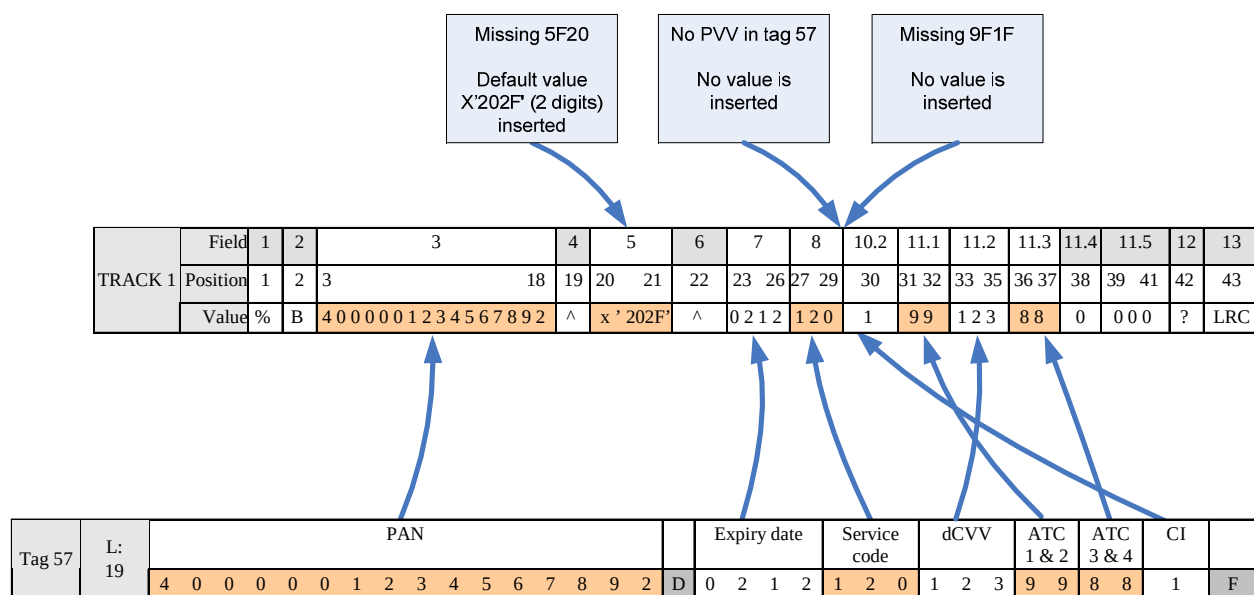
**Table E-4: Example 2 of Track 1 Format**

| Field #    | Field Name                               | Position | Length | Value                                                     |
|------------|------------------------------------------|----------|--------|-----------------------------------------------------------|
| Field 1    | Start Sentinel                           | 1        | 1      | '%'                                                       |
| Field 2    | Format Code                              | 2        | 1      | 'B'                                                       |
| Field 3    | Application Primary Account Number (PAN) | 3        | 16     | Content of Tag '57', position 1 through 16                |
| Field 4    | Field Separator                          | 19       | 1      | ' ^ '                                                     |
| Field 5    | Cardholder Name                          | 20       | 26     | Content of Tag '5F20'                                     |
| Field 6    | Field Separator                          | 46       | 1      | ' ^ '                                                     |
| Field 7    | Card Expiration Date                     | 47       | 4      | Content of Tag '57', position 18 through 21               |
| Field 8    | Service Code                             | 51       | 3      | Content of Tag '57', position 22 through 24               |
| Field 9    | PIN Verification field (PVKI & PVV)      | 54       | 5      | Content of Tag '57', position 25 through 29               |
| Field 10.1 | Track 1 Discretionary Data               | 59       | 7      | Content of Tag '9F1F' except the last position is omitted |
| Field 10.2 | Contactless Indicator                    | 66       | 1      | Content of Tag '57', position 37                          |
| Field 11.1 | ATC part 1                               | 67       | 2      | Content of Tag '57', position 33 through 34               |
| Field 11.2 | (d)CVV                                   | 69       | 3      | Content of Tag '57', position 30 through 32               |
| Field 11.3 | ATC part 2                               | 72       | 2      | Content of Tag '57', position 35 through 36               |
| Field 11.4 | Payment system reserved                  | 74       | 1      | '0'                                                       |
| Field 11.5 | Payment system reserved                  | 75       | 3      | '000'                                                     |
| Field 12   | End Sentinel                             | 78       | 1      | '?'                                                       |
| Field 13   | LRC                                      | 79       | 1      |                                                           |

### Example 3

The last example is outlined in Figure E-3, with Tags '5F20' and '9F1F' not present on the card and the PVV not present in Tag '57'. The kernel will use default values/actions as defined in Table E-2 on page 137. The result is outlined in Table E-5.

**Figure E-3: Constructing Track 1 Data – Example 3**



*Note:* Length of Tag '57' is measured in bytes while the actual digits are shown.

**Table E-5: Example 3 of Track 1 Format**

| Field #    | Field Name                               | Position | Length | Value                                            |
|------------|------------------------------------------|----------|--------|--------------------------------------------------|
| Field 1    | Start Sentinel                           | 1        | 1      | '%'                                              |
| Field 2    | Format Code                              | 2        | 1      | 'B'                                              |
| Field 3    | Application Primary Account Number (PAN) | 3        | 16     | Content of Tag '57', position 1 through 16       |
| Field 4    | Field Separator                          | 19       | 1      | ' ^ '                                            |
| Field 5    | Cardholder Name                          | 20       | 2      | Default value '202F' since Tag '5F20' is missing |
| Field 6    | Field Separator                          | 22       | 1      | ' ^ '                                            |
| Field 7    | Card Expiration Date                     | 23       | 4      | Content of Tag '57', position 18 through 21      |
| Field 8    | Service Code                             | 27       | 3      | Content of Tag '57', position 22 through 24      |
| Field 9    | PIN Verification field (PVKI & PVV)      | 30       | 0      | Not present when PVV is not present in Tag '57'  |
| Field 10.1 | Track 1 Discretionary Data               |          | 0      | Not present when Tag '9F1F' is missing           |
| Field 10.2 | Contactless Indicator                    | 30       | 1      | Content of Tag '57', position 32                 |
| Field 11.1 | ATC part 1                               | 31       | 2      | Content of Tag '57', position 28 through 29      |
| Field 11.2 | dCVV                                     | 33       | 3      | Content of Tag '57', position 25 through 27      |
| Field 11.3 | ATC part 2                               | 36       | 2      | Content of Tag '57', position 30 through 31      |
| Field 11.4 | Payment system reserved                  | 38       | 1      | '0'                                              |
| Field 11.5 | Payment system reserved                  | 39       | 3      | '000'                                            |
| Field 12   | End Sentinel                             | 42       | 1      | '?'                                              |
| Field 13   | LRC                                      | 43       | 1      |                                                  |

## E.2 Creating Track 2

Issuers will personalise Track 2 Equivalent Data for mag-stripe mode contactless payment. Therefore, the kernel is expected to do minimal work compared to creation of Track 1. Track 2 Equivalent Data contains all data elements required to create an emulation of the physical Track 2.

Track 2 Equivalent Data contains the data elements listed in Table E-6.

**Table E-6: Data Content for Track 2 Equivalent Data**

| Tag  | Value                                    | Format | Length           | Presence                                    |
|------|------------------------------------------|--------|------------------|---------------------------------------------|
| '57' | Track 2 Equivalent Data                  |        | var. up to 19    | M                                           |
|      | Application Primary Account Number (PAN) | cn     | var. up to cn 19 | M                                           |
|      | field separator = 'D'                    |        | 1                | M                                           |
|      | Expiry Date                              | n      | 4                | M                                           |
|      | Service Code                             | n      | 3                | M                                           |
|      | PIN Verification Field                   | n      | 0 or 5           | C                                           |
|      | Track 2 Discretionary Data               | n      | var.             | M                                           |
|      | Padding 'F'                              | Hex    | 1                | C<br>if required<br>to ensure<br>whole byte |

The layout of Track 2 can be mapped directly to Track 2 Equivalent Data as described in Table E-7.

**Table E-7: Mapping Track 2 to Track 2 Equivalent Data**

|                                                 |                                     |
|-------------------------------------------------|-------------------------------------|
| <b>Start Sentinel</b>                           | ','                                 |
| <b>Application Primary Account Number (PAN)</b> | PAN                                 |
| <b>Field Separator</b>                          | ' = '                               |
| <b>Expiry Date</b>                              | Expiration date                     |
| <b>Service Code</b>                             | Service Code                        |
| <b>PIN Verification Field</b>                   | PIN Verification Field (if present) |
| <b>Track 2 Discretionary Data</b>               | Track 2 Discretionary Data          |
| <b>End Sentinel</b>                             | '?'                                 |
| <b>LRC</b>                                      |                                     |



## Annex F Glossary

This is a glossary of terms and abbreviations used in this specification. For descriptions of data elements, see Annex A.

|                               |                                                                                                                                                                                                                                                                                      |    |                         |      |                                  |     |                                       |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------------------------|------|----------------------------------|-----|---------------------------------------|
| <b>AAC</b>                    | Application Authentication Cryptogram                                                                                                                                                                                                                                                |    |                         |      |                                  |     |                                       |
| <b>AC</b>                     | Application Cryptogram                                                                                                                                                                                                                                                               |    |                         |      |                                  |     |                                       |
| <b>Acquirer</b>               | A financial institution that signs a merchant (or disburses currency to a cardholder in a cash disbursement) and directly or indirectly enters the resulting transaction into interchange.                                                                                           |    |                         |      |                                  |     |                                       |
| <b>ADF</b>                    | Application Definition File                                                                                                                                                                                                                                                          |    |                         |      |                                  |     |                                       |
| <b>AFL</b>                    | Application File Locator                                                                                                                                                                                                                                                             |    |                         |      |                                  |     |                                       |
| <b>AID</b>                    | Application Identifier                                                                                                                                                                                                                                                               |    |                         |      |                                  |     |                                       |
| <b>AIP</b>                    | Application Interchange Profile                                                                                                                                                                                                                                                      |    |                         |      |                                  |     |                                       |
| <b>an</b>                     | Alphanumeric                                                                                                                                                                                                                                                                         |    |                         |      |                                  |     |                                       |
| <b>ans</b>                    | Alphanumeric Special, as defined in [EMV 4.2 Book 4], Annex B                                                                                                                                                                                                                        |    |                         |      |                                  |     |                                       |
| <b>AOSA</b>                   | Available Offline Spending Amount                                                                                                                                                                                                                                                    |    |                         |      |                                  |     |                                       |
| <b>Application Cryptogram</b> | Cryptogram returned by the card; one of the following cryptogram types: <table> <tr> <td>TC</td><td>Transaction Certificate</td></tr> <tr> <td>ARQC</td><td>Authorisation Request Cryptogram</td></tr> <tr> <td>AAC</td><td>Application Authentication Cryptogram</td></tr> </table> | TC | Transaction Certificate | ARQC | Authorisation Request Cryptogram | AAC | Application Authentication Cryptogram |
| TC                            | Transaction Certificate                                                                                                                                                                                                                                                              |    |                         |      |                                  |     |                                       |
| ARQC                          | Authorisation Request Cryptogram                                                                                                                                                                                                                                                     |    |                         |      |                                  |     |                                       |
| AAC                           | Application Authentication Cryptogram                                                                                                                                                                                                                                                |    |                         |      |                                  |     |                                       |
| <b>Approved</b>               | A Final Outcome                                                                                                                                                                                                                                                                      |    |                         |      |                                  |     |                                       |
| <b>ARQC</b>                   | Authorisation Request Cryptogram                                                                                                                                                                                                                                                     |    |                         |      |                                  |     |                                       |
| <b>ATC</b>                    | Application Transaction Counter                                                                                                                                                                                                                                                      |    |                         |      |                                  |     |                                       |
| <b>b</b>                      | Binary or Bit string                                                                                                                                                                                                                                                                 |    |                         |      |                                  |     |                                       |

| <b>BER</b>                                  | Basic Encoding Rules                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------|--------|--------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>C</b>                                    | Conditional                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>CA</b>                                   | Certification Authority                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>Candidate List</b>                       | The list of Combinations constructed by Entry Point during the Combination Selection process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>Card</b>                                 | As used in these specifications, a consumer device supporting contactless transactions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>Cardholder</b>                           | An individual to whom a card is issued or who is authorised to use that card.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>Cardholder Verification Method (CVM)</b> | A method used to confirm the identity of a cardholder.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>CED</b>                                  | Customer Exclusive Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>CID</b>                                  | Cryptogram Information Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>cn</b>                                   | Compressed Numeric                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>Combination</b>                          | Any of the following: <table border="1"> <thead> <tr> <th>For:</th><th>The combination of:</th></tr> </thead> <tbody> <tr> <td>a card</td><td> <ul style="list-style-type: none"> <li>an ADF Name</li> <li>a Kernel Identifier</li> </ul> </td></tr> <tr> <td>a reader</td><td> <ul style="list-style-type: none"> <li>an AID</li> <li>a Kernel ID</li> </ul> </td></tr> <tr> <td>the Candidate List for final selection</td><td> <ul style="list-style-type: none"> <li>an ADF Name</li> <li>a Kernel ID</li> <li>the Application Priority Indicator (if present)</li> <li>the Extended Selection (if present)</li> </ul> </td></tr> </tbody> </table> | For: | The combination of: | a card | <ul style="list-style-type: none"> <li>an ADF Name</li> <li>a Kernel Identifier</li> </ul> | a reader | <ul style="list-style-type: none"> <li>an AID</li> <li>a Kernel ID</li> </ul> | the Candidate List for final selection | <ul style="list-style-type: none"> <li>an ADF Name</li> <li>a Kernel ID</li> <li>the Application Priority Indicator (if present)</li> <li>the Extended Selection (if present)</li> </ul> |
| For:                                        | The combination of:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| a card                                      | <ul style="list-style-type: none"> <li>an ADF Name</li> <li>a Kernel Identifier</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| a reader                                    | <ul style="list-style-type: none"> <li>an AID</li> <li>a Kernel ID</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| the Candidate List for final selection      | <ul style="list-style-type: none"> <li>an ADF Name</li> <li>a Kernel ID</li> <li>the Application Priority Indicator (if present)</li> <li>the Extended Selection (if present)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |
| <b>Confirmation Code</b>                    | A code or password entered into a mobile device in order to confirm that a user wishes to perform a contactless mobile payment transaction.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |                     |        |                                                                                            |          |                                                                               |                                        |                                                                                                                                                                                          |

|                                                 |                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Contactless card</b>                         | See “Card”.                                                                                                                                                                                                                                                                                                                              |
| <b>CTQ</b>                                      | Card Transaction Qualifiers                                                                                                                                                                                                                                                                                                              |
| <b>CVM</b>                                      | Cardholder Verification Method                                                                                                                                                                                                                                                                                                           |
| <b>CVN17</b>                                    | A specific Kernel 3 implementation of an Application Cryptogram using a subset of EMV minimum data. Support of CVN17 is supported for both EMV mode transactions and for mag-stripe mode transactions                                                                                                                                    |
| <b>CVN17 mag-stripe mode [acquirer support]</b> | Acquirer support for mag-stripe mode transaction with standard track data and data in support of an Application Cryptogram                                                                                                                                                                                                               |
| <b>DDA</b>                                      | Dynamic Data Authentication                                                                                                                                                                                                                                                                                                              |
| <b>DDOL</b>                                     | Dynamic Data Authentication Data Object List                                                                                                                                                                                                                                                                                             |
| <b><i>Declined</i></b>                          | A Final Outcome                                                                                                                                                                                                                                                                                                                          |
| <b>DF</b>                                       | Dedicated File                                                                                                                                                                                                                                                                                                                           |
| <b>DOL</b>                                      | Data Object List                                                                                                                                                                                                                                                                                                                         |
| <b>DRL</b>                                      | Dynamic Reader Limits                                                                                                                                                                                                                                                                                                                    |
| <b>E</b>                                        | Indicates EMV mode in the “Path” information in Table A-1                                                                                                                                                                                                                                                                                |
| <b>EMV®</b>                                     | A global standard for credit and debit payment cards based on chip card technology. The EMV Integrated Circuit Card Specifications for Payment Systems are developed and maintained by EMVCo.                                                                                                                                            |
| <b>EMV mode</b>                                 | An operating mode of the POS System that indicates that this particular acceptance environment and acceptance rules supports chip infrastructure. Typically used in conjunction with the term “transaction” (i.e., EMV mode transaction) to indicate contactless payment utilising a full chip infrastructure carrying EMV minimum data. |

|                           |                                                                                                                                                                                                                                                                                  |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EMV Mode Path</b>      | For transactions conducted over the contactless interface, the EMV Mode Path is an application path taken by the card which results in card behaviour defined for EMV mode. This path is taken for contactless transactions where the card and reader both support EMV mode.     |
| <b>EMV mode reader</b>    | A reader in an acceptance environment that can handle EMV data for which at least one kernel is configured to accept EMV data.                                                                                                                                                   |
| <b>EMVCo</b>              | EMVCo LLC is the organisation of payment systems that manages, maintains, and enhances the EMV specifications. EMVCo is currently operated by American Express, JCB, MasterCard, and Visa.                                                                                       |
| <b>End Application</b>    | A Final Outcome                                                                                                                                                                                                                                                                  |
| <b>Extended Selection</b> | An option in which Entry Point appends the value indicated by the Extended Selection data element (Tag '9F29') to the ADF name in the SELECT command.                                                                                                                            |
| <b>F</b>                  | Format                                                                                                                                                                                                                                                                           |
| <b>Fast DDA (fDDA)</b>    | Leverages DDA as defined in [EMV 4.2] specifications. Used in EMV mode transactions to allow the reader to issue READ RECORD commands to obtain Dynamic Data Authentication (DDA) related data from the card and perform the DDA calculations after the card has left the field. |
| <b>FCI</b>                | File Control Information                                                                                                                                                                                                                                                         |
| <b>fDDA</b>               | Fast DDA                                                                                                                                                                                                                                                                         |
| <b>FFI</b>                | Form Factor Indicator                                                                                                                                                                                                                                                            |
| <b>Final Outcome</b>      | Result provided to the reader as a result of Entry Point processing the Outcome from the kernel, or provided directly by Entry Point under exception conditions.                                                                                                                 |
| <b>GPO</b>                | GET PROCESSING OPTIONS command                                                                                                                                                                                                                                                   |
| <b>Hex</b>                | Hexadecimal                                                                                                                                                                                                                                                                      |
| <b>ICC</b>                | Integrated Circuit Card                                                                                                                                                                                                                                                          |

|                                 |                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IEC</b>                      | International Electrotechnical Commission                                                                                                                                                                                                                                                                                                              |
| <b>ISO</b>                      | International Organization for Standardization                                                                                                                                                                                                                                                                                                         |
| <b>Issuer</b>                   | A financial institution that issues contactless cards or contactless payment applications that reside in consumer devices.                                                                                                                                                                                                                             |
| <b>Issuer Update Data</b>       | Data returned by the issuer in the response to an online request. Can include Issuer Response Data, Issuer Authentication Data, and/or Issuer Scripts Template.                                                                                                                                                                                        |
| <b>Issuer Update Processing</b> | Optional feature whereby the issuer can update card parameters via a second presentment of a card                                                                                                                                                                                                                                                      |
| <b>Kernel</b>                   | The kernel contains interface routines, security and control functions, and logic to manage a set of commands and responses to retrieve the necessary data from a card to complete a transaction. The kernel processing covers the interaction with the card between the Final Combination Selection (excluded) and the Outcome Processing (excluded). |
| <b>Kernel ID</b>                | Identifier to distinguish between different kernels that may be supported by the reader.                                                                                                                                                                                                                                                               |
| <b>Kernel Identifier</b>        | Identifier to distinguish between different kernels that may be indicated by the card.                                                                                                                                                                                                                                                                 |
| <b>L</b>                        | Length                                                                                                                                                                                                                                                                                                                                                 |
| <b>M</b>                        | One of the following, depending on context: <ul style="list-style-type: none"><li>• Mandatory</li><li>• Mag-stripe mode (in the “Path” information in Table A-1)</li></ul>                                                                                                                                                                             |
| <b>Mag-stripe mode</b>          | An operating mode of the POS System that indicates that this particular acceptance environment and acceptance rules supports mag-stripe infrastructure. Typically used in conjunction with the term “transaction” (i.e., mag-stripe mode transaction) to indicate contactless payment based on Track 1 and/or Track 2 Data obtained from the card.     |

|                                |                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mag-Stripe Mode Path</b>    | For transactions conducted over the contactless interface, the Mag-Stripe Mode Path is an application path taken by the card which results in card behaviour defined for mag-stripe mode. This path is taken for contactless transactions where the reader supports mag-stripe mode, the card supports mag-stripe mode, and EMV mode is not mutually supported. |
| <b>mag-stripe mode-enabled</b> | Card/reader has implemented mag-stripe mode, and has been personalised/configured to enable the Mag-Stripe Mode Path.                                                                                                                                                                                                                                           |
| <b>mag-stripe mode-only</b>    | Card/reader supports mag-stripe mode and does not support chip mode.                                                                                                                                                                                                                                                                                            |
| <b>ms</b>                      | Millisecond                                                                                                                                                                                                                                                                                                                                                     |
| <b>n</b>                       | Numeric                                                                                                                                                                                                                                                                                                                                                         |
| <b>N/A</b>                     | Not applicable; a possible value for several Outcome and Final Outcome parameters.                                                                                                                                                                                                                                                                              |
| <b>N<sub>CA</sub></b>          | Length of CA Public Key Modulus                                                                                                                                                                                                                                                                                                                                 |
| <b>NFC</b>                     | Near Field Communication                                                                                                                                                                                                                                                                                                                                        |
| <b>N<sub>I</sub></b>           | Length of the Issuer Public Key Modulus                                                                                                                                                                                                                                                                                                                         |
| <b>N<sub>IC</sub></b>          | Length of the ICC Public Key Modulus                                                                                                                                                                                                                                                                                                                            |
| <b>O</b>                       | Optional                                                                                                                                                                                                                                                                                                                                                        |
| <b>ODA</b>                     | Offline Data Authentication                                                                                                                                                                                                                                                                                                                                     |
| <b>Online PIN</b>              | A method of PIN verification where the PIN entered by the cardholder into the terminal PIN pad is encrypted and included in the online authorisation request message sent to the issuer.                                                                                                                                                                        |
| <b>Online Request</b>          | A Final Outcome                                                                                                                                                                                                                                                                                                                                                 |
| <b>Outcome</b>                 | Result from the kernel processing, provided to Entry Point, or under exception conditions, result of Entry Point processing. In either case, a primary value with a parameter set.                                                                                                                                                                              |

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|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>P</b>                                           | Path                                                                                                                                                                                                                                                                                                                   |
| <b>PAN</b>                                         | Primary Account Number                                                                                                                                                                                                                                                                                                 |
| <b>path</b>                                        | An application path taken based on reader/terminal interface and capabilities. The paths defined in this specification are EMV mode and mag-stripe mode, both supporting only the contactless interface. Card behaviour is uniquely defined based on the path taken.                                                   |
| <b>PDOL</b>                                        | Processing Options Data Object List                                                                                                                                                                                                                                                                                    |
| <b>PIN</b>                                         | Personal Identification Number                                                                                                                                                                                                                                                                                         |
| <b>PIX</b>                                         | Proprietary Identifier Extension                                                                                                                                                                                                                                                                                       |
| <b>POS</b>                                         | Point of Sale                                                                                                                                                                                                                                                                                                          |
| <b>PPSE</b>                                        | Proximity Payment System Environment                                                                                                                                                                                                                                                                                   |
| <b>Proximity Payment System Environment (PPSE)</b> | A list of all Combinations supported by the contactless card. PPSE is used in the Entry Point Combination Selection process.                                                                                                                                                                                           |
| <b>Reader</b>                                      | A component of the POS System; described in detail in <i>Book A</i>                                                                                                                                                                                                                                                    |
| <b>Reader Limit Set</b>                            | <p>An acquirer-merchant configurable set of reader risk parameters to be used during Dynamic Reader Limits processing. The acquirer-merchant is able to enable or disable the individual reader risk parameters in the Reader Limit Set, and to set the value of any corresponding limits.</p> <p>See section 5.1.</p> |
| <b>reader risk parameter</b>                       | A reader limit or check used to perform reader risk management during the Pre-Processing phase of Entry Point, or during Kernel 3 Dynamic Reader Limits (DRL) processing.                                                                                                                                              |
| <b>RF</b>                                          | Radio Frequency                                                                                                                                                                                                                                                                                                        |
| <b>RFU</b>                                         | Reserved for Future Use (by EMVCo)                                                                                                                                                                                                                                                                                     |
| <b>RID</b>                                         | Registered Application Provider Identifier                                                                                                                                                                                                                                                                             |

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|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>S</b>                                           | Source                                                                                                                                                                                                                                                                                                |
| <b>Select Next</b>                                 | An Outcome                                                                                                                                                                                                                                                                                            |
| <b>SFI</b>                                         | Short File Identifier                                                                                                                                                                                                                                                                                 |
| <b>SHA</b>                                         | Secure Hash Algorithm                                                                                                                                                                                                                                                                                 |
| <b>standard mag-stripe mode [acquirer support]</b> | Acquirer support for mag-stripe mode transaction with track data <u>without</u> data in support of an Application Cryptogram. Equivalent to traditional (swiped) magnetic stripe transactions.                                                                                                        |
| <b>Status Check Support</b>                        | Option within the reader related to the checking of a single unit of currency. The notion of single unit of currency is based on the least significant number of the currency unit as defined in ISO 4217. This option can be used by the reader to determine whether the card is genuine and active. |
| <b>SW1 SW2</b>                                     | Status Byte One, Status Byte Two                                                                                                                                                                                                                                                                      |
| <b>T</b>                                           | Tag                                                                                                                                                                                                                                                                                                   |
| <b>TC</b>                                          | Transaction Certificate                                                                                                                                                                                                                                                                               |
| <b>Terminal</b>                                    | A component of the POS System; described in detail in <i>Book A</i>                                                                                                                                                                                                                                   |
| <b>TLV</b>                                         | Tag Length Value                                                                                                                                                                                                                                                                                      |
| <b>Transaction</b>                                 | The reader-card interaction between the first presentment of the card and the decision on whether the transaction is approved or declined. If the transaction is authorised online, this may involve multiple presentments of the card on the reader.                                                 |
| <b>Try Again</b>                                   | An Outcome                                                                                                                                                                                                                                                                                            |
| <b>Try Another Interface</b>                       | A Final Outcome                                                                                                                                                                                                                                                                                       |
| <b>TTQ</b>                                         | Terminal Transaction Qualifiers                                                                                                                                                                                                                                                                       |
| <b>TVR</b>                                         | Terminal Verification Results                                                                                                                                                                                                                                                                         |
| <b>var</b>                                         | Variable length                                                                                                                                                                                                                                                                                       |

