

EMV[®]

QR Code Specification for Payment Systems (EMV QRCPS)

Merchant-Presented Mode

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1 Introduction

1.1 Purpose

This document provides:

- A brief description of merchant presented EMV QR Code payment and the entities involved.
- The requirements on the QR Code displayed by the Merchant, including format and content.

The processing of the QR Code by the mobile application and the network messages as a result of this processing are out of scope of this document.

1.2 Normative References

Table 1.1 lists the documents referenced in this specification.

Table 1.1: References Materials

Reference	Publication Name
[ISO/IEC 18004]	Information technology—Automatic identification and data capture techniques - QR Code bar code symbology specification
[ISO 18245]	Retail financial services—Merchant category codes
[ISO/IEC 13239]	Information technology—Telecommunications and information exchange between systems—High-level data link control (HDLC) procedures
[ISO 3166-1 alpha 2]	Codes for the representation of names of countries and their subdivisions—Part 1: Country codes, using two-letter country codes.
[ISO 4217]	Codes for the representation of currencies and funds
[ISO 7816-4]	Identification cards—Integrated circuit cards—Part 4: Organization, security and commands for interchange
[ISO 639]	Codes for the representation of names of languages—Part 1: Alpha - 2 Code
[EMV Book 4]	EMV Integrated Circuit Card Specifications for Payment Systems - Book 4 Cardholder, Attendant, and Acquirer Interface Requirements

Reference	Publication Name
[Unicode]	Unicode Standard, specifically the UTF-8 encoding form. For more information, please check: http://www.unicode.org/versions/latest
[UUID]	A universally unique identifier (UUID) as defined in the Internet Engineering Task Force (IETF) RFC 4122: https://tools.ietf.org/html/rfc4122

1.3 Notational Conventions

1.3.1 Abbreviations

The abbreviations listed in Table 1.2 are used in this specification.

Table 1.2: Abbreviations

Abbreviation	Description
ans	Alphanumeric Special
C	Conditional
CDCVM	Consumer Device Cardholder Verification Method
CRC	Cyclic Redundancy Check
ECI	Extended Channel Interpretation
ID	Identifier of the data object
ISO	International Standards Organization
M	Mandatory
N	Numeric
O	Optional
QR Code	Quick Response Code
RFU	Reserved for Future Use
S	String

Abbreviation	Description
SDK	Software Development Kit
var.	Variable

1.3.2 Terminology and Conventions

The following words are used often in this specification and have a specific meaning:

Shall

Defines a product or system capability which is mandatory.

May

Defines a product or system capability which is optional or a statement which is informative only and is out of scope for this specification.

Should

Defines a product or system capability which is recommended.

1.3.3 Requirement Numbering

Requirements in this specification are uniquely numbered with the number appearing next to each requirement. For example:

- 6.2.1.1 Data objects that are labelled [M] in table 4.6 shall be present under the root of the QR Code.

Note: Requirements may include informative statements. In this case, the statement is written in the italic font and the verb "should" or "may" instead of "shall" is used.

1.3.4 Presence of Data Objects

For the presence of data objects, the following notation is used:

- M: Mandatory—shall always be present.
- C: Conditional—shall be present under certain conditions.
- O: Optional—may be present.

1.4 Data Objects

1.4.1 Format Conventions

The value of a data object encoded in the EMV Merchant-Presented QR Code has one of the formats listed in Table 1.3.

Table 1.3: Data Object Value—Format Conventions

Format	Meaning
Numeric (N)	Values that can be represented by all digits, from "0" to "9". The numeric alphabet includes ten (10) characters in total.
Alphanumeric Special (ans)	Values that can be represented by the Common Character Set as defined in [EMV Book 4]. The Alphanumeric Special alphabet includes ninety-six (96) characters in total and includes the numeric alphabet and punctuation.
String (S)	Values represented by any precomposed character(s) defined in [Unicode].

1.4.2 Representation

When referencing characters to include in the EMV Merchant-Presented QR Code, this specification encloses the characters in double quotes, for instance "Test@123".

A character can be represented by its hexadecimal value. Single quotes are used to indicate the hexadecimal value, for instance '42' to represent the character "B".

1.4.3 Encoding

For conversion of a character to its binary representation, this specification uses UTF-8 encoding as defined by [Unicode]. A character in UTF-8 can be up to 4 bytes long. Precomposed characters are recommended to maintain consistent character length for cross-platform compatibility reasons. For more information, please see:

- http://unicode.org/faq/char_combmark.html
- https://en.wikipedia.org/wiki/Precomposed_character

Characters from the numeric (N) and the Alphanumeric Special alphabet (ans), as defined in Table 1.3, are always 1 byte long. For instance, "3" and "c" are encoded as '33' and '63' respectively. Unicode characters outside this range are encoded in multiple bytes, for example, "ç" is encoded as '0109' and "的" is encoded as 'E79A84'.

2 Overview to EMV® QR Code Payment

An EMV Merchant-Presented QR Code payment transaction enables consumers to make purchases using a merchant generated and displayed QR Code based on the merchant's details. For example, it can be used for a transfer of funds to a Merchant account designated by the Merchant Account Information over a payment network in exchange for goods and services provided by the Merchant.

Consumers are issued a mobile application that has the capability to scan an EMV Merchant-Presented QR Code and initiate a payment transaction. This mobile application may be an existing mobile banking app offered by the Issuer or a third party. In both cases, the request to process the payment transaction is ultimately directed to the Issuer managing the account from which the funds will be withdrawn.

The Issuer receives the initial payment transaction, and secures or withdraws the transaction amount from the consumer's account.

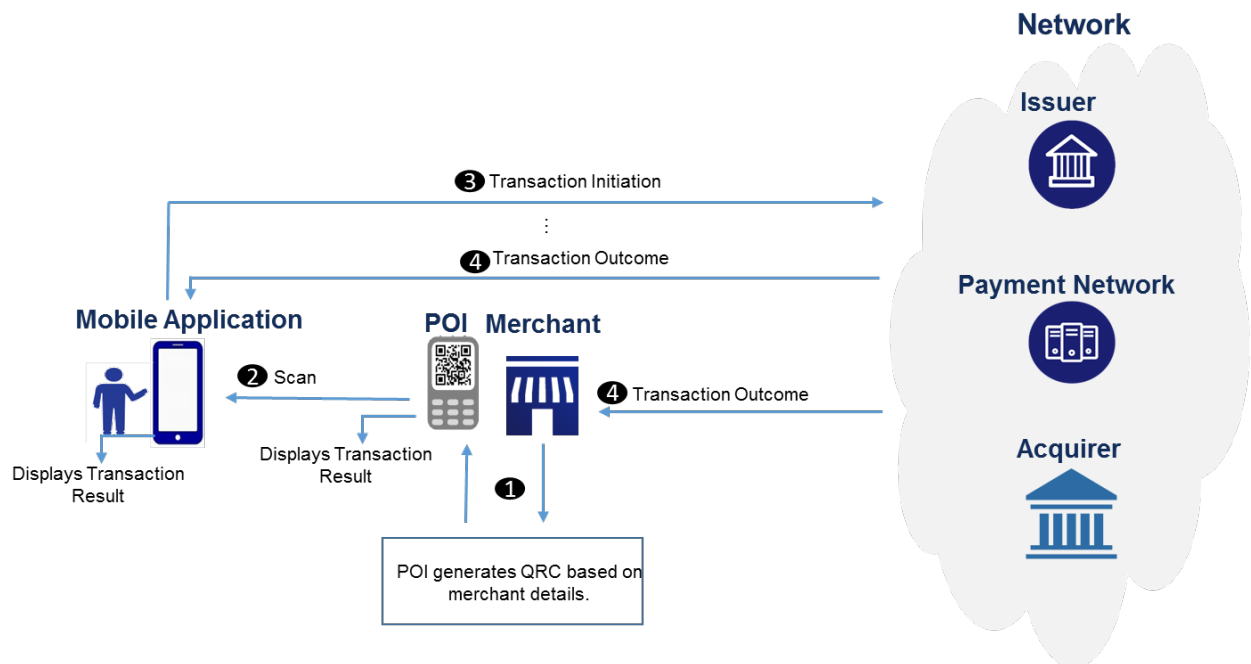
Upon receiving the payment transaction, the Acquirer checks the validity of the Merchant Account Information and other merchant credentials and, when valid, credits the payment transaction amount to the account associated with the Merchant Account Information.

The Merchant awaits notification of a successful transaction response before delivering the goods and services to the Consumer.

The Issuer also provides a notification to the Consumer (typically to their mobile application).

Figure 2.1 illustrates the EMV Merchant-Presented QR Code transaction flow. Different message flows are possible between the entities involved, depending on type of wallet (Issuer wallet or third-party wallet) and the infrastructure supported by the payment network. In Figure 2.1, the combination of entities involved and the various message flows is jointly referred to as the 'Network'. Note that the specifics of this message flow from the mobile to the Network is out of EMVCo's scope.

Figure 2.1: Merchant-Presented Mode Transaction Flow



- [1] Merchant generates and displays QR Code based on merchant details.
- [2] Consumer scans QR Code using a mobile application to initiate the transaction, with CDCVM if required.
- [3] Mobile application sends the transaction initiation request to the Network.
- [4] The Network processes the transaction and informs the Merchant and the Consumer of the transaction outcome.

3 EMV QR Code Payload Data Objects

3.1 QR Code Payload

The content of the QR Code includes the following information:

- The conventions used for the QR Code content, such as the Payload Format Indicator (see Table 3.1)
- Merchant Account Information, including information on the Merchant account (see Table 3.2)
- Additional information on the Merchant, such as the Merchant Name (see Table 3.3)
- Information on the transaction value, if known, such as the Transaction Amount (see Table 3.4)
- Additional data in support of various use cases, such as the Bill Number (see Table 3.5)

Table 3.1 to Table 3.5 lists the information that EMVCo has defined for inclusion in an EMV Merchant-Presented QR Code.

Table 3.1: QR Code Conventions

Data Object	Meaning
Payload Format Indicator	Defines the version of the QR Code template and hence the conventions on the identifiers, lengths, and values. In this version of the specification, the Payload Format Indicator has the value "01".
Point of Initiation Method	Identifies the communication technology (here QR Code) and whether the data is static or dynamic. The Point of Initiation Method has a value of "11" for static QR Codes and a value of "12" for dynamic QR Codes. The value of "11" is used when the same QR Code is shown for more than one transaction. The value of "12" is used when a new QR Code is shown for each transaction.
Cyclic Redundancy Check (CRC)	Checksum calculated over all the data objects included in the QR Code.

Table 3.2: Merchant Account Information

Data Object	Meaning
Merchant Account Information	Identifies the merchant. The format and value are unique and specific to a payment system and several values may be included in the QR Code.

Table 3.3: Additional Merchant Information

Data Object	Meaning
Merchant Category Code	As defined by [ISO 18245] and assigned by the Acquirer.
Country Code	Indicates the country of the merchant acceptance device. A 2-character alpha value, as defined by [ISO 3166-1 alpha 2] and assigned by the Acquirer. The country may be displayed to the consumer by the mobile application when processing the transaction.
Merchant Name	The “doing business as” name for the merchant, recognizable to the consumer. This name may be displayed to the consumer by the mobile application when processing the transaction.
Merchant City	City of operations for the merchant. This name may be displayed to the consumer by the mobile application when processing the transaction.
Postal Code	Zip code or Pin code or Postal code of the merchant. If present, this value may be displayed to the consumer by the mobile application when processing the transaction.
Merchant Information-Alternate Language	Merchant Name and potentially other merchant related information in an alternate language, typically the local language.

Table 3.4: Transaction Value

Data Object	Meaning
Transaction Amount	The transaction amount, if known. For instance, "99.34". If present, this value is displayed to the consumer by the mobile application when processing the transaction. If this data object is not present, the consumer is prompted to input the transaction amount to be paid to the merchant.

Data Object	Meaning
Transaction Currency	<p>Indicates the currency code of the transaction.</p> <p>A 3-digit numeric value, as defined by [ISO 4217]. This value will be used by the mobile application to display a recognizable currency to the consumer whenever an amount is being displayed or whenever the consumer is prompted to enter an amount.</p>
Tip or Convenience Indicator	<p>Indicates whether the consumer will be prompted to enter a tip or whether the merchant has determined that a flat, or percentage convenience fee is charged.</p>
Value of Convenience Fee Fixed	<p>The fixed amount convenience fee when 'Tip or Convenience Indicator' indicates a flat convenience fee.</p> <p>For example, "9.85", indicating that this fixed amount (in the transaction currency) will be charged on top of the transaction amount.</p>
Value of Convenience Fee Percentage	<p>The percentage convenience fee when 'Tip or Convenience Indicator' indicates a percentage convenience fee.</p> <p>For example, "3.00" indicating that a convenience fee of 3% of the transaction amount will be charged, on top of the transaction amount.</p>

Table 3.5: Additional Data Objects

Data Object	Meaning
Bill Number	<p>The invoice number or bill number. This number could be provided by the merchant or could be an indication for the mobile application to prompt the consumer to input a Bill Number.</p> <p>For example, the Bill Number may be present when the QR Code is used for bill payment.</p>
Mobile Number	<p>The mobile number could be provided by the merchant or could be an indication for the mobile application to prompt the consumer to input a Mobile Number.</p> <p>For example, the Mobile Number to be used for multiple use cases, such as mobile top-up and bill payment.</p>
Store Label	<p>A distinctive value associated to a store. This value could be provided by the merchant or could be an indication for the mobile application to prompt the consumer to input a Store Label.</p> <p>For example, the Store Label may be displayed to the consumer on the mobile application identifying a specific store.</p>

Data Object	Meaning
Loyalty Number	<p>Typically, a loyalty card number. This number could be provided by the merchant, if known, or could be an indication for the mobile application to prompt the consumer to input their Loyalty Number.</p>
Reference Label	<p>Any value as defined by the merchant or acquirer in order to identify the transaction. This value could be provided by the merchant or could be an indication for the mobile app to prompt the consumer to input a transaction Reference Label.</p> <p>For example, the Reference Label may be used by the consumer mobile application for transaction logging or receipt display.</p>
Customer Label	<p>Any value identifying a specific consumer. This value could be provided by the merchant (if known), or could be an indication for the mobile application to prompt the consumer to input their Customer Label.</p> <p>For example, the Customer Label may be a subscriber ID for subscription services, a student enrolment number, etc.</p>
Terminal Label	<p>A distinctive value associated to a terminal in the store. This value could be provided by the merchant or could be an indication for the mobile application to prompt the consumer to input a Terminal Label.</p> <p>For example, the Terminal Label may be displayed to the consumer on the mobile application identifying a specific terminal.</p>
Purpose of Transaction	<p>Any value defining the purpose of the transaction. This value could be provided by the merchant or could be an indication for the mobile application to prompt the consumer to input a value describing the purpose of the transaction.</p> <p>For example, the Purpose of Transaction may have the value "International Data Package" for display on the mobile application.</p>
Additional Consumer Data Request	<p>Contains indications that the mobile application is to provide the requested information in order to complete the transaction. The information requested should be provided by the mobile application in the authorization without unnecessarily prompting the consumer.</p> <p>For example, the Additional Consumer Data Request may indicate that the consumer mobile number is required to complete the transaction, in which case the mobile application should be able to provide this number (that the mobile application has previously stored) without unnecessarily prompting the consumer.</p>

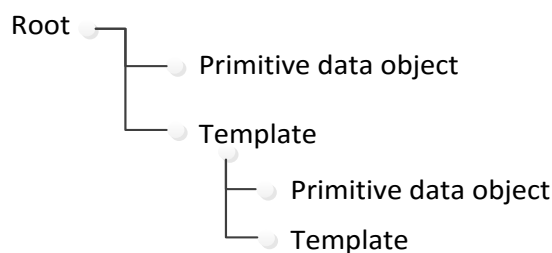
3.2 Data Organization

The data contained within a QR Code is organized as follows. Each data object is made up of three individual fields. The first field is an identifier (ID) by which the data object can be referenced. The next field is a length field that explicitly indicates the number of characters included in the third field: the value field. A data object is then represented as an ID / Length / Value combination, where:

- The ID is coded as a two-digit numeric value, with a value ranging from "00" to "99",
- The length is coded as a two-digit numeric value, with a value ranging from "01" to "99",
- The value field has a minimum length of one character and maximum length of 99 characters.

In the QR Code, the data objects are organized in a tree-like structure, under the root (see Figure 3.1). A data object may be a primitive data object or a template. A template may include other templates and primitive data objects.

Figure 3.1: Data Object Organization in the QR Code



A data object that is not encapsulated within a template is said to be under the root of the QR Code.

The value of an ID is not unique and the data object to which it refers is context specific. If the ID is not under the root, the context of an ID is defined by the encapsulating template.

As an example: ID "01" that is under the root of the QR Code refers to the Point of Initiation Method, while ID "01" refers to the Bill Number when it is under the Additional Data Field Template (that is, within ID "62").

The Payload Format Indicator (ID "00") is the first data object under the root and allows the mobile application to determine the data representation of the remaining data included in the QR Code and how to parse the data. The CRC (ID "63") is the last object under the root and allows the mobile application to check the integrity of the data scanned without having to parse all of the data objects. The position of all other data objects under the root or within templates is arbitrary and may appear in any order.

The format of a value field in a data object is either Numeric (N), Alphanumeric Special (ans), or String (S). Note that Numeric is a subset of Alphanumeric Special and that Alphanumeric Special is a subset of String.

Table 3.6 lists the name of the data object, the ID of the data object, the format of the value field of the data object, the length of the value field of the data object, and whether the presence of the data object at the root level of the QR Code is Mandatory (M), Conditional (C), or Optional (O).

Table 3.6: Data Objects Under the Root of a QR Code

Name	ID	Format	Length	Presence	Comment
Payload Format Indicator	"00"	N	"02"	M	
Point of Initiation Method	"01"	N	"02"	O	
Merchant Account Information	"02"- "51"	ans	var. up to "99"	M	At least one Merchant Account Information data object shall be present.
Merchant Category Code	"52"	N	"04"	M	
Transaction Currency	"53"	N	"03"	M	
Transaction Amount	"54"	ans	var. up to "13"	C	Absent if the mobile application is to prompt the consumer to enter the transaction amount. Present otherwise.
Tip or Convenience Indicator	"55"	N	"02"	O	
Value of Convenience Fee Fixed	"56"	ans	var. up to "13"	C	Presence of these data objects depends on the presence and value of the Tip or Convenience Indicator.
Value of Convenience Fee Percentage	"57"	ans	var. up to "05"	C	
Country Code	"58"	ans	"02"	M	
Merchant Name	"59"	ans	var. up to "25"	M	

Name	ID	Format	Length	Presence	Comment
Merchant City	"60"	ans	var. up to "15"	M	
Postal Code	"61"	ans	var. up to "10"	O	
Additional Data Field Template	"62"	S	var. up to "99"	O	<p>The Additional Data Field Template includes information that may be provided by the Merchant or may be populated by the mobile application to enable or facilitate certain use cases.</p> <p>For the list of data objects that can be included in this template, please refer to Table 3.7.</p>
Merchant Information—Language Template	"64"	S	var. up to "99"	O	<p>The Merchant Information—Language Template includes merchant information in an alternate language and may use a character set different from the Common Character Set. It provides an alternative to the merchant information under the root.</p> <p>For the list of data objects that can be included in this template, please refer to Table 3.8.</p>
RFU for EMVCo	"65"- "79"	S	var. up to "99"	O	Data objects reserved for EMVCo
Unreserved Templates	"80"- "99"	S	var. up to "99"	O	Unreserved Templates
CRC	"63"	ans	"04"	M	

Table 3.7 lists the name of the data object, the ID of the data object, the format of the value field of the data object, the length of the value field of the data object, and whether the presence of the data object within the Additional Data Field Template (ID "62") of the QR Code is Mandatory (M), Conditional (C), or Optional (O).

Table 3.7: Data Objects for Additional Data Field Template (ID "62")

Name	ID	Format	Length	Presence
Bill Number	"01"	ans	var. up to "25"	O
Mobile Number	"02"	ans	var. up to "25 "	O
Store Label	"03"	ans	var. up to "25"	O
Loyalty Number	"04"	ans	var. up to "25"	O
Reference Label	"05"	ans	var. up to "25"	O
Customer Label	"06"	ans	var. up to "25"	O
Terminal Label	"07"	ans	var. up to "25"	O
Purpose of Transaction	"08"	ans	var. up to "25"	O
Additional Consumer Data Request	"09"	ans	var. up to "03"	O
RFU for EMVCo	"10"- "49"	S		O
Payment System specific templates.	"50"- "99"	S		O

Each of the data objects with IDs "01" to "08" in Table 3.7 can be used in two ways: either the merchant can provide both the ID and its meaningful value or the merchant can include the ID with a special value to have the mobile application prompt the consumer to input this information.

To prompt the consumer for one or more of these values, the merchant includes the respective IDs in this template each with a length of "03" and with a value equal to "****".

When the consumer is prompted by the mobile application to enter a value for any of these data objects, the length of the value to be entered should not exceed the length as indicated in Table 3.7.

The data object with the ID "09" contains one or more values that indicate to the mobile application the data to provide as part of the transaction initiation request. This data should already be known by the mobile application, and the consumer should not be unnecessarily prompted for the data.

One or more of the following characters may appear in the Additional Consumer Data Request (ID "09"), to indicate that the corresponding data should be provided in the transaction initiation to complete the transaction:

- "A" = Address of the consumer
- "M" = Mobile number of the consumer
- "E" = Email address of the consumer

If more than one character is included, it means that each data object corresponding to the character is required to complete the transaction. Note that each unique character should appear only once.

Table 3.8 lists the name of the data object, the ID of the data object, the format of the value field of the data object, the length of the value field of the data object, and whether the presence of the data object within the Merchant Information—Language Template (ID "64") of the QR Code is Mandatory (M), Conditional (C), or Optional (O).

These data objects may be used by a mobile application to present the merchant information in an alternate language.

Table 3.8: Data Objects for Merchant Information—Language Template (ID "64")

Name	ID	Format	Length	Presence
Language Preference	"00"	ans	"02"	M
Merchant Name—Alternate Language	"01"	S	var. up to "25"	M
Merchant City—Alternate Language	"02"	S	var. up to "15"	O
RFU for EMVCo	"03"–"99"	S	var. up to "99"	Data objects reserved for EMVCo

The data objects with IDs "01" and "02" are used as an addition to the merchant information under the root. While the equivalent data objects under the root are defined with a format of Alphanumeric Special, and as such can only contain the Common Character Set, these data objects, if present, are defined with a format of String, so therefore may contain a different character set.

3.3 Data Object ID Allocation

An ID of a primitive data object or a template is either allocated by EMVCo, Reserved for Future Use (RFU) by EMVCo, or Unreserved.

IDs allocated by EMVCo have a meaning, representation, and format as defined by EMVCo in this, and related, specifications.

Unreserved IDs can be allocated and used by other parties, such as (domestic) payment systems and value-added service providers for their own products. These entities can then define the meaning and representation of the values within these data objects in one of the formats defined by this specification. Other constraints defined in this specification (for example, length of data objects) also apply.

These parties are encouraged though to use the EMVCo allocated data objects whenever the meaning of a data object corresponds to what is needed for their own solution, even if the representation or format is different from their existing or desired solution. The conversion from the representation and format as defined for the QR Code to the desired representation and format for the mobile application, user display, and subsequent transaction processing can be done by the mobile application. Avoiding duplication of information due to differences in representation and format reduces the payload data and therefore the size of the QR Code and improves the consumer experience when reading and processing the QR Code.

An example is given below:

The QR Code presents the Transaction Amount (ID "54") as a series of digits, where the "." character is used as a decimal mark to separate the decimals from the integer value. It also includes the Transaction Currency (ID "53") using 3-digit numeric representation.

The mobile application can easily represent the amount and the currency as defined for Amount, Authorized (Numeric) and Transaction Currency Code in [EMV Book 4].

For example, if the values of the Transaction Amount and Transaction Currency in the QR Code are "98.73" and "840", respectively, then the mobile application can convert these values to '000000009873' and '0840' to put them in the representation and format as used for the Amount, Authorized (Numeric) and Transaction Currency Code.

4 Requirements

This chapter defines the requirements that shall be followed when generating a payload for a QR Code.

4.1 Payload

The length of the payload should not exceed 512 alphanumeric characters, and the number of characters should be reduced proportionally when multi-byte [Unicode] characters are used.

Note that, as data object values with a format of S may contain characters coded as UTF-8 and depending on the alphabet being used there may not be a one-to-one mapping of characters to bytes, special consideration would be needed to determine the number of bytes in the payload.

4.2 Presence of Data Objects

4.2.1.1 Data objects that are labelled [M] in Table 3.6 shall be present under the root of the QR Code.

4.2.1.2 Data objects that are labelled [C] in Table 3.6, shall be present under the root if the respective conditions are met.

The data objects labelled [O] in Table 3.6 may be present under the root.

4.2.1.3 If the Merchant Information—Language Template (ID "64") is present, then the data objects that are labelled [M] in Table 3.8 shall be present in the template.

Other data objects that are labelled [O] in Table 3.8 may be present in this template.

If the Additional Data Field Template (ID "62") is present, then the data objects that are labelled [O] in Table 3.7 may be present in this template.

4.3 Data Object ID

4.3.1.1 An ID shall be coded as a two-digit numeric value and shall have a value "00" to "99".

4.3.1.2 There shall be only one occurrence of a data object with a specific ID under the root and there shall be only one occurrence of a specific ID within a template.

4.4 Data Object Length

4.4.1.1 Length shall be equal to the number of characters in the value field.

4.4.1.2 Length shall be coded as a two-digit numeric value and shall have a value "01" to "99".

4.5 Data Object Values

4.5.1 Numeric Values

- 4.5.1.1 Data objects with a format of numeric [N] shall only contain values represented by digits "0" to "9". Each digit is encoded in the QR Code by its binary representation as defined by [Unicode].

4.5.2 Alphanumeric Special Values

- 4.5.2.1 Data objects with a format of Alphanumeric Special [ans] shall only contain values defined in the Common Character Set of [EMV Book 4]. Each character is encoded in the QR Code by its binary representation as defined by [Unicode].

4.5.3 String Values

- 4.5.3.1 Data objects with a format of String [S] shall only contain precomposed values defined in [Unicode]. Each precomposed character is encoded in the QR Code by its binary representation as defined by [Unicode].

4.6 Data Organization

4.6.1 Position of Data Objects

- 4.6.1.1 The Payload Format Indicator (ID "00") shall be the first data object in the QR Code.
- 4.6.1.2 The CRC (ID "63") shall be the last data object in the QR Code.

All other data objects under the root may be placed at any position.

Data objects within a template, such as the Additional Data Field Template (ID "62") or the Merchant Information—Language Template (ID "64"), may be placed in any position under their respective templates.

4.7 Data Objects—Root

4.7.1 Payload Format Indicator (ID "00")

- 4.7.1.1 The Payload Format Indicator shall contain a value of "01". All other values are RFU.

4.7.2 Point of Initiation Method (ID "01")

- 4.7.2.1 If present, the Point of Initiation Method shall contain a value of "11" or "12". All other values are RFU.

The value of "11" should be used when the same QR Code is shown for more than one transaction and the value of "12" should be used when a new QR Code is shown for each transaction.

4.7.3 CRC (ID "63")

- 4.7.3.1 The checksum shall be calculated according to [ISO/IEC 13239] using the polynomial '1021' (hex) and initial value 'FFFF' (hex). The data over which the checksum is calculated shall cover all data objects, including their ID, Length and Value, to be included in the QR Code, in their respective order, as well as the ID and Length of the CRC itself (but excluding its Value).
- 4.7.3.2 Following the calculation of the checksum, the resulting 2-byte hexadecimal value shall be encoded as a 4-character Alphanumeric Special value by converting each nibble to an Alphanumeric Special character.

Example: a CRC with a two-byte hexadecimal value of '007B' is included in the QR Code as "6304007B".

4.7.4 Transaction Amount (ID "54")

- 4.7.4.1 If present, the Transaction Amount shall be different from zero, shall only include (numeric) digits "0" to "9" and may contain a single "." character as the decimal mark. When the amount includes decimals, the "." character shall be used to separate the decimals from the integer value and the "." character may be present even if there are no decimals.

The number of digits after the decimal mark should align with the currency exponent associated to the currency code defined in [ISO 4217].

The above describes the only acceptable format for the Transaction Amount. It cannot contain any other characters (for instance, no space character can be used to separate thousands).

*The following are examples of valid Transaction Amounts: "98.73", "98" and "98.". The following are **NOT** valid Transaction Amounts: "98,73" and "3 705".*

- 4.7.4.2 The Transaction Amount shall not be included if the mobile application should prompt the consumer to enter the amount to be paid to the Merchant.

4.7.5 Transaction Currency (ID "53")

- 4.7.5.1 The Transaction Currency shall conform to [ISO 4217] and shall contain the 3-digit numeric representation of the currency. For example, USD is represented by the value "840".

The value should indicate the transaction currency in which the merchant transacts.

4.7.6 Tip or Convenience Indicator (ID "55")

- 4.7.6.1 If present, the Tip or Convenience Indicator shall contain a value of "01", "02" or "03". All other values are RFU.
- A value of "01" shall be used if the mobile application should prompt the consumer to enter a tip to be paid to the merchant.
 - A value of "02" shall be used to indicate inclusion of the data object Value of Convenience Fee Fixed (ID "56").
 - A value of "03" shall be used to indicate inclusion of the data object Value of Convenience Fee Percentage (ID "57").

Note that even if the Transaction Amount is not present in the QR Code, this data object may still be present.

4.7.7 Value of Convenience Fee Fixed (ID "56")

- 4.7.7.1 The Value of Convenience Fee Fixed shall be present and different from zero if the data object Tip or Convenience Indicator (ID "55") is present with a value of "02". Otherwise this data object shall be absent.
- 4.7.7.2 If present, the Value of Convenience Fee Fixed shall only include (numeric) digits "0" to "9" and may contain a single "." character as the decimal mark.
- 4.7.7.3 When the Value of the Convenience Fee Fixed includes decimals, the "." character shall be used to separate the decimals from the integer value.

The "." character may be present even if there are no decimals.

The number of digits after the decimal mark should align with the currency exponent associated to the currency code defined in [ISO 4217].

The above describes the only acceptable format for the Value of Convenience Fee Fixed. It cannot contain any other characters (for instance, no space character can be used to separate thousands).

4.7.8 Value of Convenience Fee Percentage (ID "57")

- 4.7.8.1 The Value of Convenience Fee Percentage shall be present if the data object Tip or Convenience Indicator (ID "55") is present with a value of "03" and only values between "00.01" and "99.99" shall be used. Otherwise this data object shall be absent.
- 4.7.8.2 If present, the Value of Convenience Fee Percentage shall only include (numeric) digits "0" to "9" and may contain a single "." character as the decimal mark.
- 4.7.8.3 When the Value of the Convenience Fee Percentage includes decimals, the "." character shall be used to separate the decimals from the integer value and the "." character may be present even if there are no decimals.

The Value of Convenience Fee Percentage shall not contain any other characters. For example, the "%" character must not be included.

The above describes the only acceptable format for the Value of Convenience Fee Percentage.

4.7.9 Merchant Account Information (IDs "02" to "51")

4.7.9.1 At least one Merchant Account Information data object in the range "02" to "51" shall be present.

Table 4.1: Allocation of Merchant Account Information (IDs "02" to "51")

ID	Meaning
"02"- "03"	Reserved for Visa
"04"- "05"	Reserved for Mastercard
"06"- "08"	Reserved by EMVCo
"09"- "10"	Reserved for Discover
"11"- "12"	Reserved for Amex
"13"- "14"	Reserved for JCB
"15"- "16"	Reserved for UnionPay
"17"- "25"	Reserved by EMVCo
"26"- "51"	Templates reserved for additional payment networks. For content of this template, please refer to Table 4.2.

4.7.10 Primitive Payment System Merchant Account Information (IDs "02" to "25")

4.7.10.1 A primitive payment system Merchant Account Information ID shall be used when the payment system that assigned the Merchant Account Information is implicitly identified by the ID. Allocation of these IDs is described in Table 4.1.

4.7.11 Merchant Account Information Template (IDs "26" to "51")

4.7.11.1 A Merchant Account Information template shall be used when the payment system corresponding to the Merchant Account Information is explicitly identified in the template.

4.7.11.2 If present, a Merchant Account Information template shall contain a primitive Globally Unique Identifier data object with a data object ID "00", as defined in Table 4.2.

The value of this data object shall contain one of the following:

- An Application Identifier (AID) consisting of a RID registered with ISO and, optionally, a PIX, as defined by [ISO 7816-4]. *For example, "D840000000".*
- A [UUID] without the hyphen (-) separators. *For example, "581b314e257f41bfbbdc6384daa31d16".*
- A reverse domain name. *For example, "com.merchant.name".*

The value of the Globally Unique Identifier sets the context for the remainder of the template and the meaning of the other data objects in the template are context specific and outside of the scope of EMVCo.

Table 4.2: Data Object ID Allocation in Merchant Account Information Template (IDs "26" to "51")

ID	Meaning	Format	Length	Presence	Comment
"00"	Globally Unique Identifier	ans	var. up to "32"	M	An identifier that sets the context of the data that follows. The value is one of the following: <ul style="list-style-type: none"> • an Application Identifier (AID); • a [UUID] without the hyphen (-) separators; • a reverse domain name.
"01"- "99"	Payment network specific	S		O	Association of data objects to IDs and type of data object is specific to the Globally Unique Identifier.

4.7.12 Merchant Category Code (ID "52")

4.7.12.1 The Merchant Category Code (MCC) shall contain an MCC as defined by [ISO 18245].

This MCC should indicate the Merchant Category Code of the merchant.

4.7.13 Country Code (ID "58")

4.7.13.1 The Country Code shall contain a value as defined by [ISO 3166-1 alpha 2].

The Country Code should indicate the country in which the merchant transacts.

4.7.14 Merchant Name (ID "59")

4.7.14.1 The Merchant Name shall be present.

The Merchant Name should indicate the "doing business as" name for the merchant.

4.7.15 Merchant City (ID "60")

4.7.15.1 The Merchant City shall be present.

The Merchant City should indicate the city of the merchant's physical location.

4.7.16 Postal Code (ID "61")

If present, the Postal Code should indicate the postal code of the merchant's physical location. Depending on the country, the Postal code is the Zip code or PIN code or Postal code of the merchant.

4.8 Data Objects—Additional Data Field Template (ID "62")

- 4.8.1.1 If present, the Additional Data Field Template shall contain at least 1 data object.
- 4.8.1.2 If present, the content of the data object value for IDs "01" to "08" shall be either "****" or a value defined by the merchant. The presence of "****" indicates that the mobile application is responsible for obtaining the necessary information.
- 4.8.1.3 If present, the Additional Consumer Data Request (ID "09") shall contain any combination of the characters: "A", "M" and/or "E", and there shall only be a single instance of each of these characters.
- 4.8.1.4 When additional primitive data objects and templates are present, the allocation of the other IDs shall be as given in Table 4.3.
- 4.8.1.5 If present, a Payment System Specific Template shall contain a primitive Globally Unique Identifier data object with a data object ID "00", as defined in Table 4.4.

The value of this data object shall contain one of the following:

- An Application Identifier (AID) consisting of a RID registered with ISO and, optionally, a PIX, as defined by [ISO 7816-4]. *For example, "A000000004".*
- A [UUID] without the hyphen (-) separators. *For example, "581b314e257f41bfbbdc6384daa31d16".*
- A reverse domain name. *For example, "com.paymentsystem.name".*

Table 4.3: Data Object ID Allocation in Additional Data Field Template with ID "62"

ID	Meaning
"10"-"49"	RFU for EMVCo
"50"-"99"	Payment System specific templates. See Table 4.4.

Table 4.4: Data Object ID Allocation in Payment System Specific Templates

ID	Meaning	Type	Length	Presence	Comment
"00"	Globally Unique Identifier	ans	var. up to "32"	M	An identifier that sets the context of the data that follows. The value is one of the following: <ul style="list-style-type: none"> • an Application Identifier (AID); • a [UUID] without the hyphen (-) separators; • a reverse domain name.
"01"- "99"	Payment System specific	S		O	Association of data objects to IDs and type of data object is specific to the Globally Unique Identifier.

4.9 Data Objects—Merchant Information—Language Template (ID "64")

4.9.1.1 If this template is present, it shall contain the Language Preference (ID "00") and Merchant Name—Alternate Language (ID "01").

It may contain the Merchant City—Alternate Language (ID "02").

All other IDs within the Merchant Information—Language Template are RFU for EMVCo.

4.9.2 Language Preference (ID "00")

4.9.2.1 Language Preference shall contain 2 alphabetical characters coded to a value defined by [ISO 639].

The value should represent the single language used to encode the Merchant Name—Alternate Language and the optional Merchant City—Alternate Language.

4.9.3 Merchant Name—Alternate Language (ID "01")

4.9.3.1 The Merchant Name—Alternate Language shall be present.

The Merchant Name—Alternate Language should indicate the “doing business as” name for the merchant in the merchant’s local language.

4.9.4 Merchant City—Alternate Language (ID "02")

If present, the Merchant City—Alternate Language should indicate the city in which the merchant transacts in the merchant’s local language.

4.10 Data Objects—RFU for EMVCo (IDs "65" to "79")

Data objects in this range are reserved for future use for EMVCo.

4.11 Data Objects—Unreserved Templates (IDs "80" to "99")

4.11.1.1 For Unreserved Templates with IDs "80" to "99", the primitive data object 'Globally Unique Identifier' with ID "00" shall be included in the template. Its value sets the context for the remainder of the template and the meaning of the other IDs and data objects in the template are context specific and outside of the scope of EMVCo.

Zero or more Unreserved Templates may be present.

Unreserved Templates can be allocated and used by other parties, such as (domestic) payment systems and value-added service providers, for their own products. They can then define the meaning, representation and format. Each payment system provider or value-added service provider puts their data in a separate Unreserved Template ID. For example, the first set of data is placed in ID "80", the second set of data is placed in ID "81", and so on.

4.11.1.2 If present, an Unreserved Template shall contain a primitive Globally Unique Identifier data object with a data object ID "00", as defined in Table 4.5.

The value of this data object shall contain one of the following:

- An Application Identifier (AID) consisting of a RID registered with ISO and, optionally, a PIX, as defined by [ISO 7816-4]. *For example, "D840000000".*
- A [UUID] without the hyphen (-) separators. *For example, "581b314e257f41bfbbdc6384daa31d16".*
- A reverse domain name. *For example, "com.unreserved.name".*

The value of the Globally Unique Identifier sets the context for the remainder of the template and the meaning of the other data objects in the template are context specific and outside of the scope of EMVCo.

Table 4.5: Data Object ID Allocation in Unreserved Templates (IDs "80" to "99")

ID	Meaning	Type	Length	Presence	Comment
"00"	Globally Unique Identifier	ans	var. up to "32"	M	<p>An identifier that sets the context of the data that follows.</p> <p>The value is one of the following:</p> <ul style="list-style-type: none"> • an Application Identifier (AID); • a [UUID] without the hyphen (-) separators; • a reverse domain name.

"01"- "99"	Context Specific Data	S		O	Association of data objects to IDs and type of data object is specific to the Globally Unique Identifier.
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4.12 Data Coding of an EMV Merchant-Presented QR Code

4.12.1 Supported Modes

4.12.1.1 For an EMV Merchant-Presented QR Code, all the data shall be encoded using Byte Mode.

Alphanumeric Mode, Numeric mode, Kanji, Structured Append, and FCN1 mode shall not be used.

4.12.1.2 If the EMV Merchant-Presented QR Code includes characters other than Alphanumeric Special, then it shall include an ECI mode indicator and ECI Designator, where the ECI Designator includes the binary representation of an ECI Assignment number equal to 000026, to indicate UTF-8 encoding.

Note that Alphanumeric Special includes Numeric.

Annex A Data Objects Dictionary

Table A.1 defines the data objects that may be included in the QR Code data.

The *Name* column lists the name of the data object and also includes the following:

- Format (F) of the data object. The supported formats are as follows:
 - N (Numeric)
 - ans (Alphanumeric Special)
 - S (String)
- Identifier (ID) of the data object.
- Length (L) of the data object.

The *Template* column lists whether the data object belongs under the root or under a specific template.

The table also includes a short description and (where to find) the value(s) of the data objects.

Table A.1: QR Code Data Objects

Name (Format; ID; Length)	Template	Description	Values
Additional Consumer Data Request F: ans ID: "09" L: var. up to "03"	"62"	Contains indications that the mobile application should include the requested information in order to complete the transaction. The information requested should be provided by the mobile application in the authorization without unnecessarily prompting the consumer.	Please refer to 4.8.

Name (Format; ID; Length)	Template	Description	Values
Additional Data Field Template F: S ID: "62" L: var. up to "99"	Root	This template includes information that may be provided by the merchant or may be requested from the consumer to enable or facilitate certain use cases.	Please refer to 4.8.
Bill Number F: ans ID: "01" L: var. up to "25"	"62"	The invoice number or bill number.	Please refer to 4.8.
Country Code F: ans ID: "58" L: "02"	Root	Indicates the country of the merchant acceptance device.	Please refer to 4.7.13
CRC F: ans ID: "63" L: "04"	Root	Checksum calculated over all the data objects included in the QR Code.	Please refer to 4.7.3.
Customer Label F: ans ID: "06" L: var. up to "25"	"62"	This value could be provided by the merchant, if known, or could be an indication to the mobile application to provide a prompt that will allow the consumer to input their Customer Label.	Please refer to 4.8.
RFU for EMVCo F: S ID: "65" - "79" L: var. up to "99"	Root	Templates reserved for EMVCo.	Please refer to 4.10.

Name (Format; ID; Length)	Template	Description	Values
Globally Unique Identifier F: ans ID: "00" L: var. up to "32"	"26" - "51" or "62" ["50" - "99"] or "80" - "99"	An identifier that sets the context of the data that follows. The value is one of the following: <ul style="list-style-type: none"> • an Application Identifier (AID); • a [UUID] without the hyphen (-) separators; • a reverse domain name. 	Please refer to 4.7.11, 4.8, 4.11.
Language Preference F: ans ID: "00" L: "02"	"64"	Identifies the alternate language used in the Merchant Information—Language Template.	Please refer to 4.9.
Loyalty Number F: ans ID: "04" L: var. up to "25"	"62"	Typically a loyalty card number.	Please refer to 4.8.
Merchant Category Code F: N ID: "52" L: "04"	Root	The MCC of the merchant.	Please refer to 4.7.12.
Merchant City F: ans ID: "60" L: var. up to "15"	Root	City of operations for the merchant. This name may be displayed to the consumer by the mobile application when processing the transaction.	Please refer to 4.7.15.

Name (Format; ID; Length)	Template	Description	Values
Merchant City—Alternate Language F: S ID: "02" L: var. up to "15"	"64"	Indicates the merchant city in the alternate language.	Please refer to 4.9.
Merchant Account Information F: ans ID: "02" - "51" L: var. up to "99"	Root	Identifies the merchant.	The value is unique and specific to a payment system and several values may be included in the QR Code. Please refer to 4.7.10.
Merchant Information—Language Template F: S ID: "64" L: var. up to "99"	Root	This template includes the language preference, one merchant name and city in the Merchant's local language. This information is used for representation.	Please refer to 4.9.
Merchant Name F: ans ID: "59" L: var. up to "25"	Root	The “doing business as” name for the merchant, recognizable to the consumer. This name may be displayed to the consumer by the mobile application when processing the transaction.	Please refer to 4.7.14.
Merchant Name—Alternate Language F: S ID: "01" L: var. up to "25"	"64"	Indicates the merchant name in the alternate language.	Please refer to 4.9.

Name (Format; ID; Length)	Template	Description	Values
Mobile Number F: ans ID: "02" L: var. up to "25"	"62"	Mobile phone number to be used for multiple use cases, such as mobile top-up and bill payment.	Please refer to 4.8.
Payload Format Indicator F: N ID: "00" L: "02"	Root	Defines the version of the QR Code and the conventions on the IDs, lengths and values.	"01", please refer to 4.7.1.
Point of Initiation Method F: N ID: "01" L: "02"	Root	Identifies the communication technology (here QR Code) and whether the data is static or dynamic.	"11" or "12", please refer to 4.7.2.
Postal Code F: ans ID: "61" L: var. up to "10"	Root	Zip code or Pin code or Postal code of merchant. If present, this value may also be displayed to the consumer by the mobile application when processing the transaction.	Please refer to 4.7.16.
Purpose of Transaction F: ans ID: "08" L: var. up to "25"	"62"	Any value as defined by the merchant or acquirer in order to define the purpose of the transaction.	Please refer to 4.8.
Reference Label F: ans ID: "05" L: var. up to "25"	"62"	Any value as defined by the merchant or acquirer in order to identify the transaction.	Please refer to 4.8.

Name (Format; ID; Length)	Template	Description	Values
Store Label F: ans ID: "03" L: var. up to "25"	"62"	A distinctive number associated to a store.	Please refer to 4.8.
Terminal Label F: ans ID: "07" L: var. up to "25"	"62"	A distinctive number associated to a terminal in the store.	Please refer to 4.8.
Tip or Convenience Indicator F: N ID: "55" L: "02"	Root	Indicates whether the consumer will be prompted to enter a tip or whether the merchant has determined that a flat, or percentage, convenience fee is charged.	Please refer to 4.7.6.
Transaction Amount F: ans ID: "54" L: var. up to "13"	Root	The transaction amount.	Please refer to 4.7.4.
Transaction Currency F: N ID: "53" L: "03"	Root	Indicates the currency code of the transaction.	Please refer to 4.7.5.
Unreserved Templates F: S ID: "80" - "99" L: var. up to "99"	Root	Unreserved templates can be allocated and used by other parties, such as (domestic) payment systems and value-added service providers, for their own products. They can then define the meaning, representation and format.	Please refer to 4.11.

Name (Format; ID; Length)	Template	Description	Values
Value of Convenience Fee Fixed F: ans ID: "56" L: var. up to "13"	Root	The fixed amount convenience fee when 'Tip or Convenience Indicator' indicates a flat convenience fee.	Please refer to 4.7.7.
Value of Convenience Fee Percentage F: ans ID: "57" L: var. up to "05"	Root	The percentage convenience fee when 'Tip or Convenience Indicator' indicates a percentage convenience fee.	Please refer to 4.7.8.

Annex B Examples

Below is an example of an EMV Merchant-Presented QR Code.

B.1 QR Code Conventions

Table B.1: QR Code Conventions

Data Object	Input Characters	Meaning
Payload Format Indicator	"000201"	Version 01
Point of Initiation Method	"010212"	Unique QR Code is shown for each consumer
CRC	"6304A13A"	Checksum

B.2 Merchant Account Information

Table B.2: Merchant Account Information

Data Object	Input Characters	Meaning
Merchant Account Information (ID "29")	"2930"	
<ul style="list-style-type: none">Globally Unique Identifier	"0012D15600000000"	Globally Unique Identifier = D15600000000
<ul style="list-style-type: none">Merchant Account Information	"0510A93FO3230Q"	ID "05" holds the Merchant Account Information with value A93FO3230Q
Merchant Account Information (ID "31")	"3128"	
<ul style="list-style-type: none">Globally Unique Identifier	"0012D15600000001"	Globally Unique Identifier = D15600000001
<ul style="list-style-type: none">Merchant Account Information	"030812345678"	ID "03" holds the Merchant Account Information with value 12345678

Note that the ID for the Merchant Account Information or any other ID other than the ID for the Globally Unique Identifier can be arbitrarily chosen.

B.3 Additional Merchant Information

Table B.3: Additional Merchant Information

Data Object	Input Characters	Meaning
MCC	"52044111"	Transportation (such as railroads and ferries)
Country Code	"5802CN"	China
Merchant Name	"5914BEST TRANSPORT"	Best Transport
Merchant City	"6007BEIJING"	Beijing
Language Template	"6420"	
• Local Language	"0002ZH"	Chinese
• Merchant Name—Alternate Language	"0104 最佳运输"	Best Transport
• Merchant City—Alternate Language	"0202 北京"	Beijing

B.4 Transaction Value

Table B.4: Transaction Value

Data Object	Input Characters	Meaning
Transaction Amount	"540523.72"	Amount is 23.72
Transaction Currency	"5303156"	Renminbi
Tip	"550201"	Consumer is prompted for tip

B.5 Additional Data Field Template

Table B.5: Additional Data Field Template

Data Object	Input Characters	Meaning
Additional Data Field Template	"6233"	
<ul style="list-style-type: none"> • Store Label 	"03041234"	Store Label = 1234
<ul style="list-style-type: none"> • Customer Label 	"0603****"	Customer is prompted for Customer Label
<ul style="list-style-type: none"> • Terminal Label 	"0708A6008667"	Terminal Label = A6008667
<ul style="list-style-type: none"> • Additional Consumer Data Request 	"0902ME"	Mobile application is requested to provide mobile number and email of the consumer as part of authorization request

B.6 Unreserved Template

Table B.6: Unreserved Template (ID "91")

Data Object	Printable Format	Meaning
Unreserved template (ID "91")	"9132"	
<ul style="list-style-type: none"> • Globally Unique Identifier 	"0016A011223344998877"	Globally Unique Identifier = A011223344998877
<ul style="list-style-type: none"> • Merchant Account Information 	"070812345678"	Merchant Loyalty Identifier =12345678

B.7 Representation

The representation and corresponding QR Code is given below.

```
"00020101021229300012D15600000000510A93FO3230Q31280012D1560000000103081  
2345678520441115802CN5914BEST TRANSPORT6007BEIJING64200002ZH0104 最佳运  
输 0202 北京  
540523.7253031565502016233030412340603***0708A60086670902ME91320016A011223  
3449988770708123456786304A13A"
```



For ease of reference, the hexadecimal representation is given below as well.

```
'303030323031303130323132323933303030313244313536303030303030303030303531304  
13933464F3332333051333132383030313244313536303030303030303130333038313233  
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