ICMI LEARNING

# EMV card structure

# EMV card structure

EMV on the lower level is based on

ISO 7810

Size and shape

Location of magnetic strip and the chip

## The front of EMV card

# EMV card structure

## The front of EMV card


The card number could vary in length from 16 to 19 digits

ISO 7812

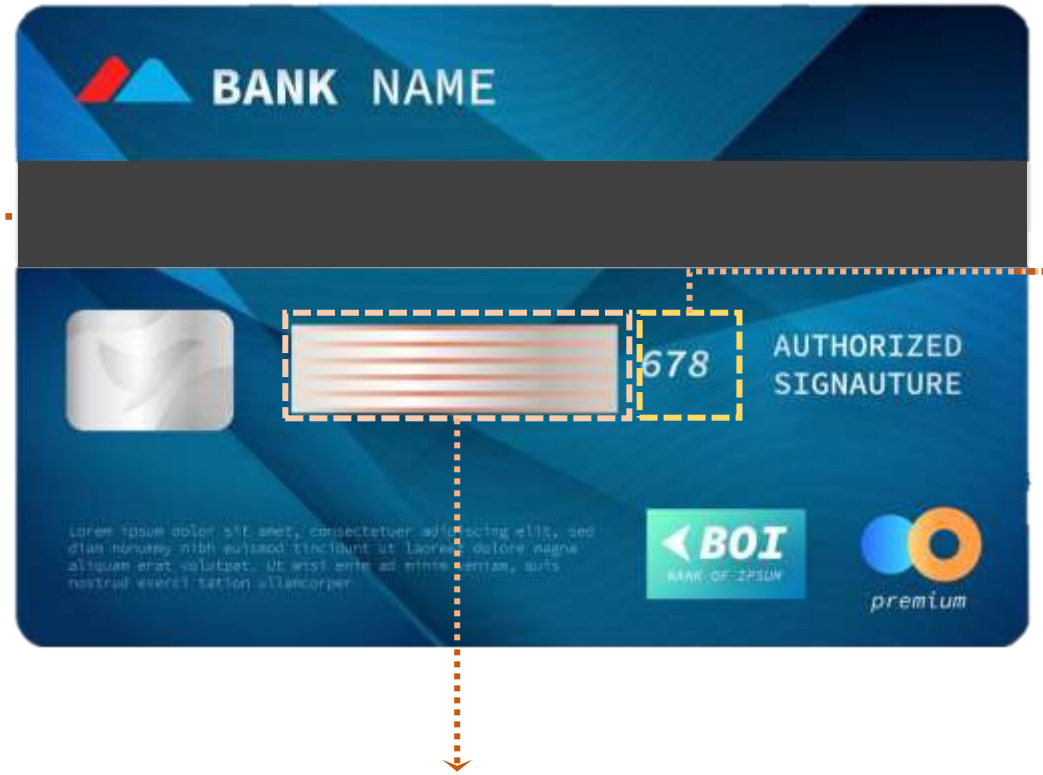
Specifies the requirements for the identification numbers used on payment cards, including the card number and expiration date

# EMV card structure

## Back side of EMV card

### Magnetic stripe

*The non-functional magnetic stripe provides a physical guide for the user to correctly insert the card into the terminal*




CVV2

Signature panel

# Tracks of magnetic stripe cards

# Tracks of magnetic stripe cards

## How the same data is made available on EMV chip cards?

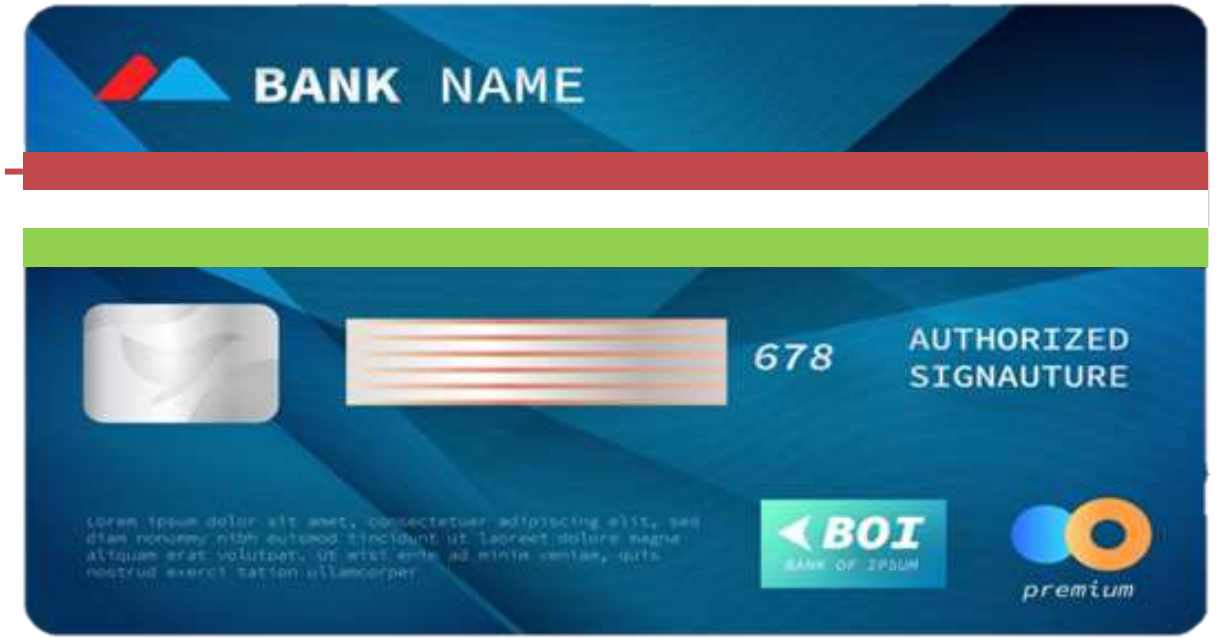

# Tracks of magnetic stripe cards


Stores information using magnetic fields of different strengths and polarities

The specifications of the tracks are based on ISO 7811

# Tracks of magnetic stripe cards

Track 1




Developed by IATA

Contains 79 read only character

- Cardholder name
- Account number
- Expiration date

Used for financial Transaction such as credit card purchases

The density of information stored in this track is 210 bpi

# EMV card structure

Track 2


Developed by American Bankers Association (ABA)

Contains up to 40 numeric read-only characters

- Account number
- Expiration date
- ~~Cardholder's name~~

Used for financial Transaction, most commonly debit card transactions

The density of information stored in this track is 75 bpi

# EMV card structure

Track 3


Developed by Thrift Savings Plan (TSP), for federal employees in the US

Less commonly used and not always present on Magstripe cards

It contains up to 107 numeric read-write characters

Mass transit systems, electronic toll collection systems, or other similar applications

# EMV card structure

Track 3


Developed by Thrift Savings Plan (TSP), for federal employees in the US

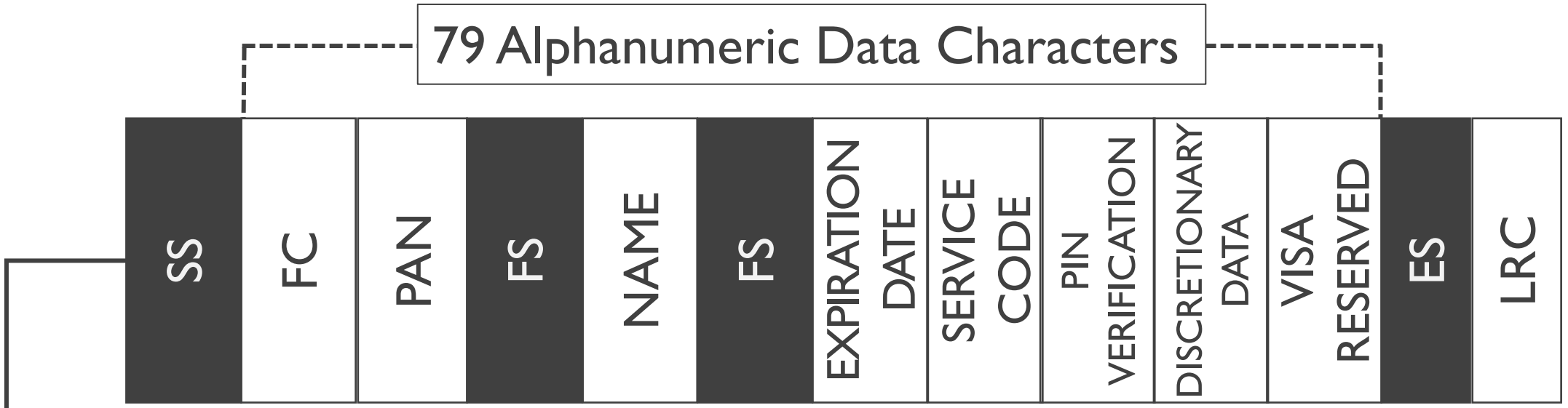
Read-write characters are data elements that can be updated or modified

Used to store dynamic information that may change over time

Density equivalent to Track 1, which is 210 bits per inch

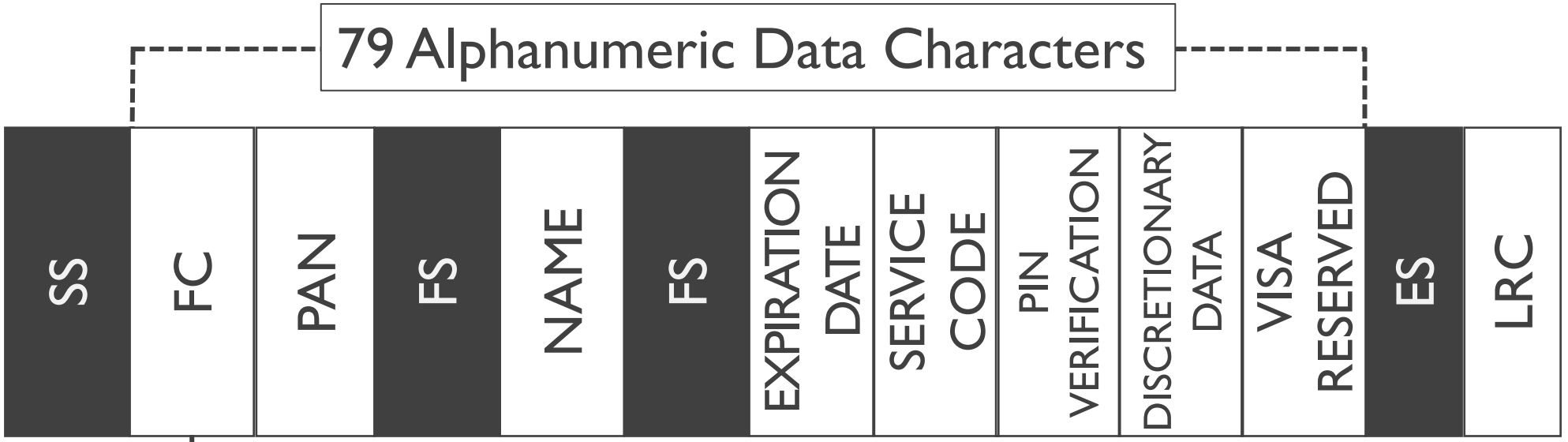
# Fields present in Track 1

# Fields present in Track 1



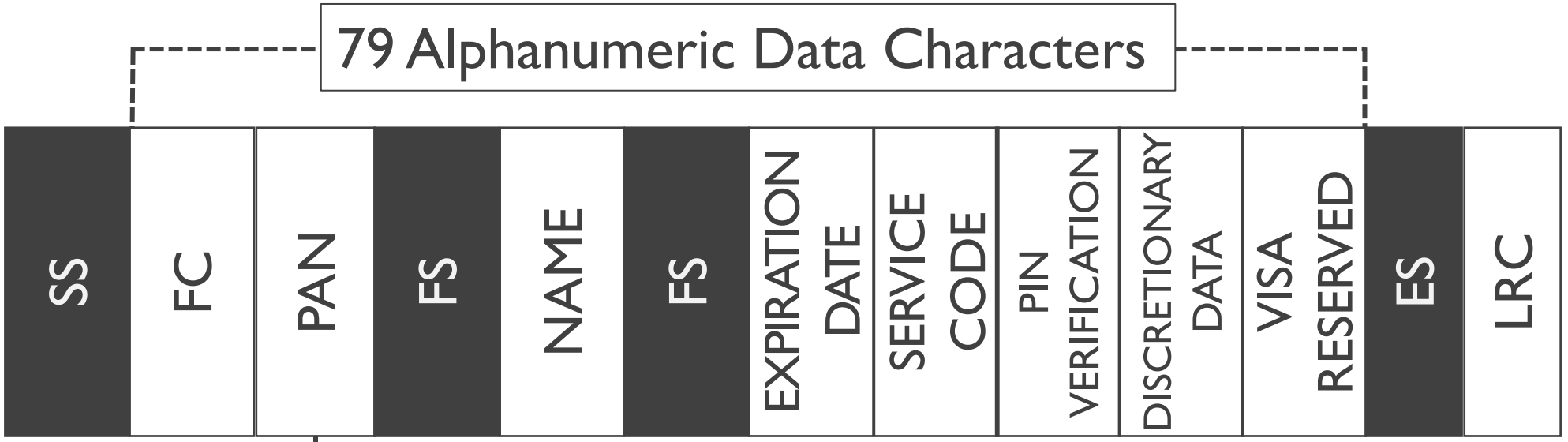

- The first field is Start Sentinel **(SS)**
- A unique character that marks the beginning of the Track 1 record
- It is typically a '%'

# Fields present in Track 1



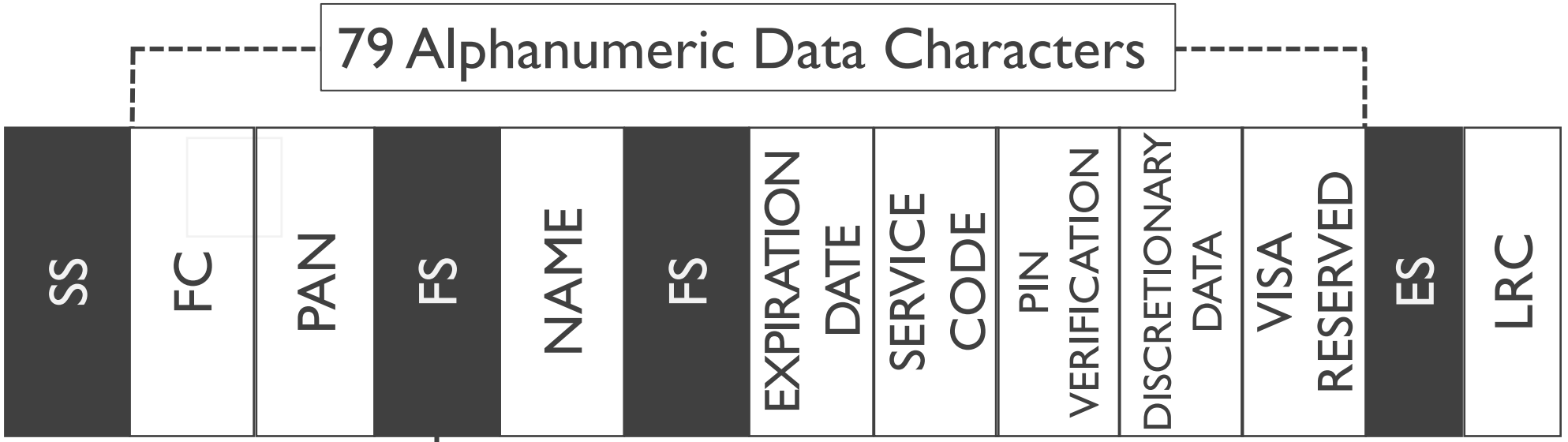

- We have the format code **(FC)**
- A digit that identifies the format of the track 1 record
- For most credit and debit cards, this is 'B'

# Fields present in Track 1



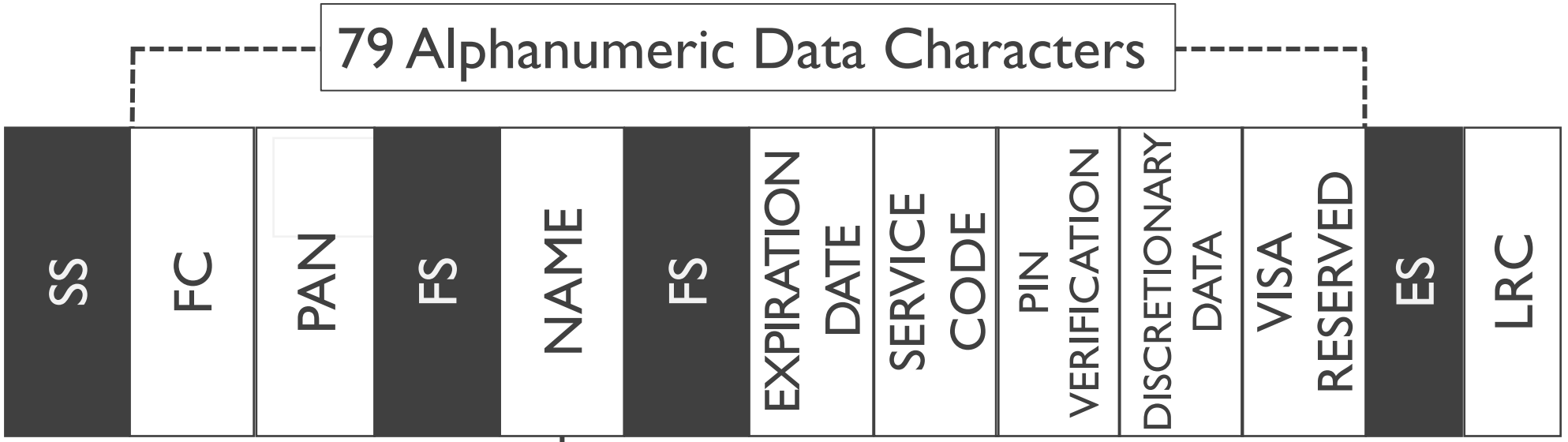

- Primary account number **(PAN)**
- A 16-digit card number that uniquely identifies the account

# Fields present in Track 1



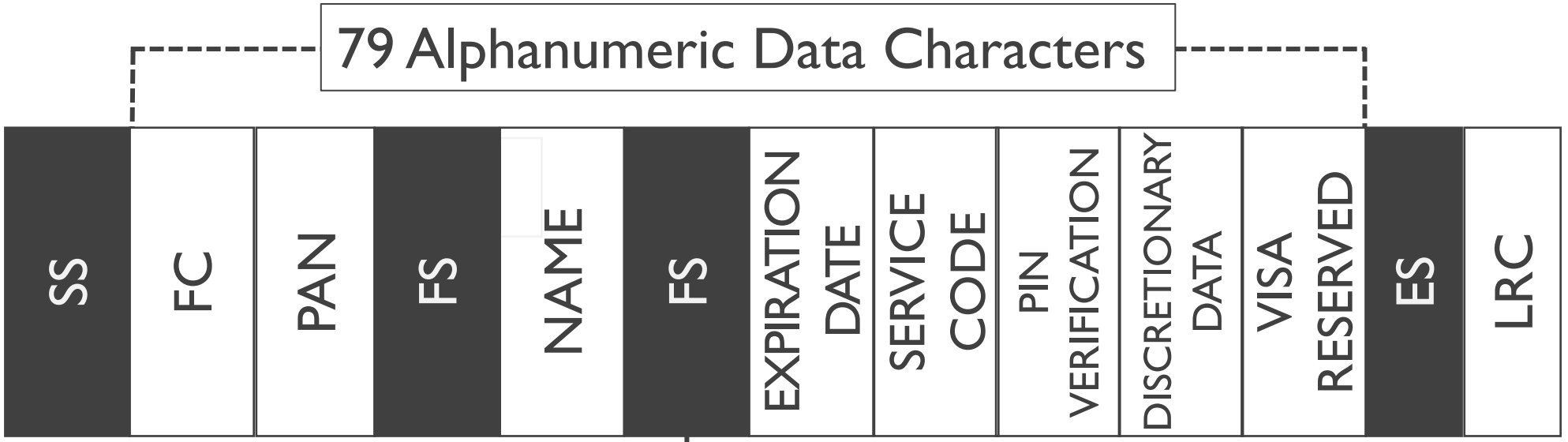

- Field separator **(FS)**
- A character that separates different fields of data in the Track 1 record
- For most cards, this is a '^'

# Fields present in Track 1



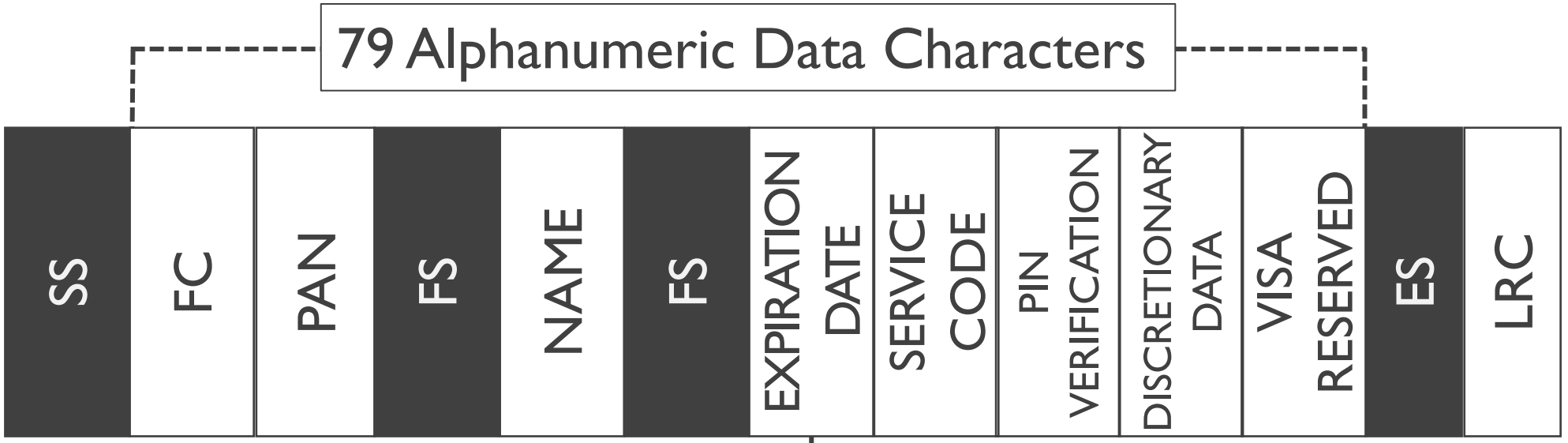

- Name of the cardholder **(NAME)**
- This is the name that is embossed on the front of the card
- It may contain 2 to 26 characters

# Fields present in Track 1



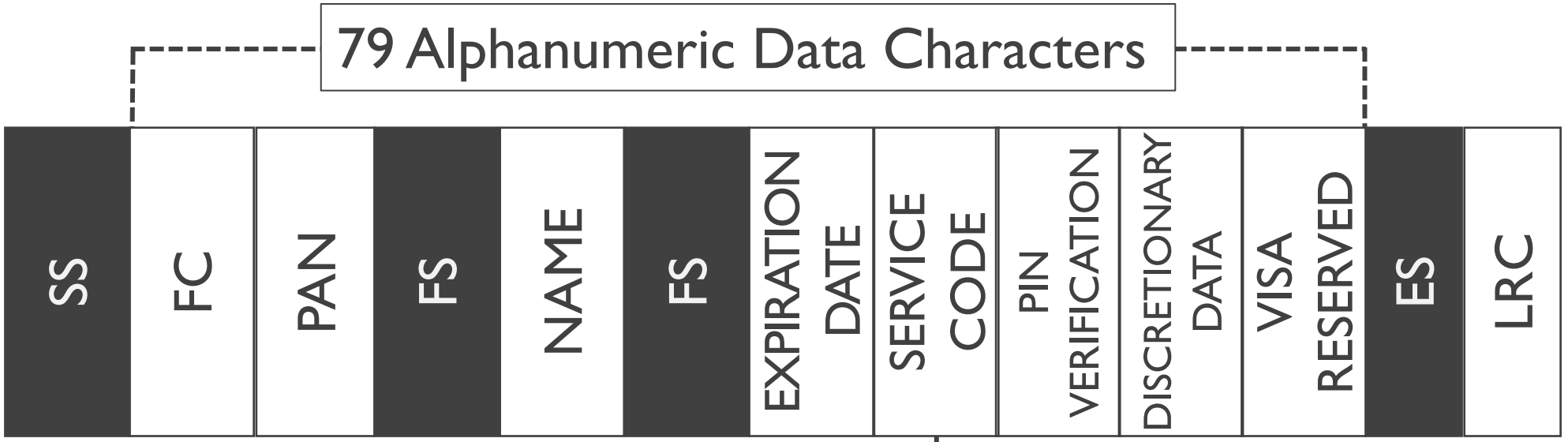

- Field separator **(FS)**
- Separator character separates the name field from the expiration date field
- This is typically a '^'

# Fields present in Track 1



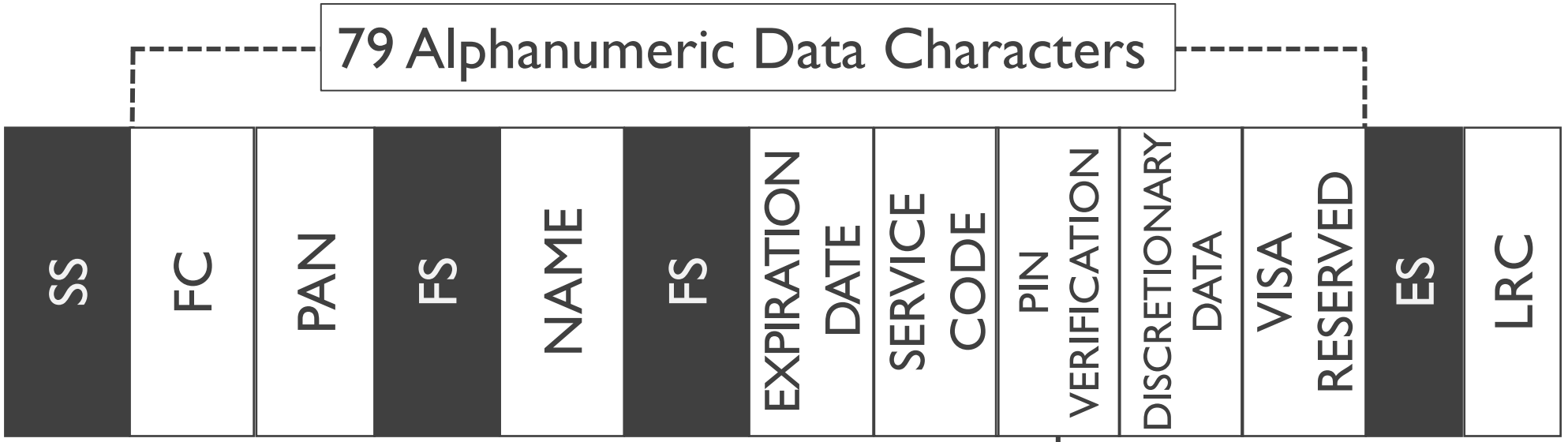

- Expiration date, the month and year when the card expires
- It is encoded as four digits in the format 'YYMM'

# Fields present in Track 1



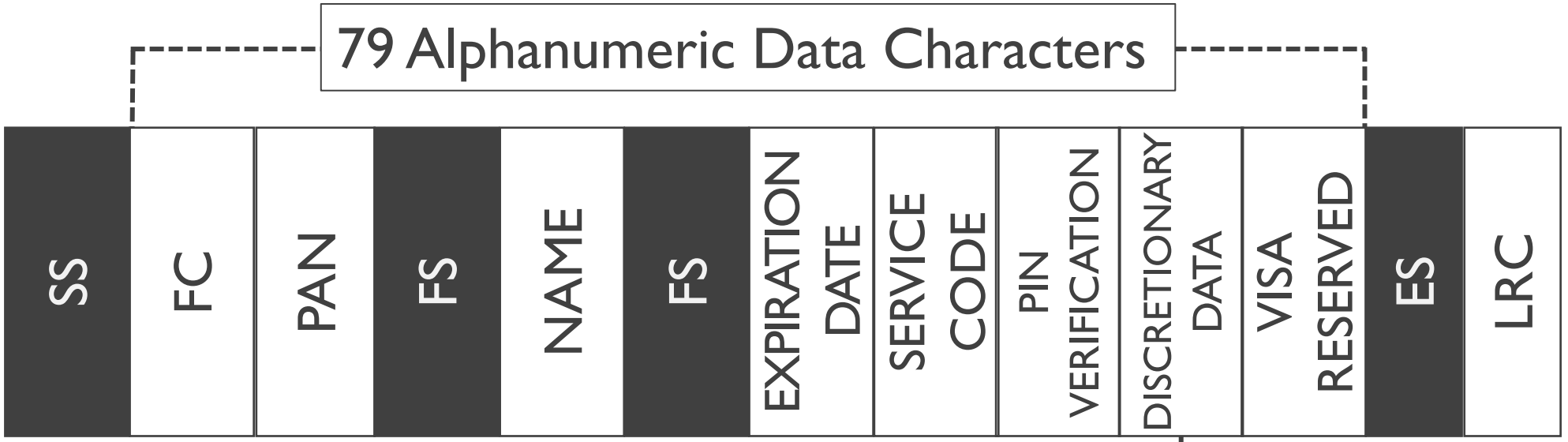

- A three-digit code that provides information about the services and features available on the card
    - National or international usage | Authorization processing Allowed services | Pin requirements

# Fields present in Track 1



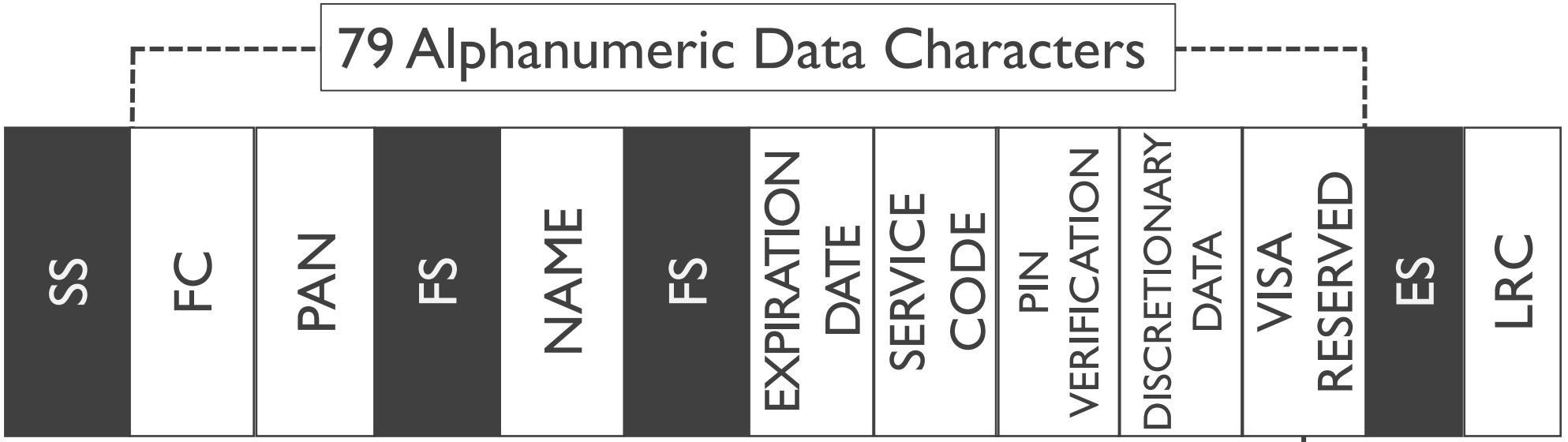

- PIN verification key index (PVKI) PIN verification value (PVV)
- The PVKI is a one-digit value that indicates the location of the cryptographic key used to encrypt the pin on the card
- The PVV is the encrypted pin value itself

# Fields present in Track 1



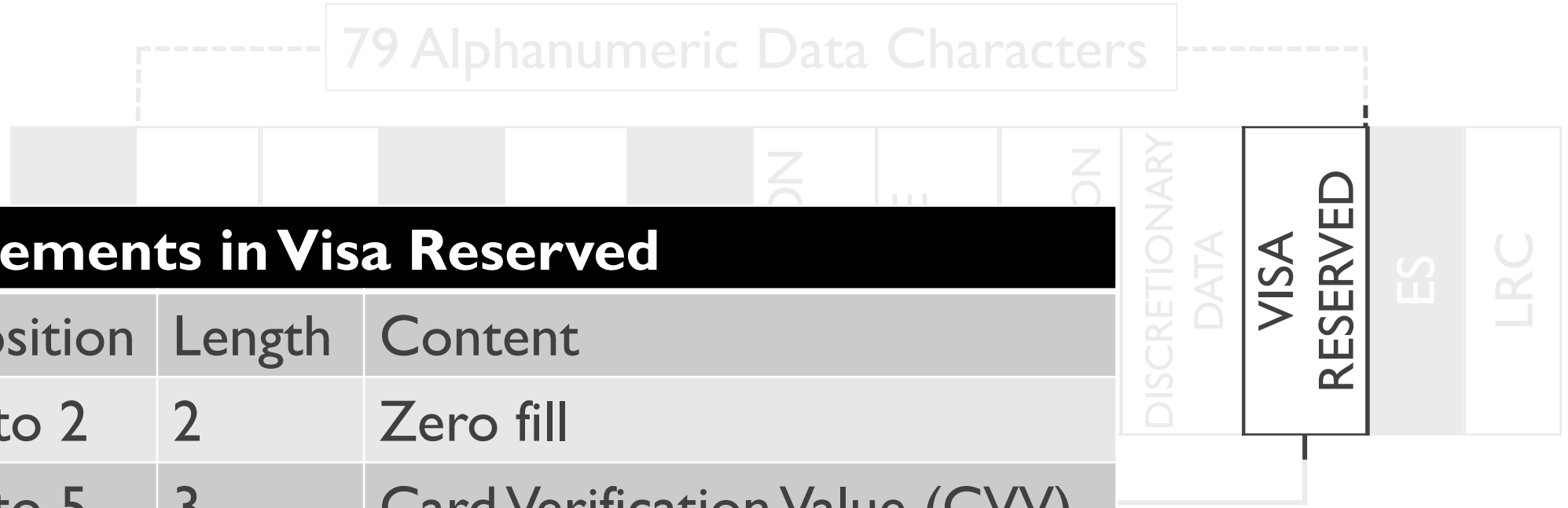

- It can contain additional information that the card issuer can include on the Track 1 record
- A country code or a proprietary code

# Fields present in Track 1




- It contains the Card Verification Value **(CVV)** and the Authorization Control Indicator **(ACI)**

# Fields present in Track 1

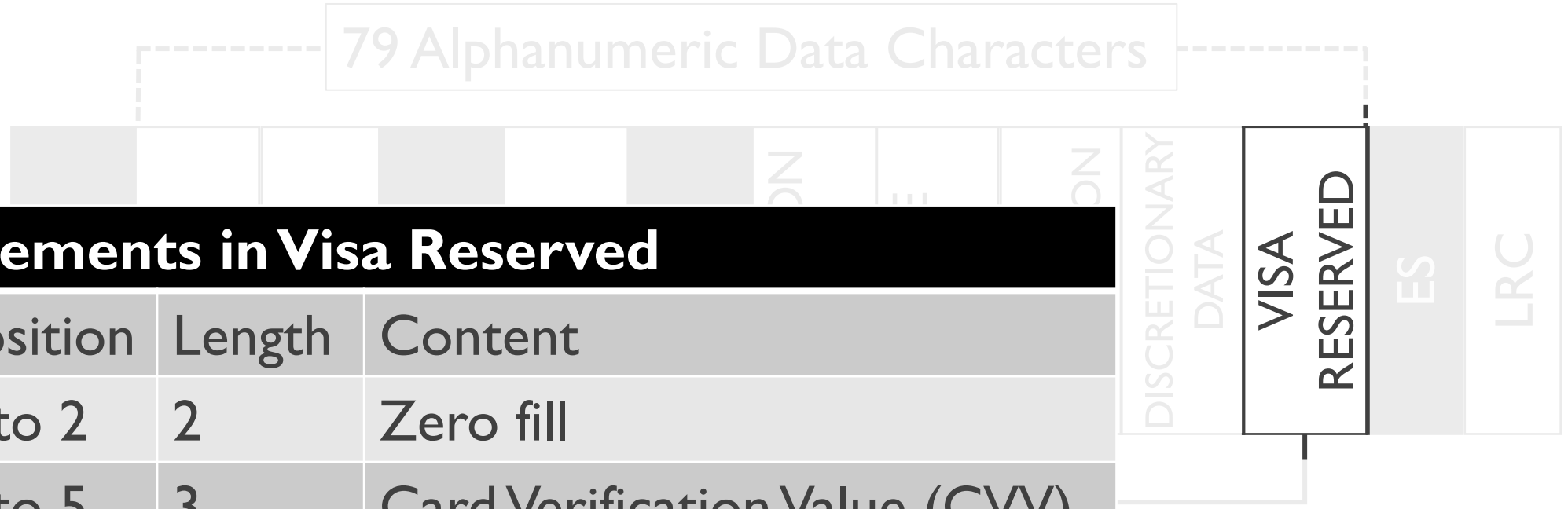



## Elements in Visa Reserved

| Position | Length | Content |
|---|---|---|
| 1 to 2 | 2 | Zero fill |
| 3 to 5 | 3 | Card Verification Value (CVV) |
| 6 to 7 | 2 | Zero fill |
| 8 | 1 | Authorization Control Indicator (ACI) **0** |
| 9 to 11 | 3 | Zero fill |

*International transactions are not allowed*

# Fields present in Track 1

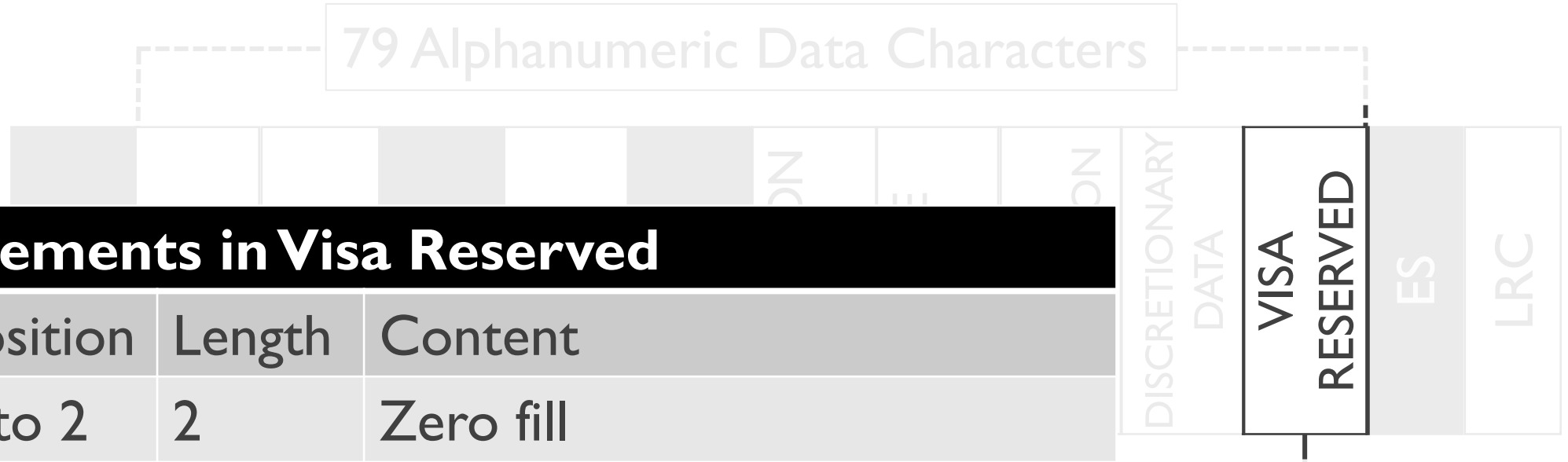



## Elements in Visa Reserved

| Position | Length | Content |
|---|---|---|
| 1 to 2 | 2 | Zero fill |
| 3 to 5 | 3 | Card Verification Value (CVV) |
| 6 to 7 | 2 | Zero fill |
| 8 | 1 | Authorization Control Indicator (ACI) **1** |
| 9 to 11 | 3 | Zero fill |

*International transactions are allowed*

# Fields present in Track 1

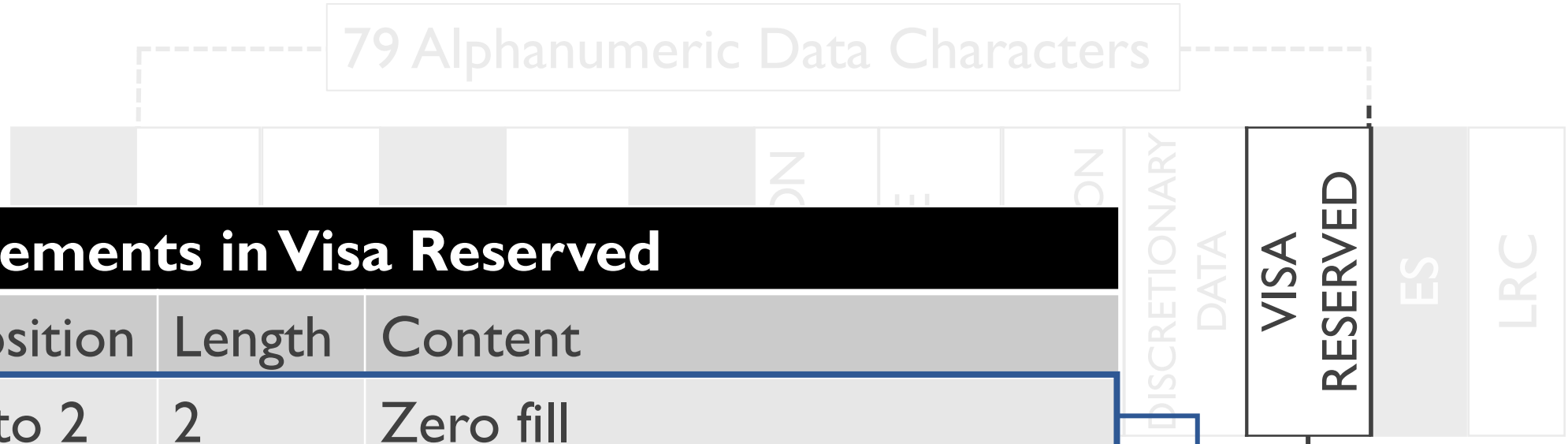



**Elements in Visa Reserved**

| Position | Length | Content |
|---|---|---|
| 1 to 2 | 2 | Zero fill |
| 3 to 5 | 3 | Card Verification Value (CVV) |
| 6 to 7 | 2 | Zero fill |
| 8 | 1 | Authorization Control Indicator (ACI) **2** |
| 9 to 11 | 3 | Zero fill |

*International transactions are allowed and the cardholder is verified by the issuer*

# Fields present in Track 1

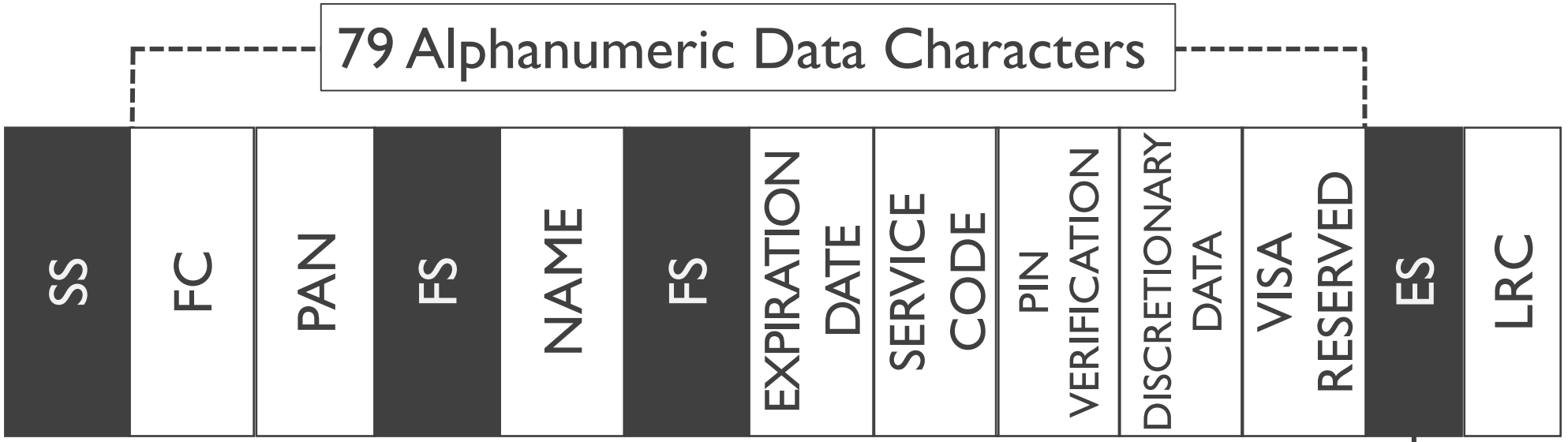



## Elements in Visa Reserved

| Position | Length | Content |
|---|---|---|
| 1 to 2 | 2 | Zero fill |
| 3 to 5 | 3 | Card Verification Value (CVV) |
| 6 to 7 | 2 | Zero fill |
| 8 | 1 | Authorization Control Indicator (ACI) |
| 9 to 11 | 3 | Zero fill |

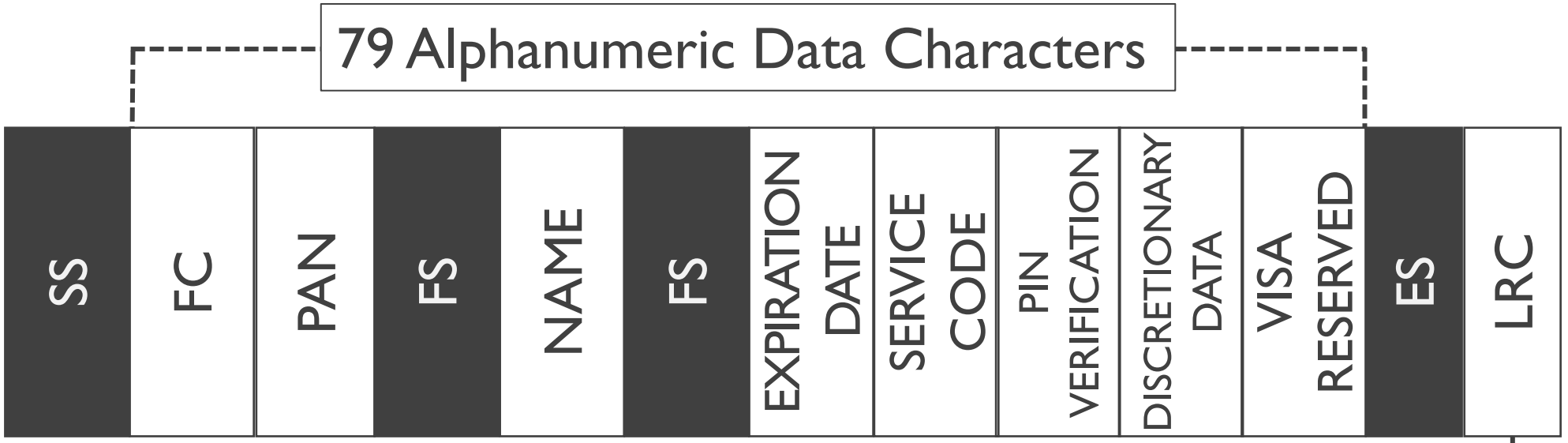
*Refers to the practice of filling unused spaces*

# Fields present in Track 1




- End sentinel **(ES)**
- A unique character that marks the end of the Track 1 record.
- It is typically a '?'

# Fields present in Track 1




- Longitudinal redundancy check (LRC)
- A simple error-checking mechanism used to ensure that the data stored in the magnetic stripe is accurate

# Fields present in Track 1

79 Alphanumeric Data Characters


**Recalculated LRC**

***Recalculated*** *using the same algorithm at the terminal*

=

**LRC in field 13**

*Calculated using a* ***specific algorithm*** *applied to the* ***12 fields***

# Test Your Knowledge!

Which of the following fields present in Track 1 of the magnetic stripe is absent in Track 2

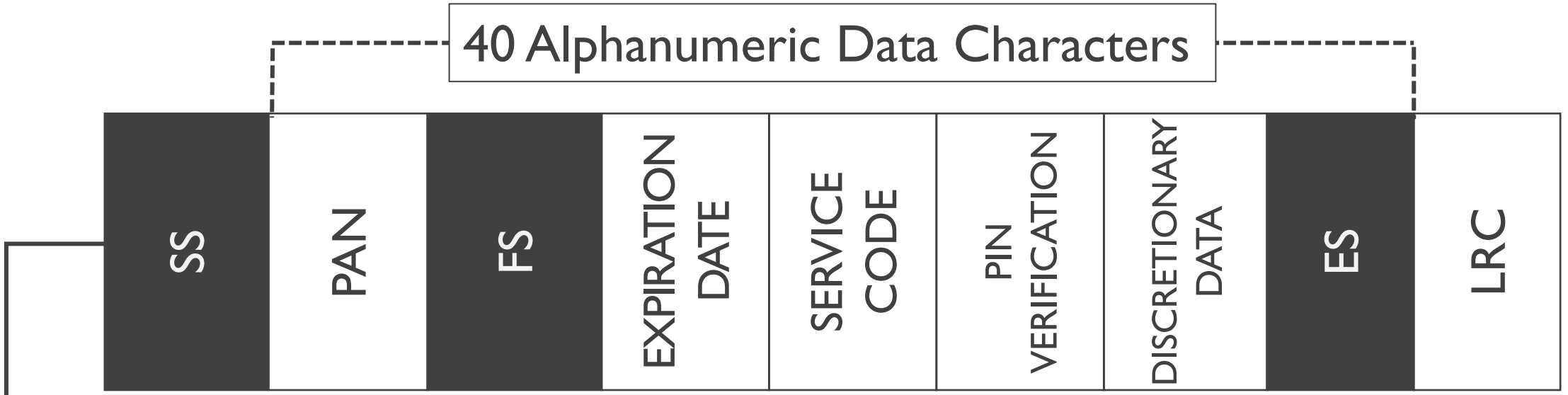
1. Cardholder's name
2. Expiration date

# Fields present in Track 2

# Fields present in Track 2

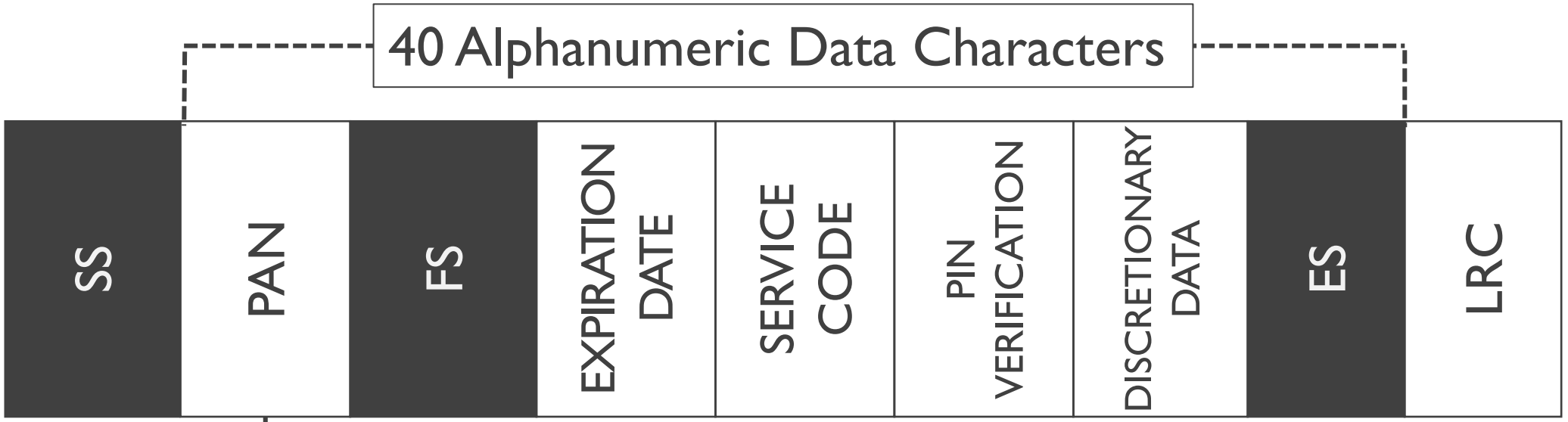
| Field | Field name | Length |
|---|---|---|
| 1 | Start Sentinel | 1 |
| 2 | Primary account number (PAN) | 12-19 |
| 3 | Separator | 1 |
| 4 | Expiration date | 4 |
| 5 | Service code | 3 |
| 6 | Pin verification data | 0 or 5 |
| 7 | Discretionary data | Varies |
| 8 | End sentinel | |
| 9 | Longitudinal Redundancy Check (LRC) | 1 |

# Fields present in Track 2



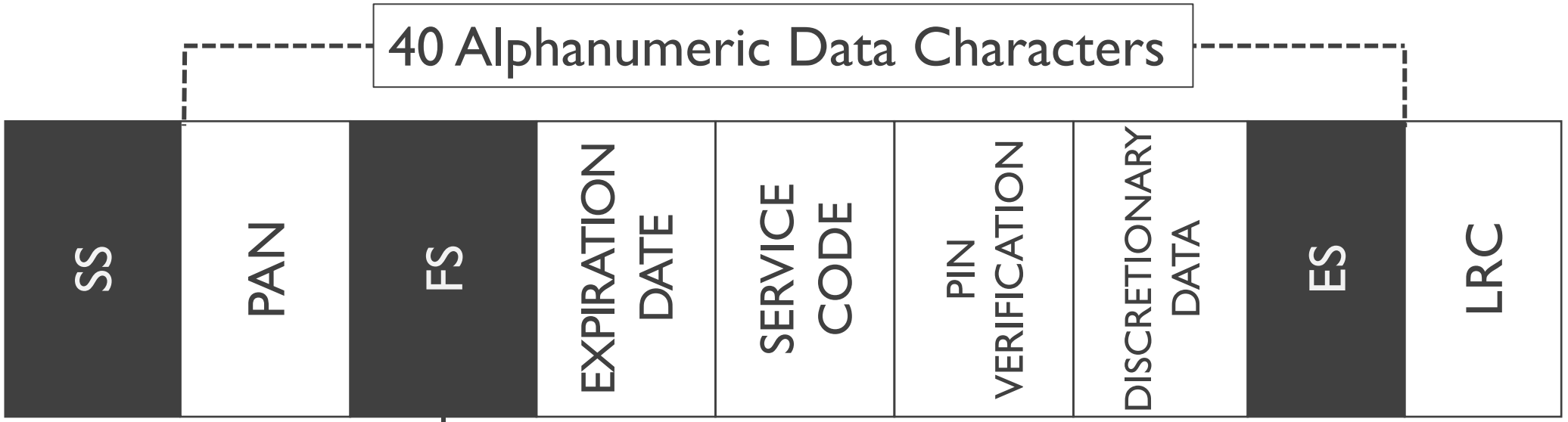

- The first field is Start Sentinel **(SS)**
- This is a unique character that identifies the beginning of the track

# Fields present in Track 2



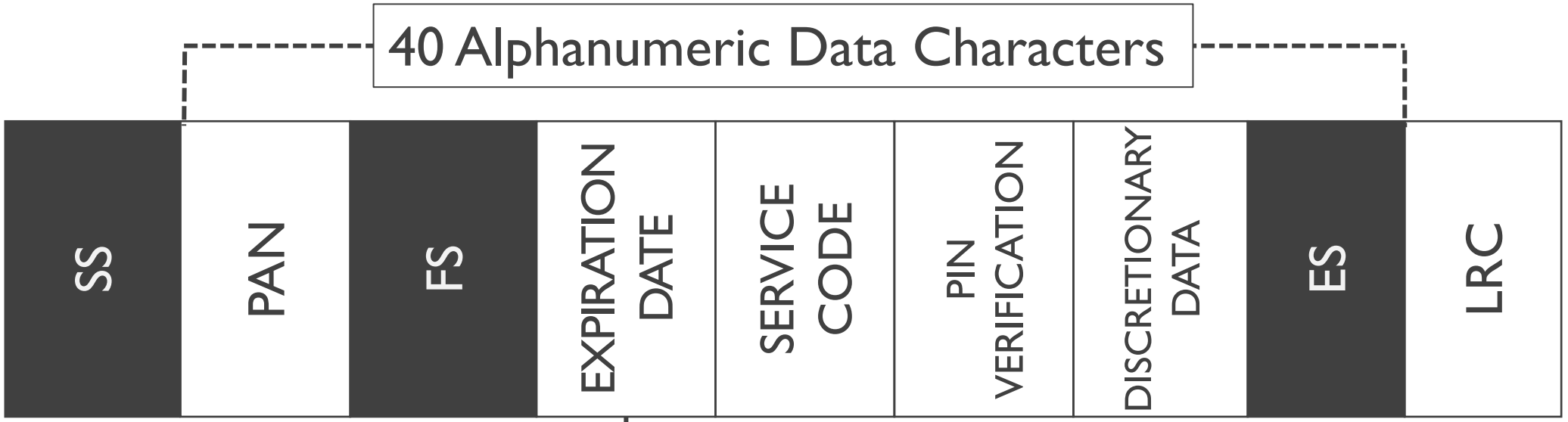

- In the following field, we have the primary account number (PAN)

# Fields present in Track 2



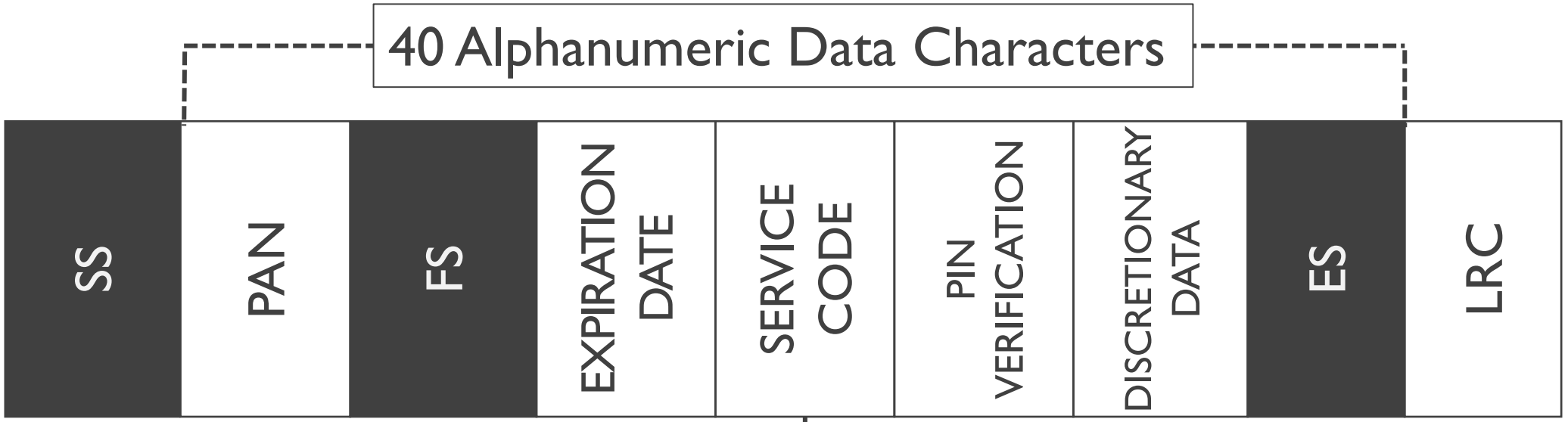

- Field separator, which separates the PAN from the other data

# Fields present in Track 2




- Then the expiration date is the date when the card expires, in the format YYMM

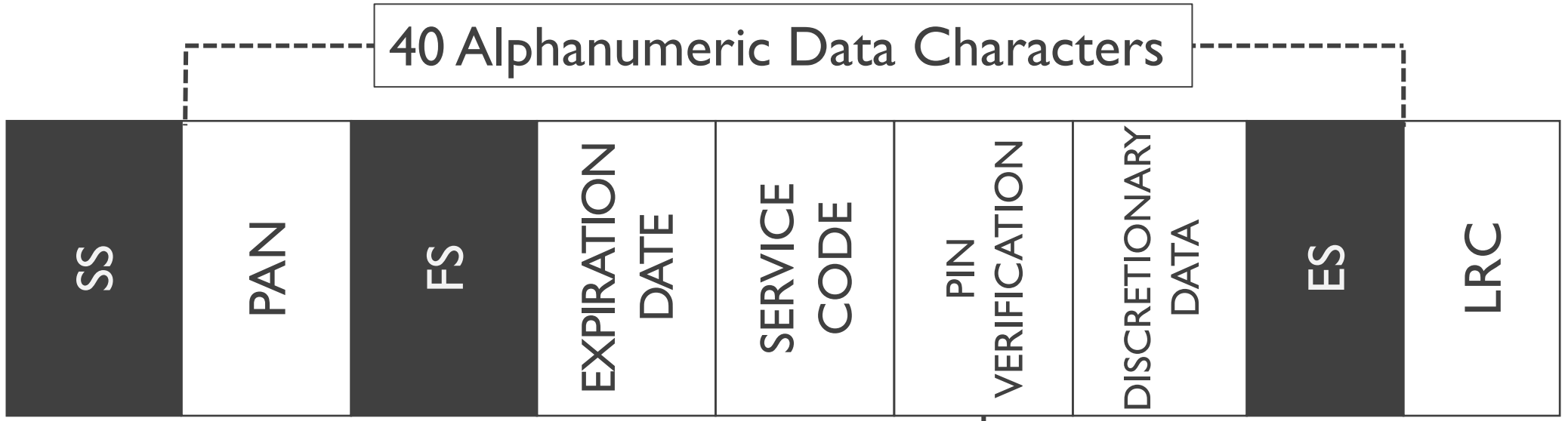
# Fields present in Track 2




- A three-digit code that provides information about the services and features available on the card

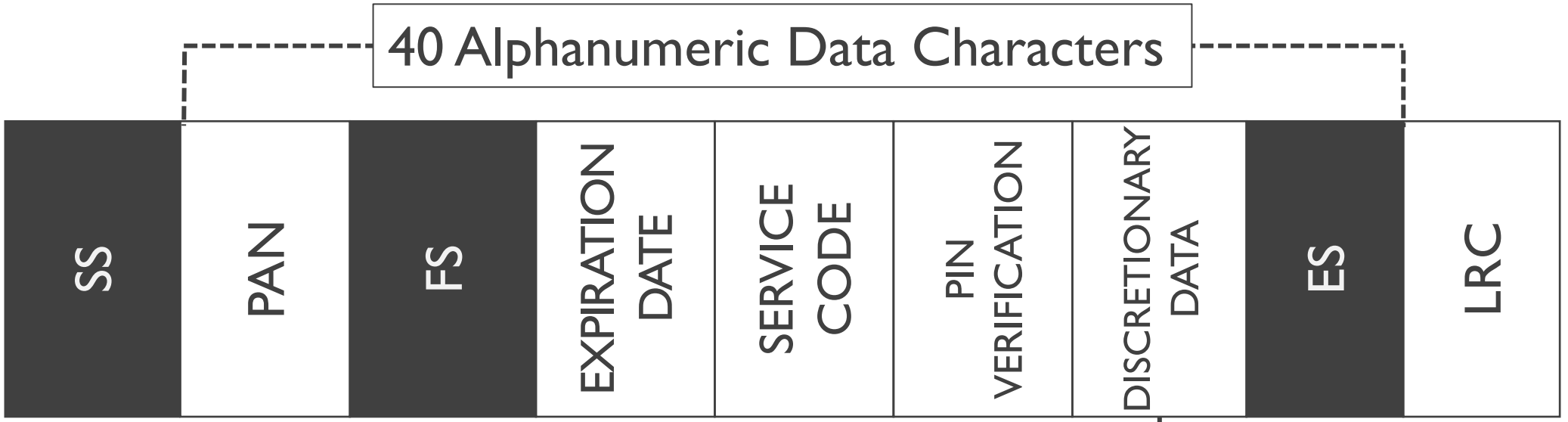
| | |
|---|---|
| National or international usage | Authorization processing |
| Allowed services | Pin requirements |

# Fields present in Track 2



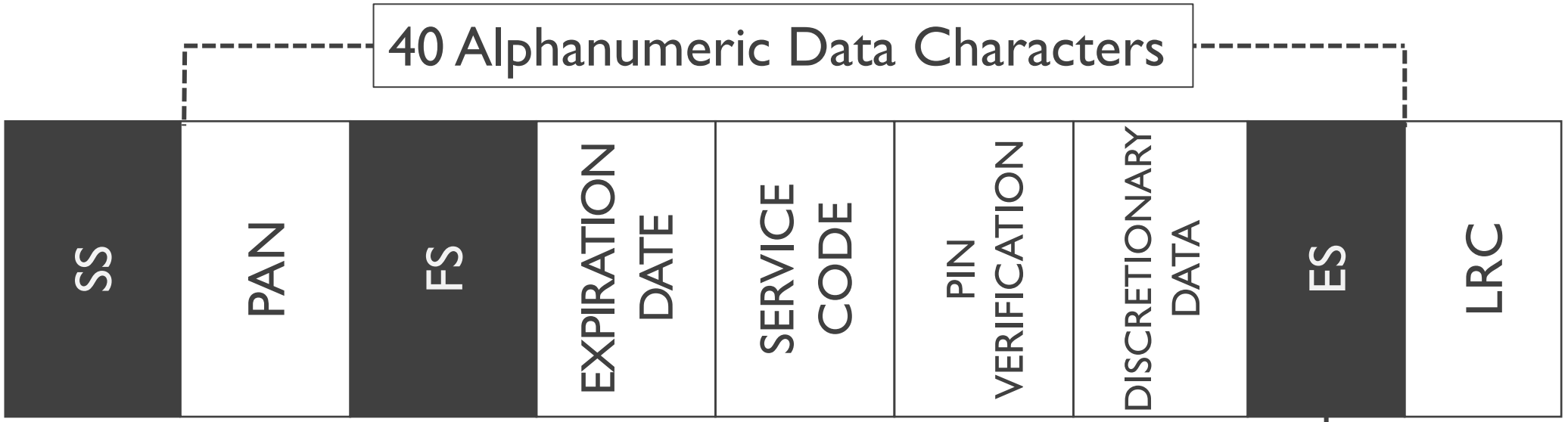

- This field contains the pin verification data, similar to Track 1

# Fields present in Track 2



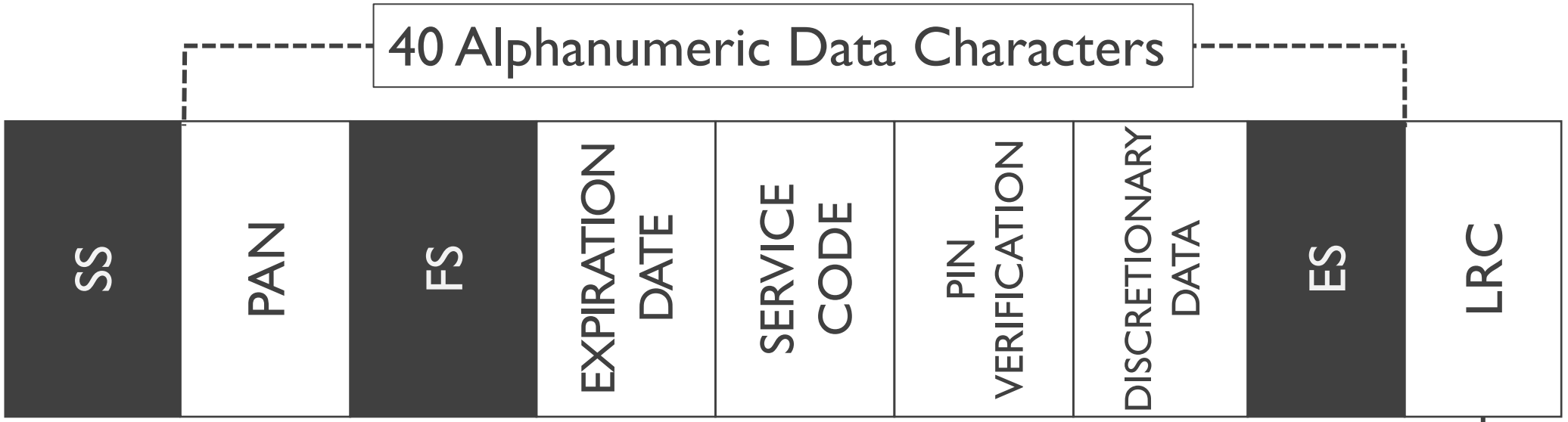

- It contains optional data that may include additional information

# Fields present in Track 2




- This is a unique character that identifies the end of the track.

# Fields present in Track 2




- A one-byte error detection code that helps ensure the accuracy of the data on the track.

# Fields present in Track 2

*Why both tracks have* ***identical data?***

*Track 2 has fewer fields so it is read first , both have same data for* ***backup mechanism***

# Track 3 record format

*Another track that is less commonly used in the card industry is Track 3*

This tract has read-write ability

It is 210 bytes per inch, with room for 107 numeric digits

## Track 3 is used to store

- Enciphered PIN,
- Country code,
- Currency units,
- Amount authorized,
- Subsidiary account information,
- Other account restrictions

# Track 3 record format

Track 3 has the same properties as track 1

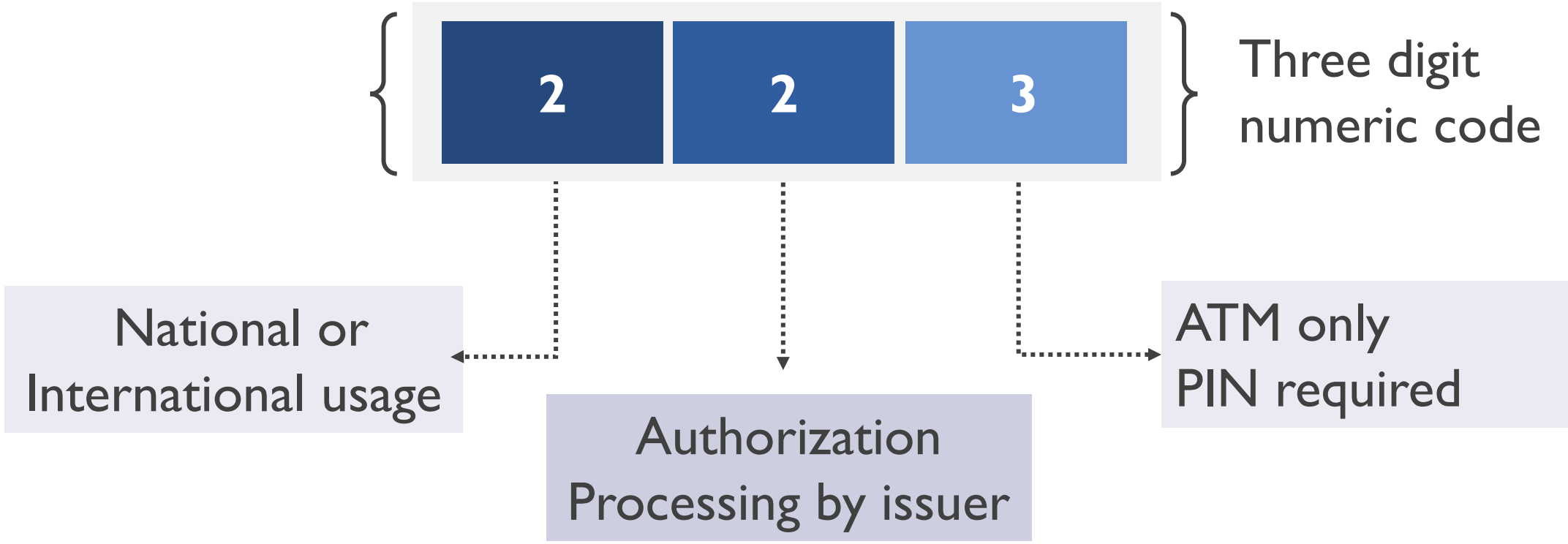
But there is no standard for the data content or format

Currently it is not used by any national bank card issuer

# Field- Service code

## Service code example

A three-digit code that provides information about the services and features available on the card



# Fields present in Track 1

| Value | Position 1 | | Position 2 | Position 3 | |
|---|---|---|---|---|---|
| | Interchange | Technology | Authorization | Service | Pin |
| 0 | - | - | Normal | No restriction | Required |
| 1 | International | - | - | No restriction | - |
| 2 | International | Integrated circuit | Issuer | Goods and service only | - |
| 3 | - | - | - | ATM only | Required |
| 4 | - | - | By issuer, unless explicit bilateral agreement applies | Cash only | - |

# Field: Service code

| Value | Position 1 | | Position 2 | Position 3 | |
|---|---|---|---|---|---|
| | Interchange | Technology | Authorization | Service | Pin |
| 5 | National | - | - | Goods and service only | Required |
| 6 | National | Integrated circuit | - | No restriction | Prompt for pin if PED IS 9 |
| 7 | Private | - | - | Goods and service only | Prompt for pin if PED IS 9 |
| 8 | - | - | - | | |
| 9 | Test | - | - | - | - |

# Fields present in Track 1

| Value | Position 1 | | Position 2 | Position 3 | |
|---|---|---|---|---|---|
| | Interchange | Technology | Authorization | Service | Pin |
| 0 | - | - | Normal | No restriction | Required |
| 1 | International | - | - | No restriction | - |
| 2 | International | Integrated circuit | Issuer | Goods and service only | - |
| 3 | - | - | - | ATM only | Required |
| 4 | - | - | By issuer, unless explicit bilateral agreement applies | Cash only | - |

# Fields present in Track 1

| Value | Position 1 | | Position 2 | Position 3 | |
|---|---|---|---|---|---|
| | Interchange | Technology | Authorization | Service | Pin |
| 0 | - | - | Normal | No restriction | Required |
| 1 | International | - | - | No restriction | - |
| 2 | International | Integrated circuit | Issuer | Goods and service only | - |
| 3 | - | - | - | ATM only | Required |
| 4 | - | - | By issuer, unless explicit bilateral agreement applies | Cash only | - |

# Field: Service code

| Value | Position 1 | | Position 2 | Position 3 | |
|---|---|---|---|---|---|
| | Interchange | Technology | Authorization | Service | Pin |
| 5 | National | - | - | Goods and service only | Required |
| 6 | National | Integrated circuit | - | No restriction | Prompt for pin if PED IS 9 |
| 7 | Private | - | - | Goods and service only | Prompt for pin if PED IS 9 |
| 8 | - | - | - | | |
| 9 | Test | - | - | - | - |

# Test Your Knowledge!

What does it mean if the service code of a card is found to be 206?

1. International chip card with normal authorization processing, and terminal must prompt for a PIN if a pin entry device is present
2. National chip card with normal authorization processing and PIN is required