

Excellent! Let's now go **in-depth into CTQ (Card Transaction Qualifiers)** — the counterpart to TTQ — which plays a **vital role in EMV contactless transactions**.

◆ What is CTQ?

- **Tag:** 9F6C
- **Length:** 2 bytes (16 bits)
- **Format:** Binary
- **Direction:** Card → Terminal
- **Purpose:** Tells the terminal what the **card supports or requires**, in response to the terminal's capabilities (TTQ).

You can think of CTQ as the **card's response** to the terminal's TTQ:

"Given what you (terminal) can do, here's how I want the transaction to proceed."

◆ When is CTQ used?

- **During GET PROCESSING OPTIONS (GPO):**
 - Terminal sends TTQ inside PDOL (Processing Data Object List).
 - Card responds with AIP and CTQ.
 - Terminal uses CTQ + AIP to:
 - Determine **contactless mode** (EMV or magstripe)
 - Determine **CVM path**
 - Decide **online/offline flow**
 - Set up the correct processing path.

◆ CTQ Bit Structure (2 Bytes = 16 Bits)

Let's break down CTQ byte-by-byte.

■ Byte 1 – Contactless Mode & CVM

Bit Meaning

- 8 **EMV contactless supported**
- 7 **Magstripe mode supported**
- 6 **Online PIN supported**
- 5 **Signature supported**
- 4 **No CVM supported**
- 3 **CDCVM supported (Consumer Device CVM)**
- 2 **Online cryptogram supported if no CVM**
- 1 **EMV mode supported if no CVM**

These bits help terminal choose:

- Contactless mode: EMV vs magstripe
- CVM path: PIN, signature, no CVM, CDCVM
- Whether online-only with no CVM is allowed

Byte 2 – Card Risk Control / Transaction Types

Bit Meaning

- 8 **Online cryptogram required** (regardless of CVM result)
- 7 **Contact chip fallback allowed**
- 6 **Issuer script processing supported**
- 5 **Mobile device transaction (tap to phone)**
- 4 **Deferred authorization allowed**
- 3 Reserved
- 2 Reserved
- 1 Reserved

💡 Note: Some bits are scheme-specific (e.g., Mastercard vs Visa), and not all cards use all bits.

◆ Example CTQ Breakdown

Let's say:

makefile





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CTQ = E0 90




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11100000 10010000

Byte 1: E0 = 11100000

- Bit 8:  EMV contactless supported
- Bit 7:  Magstripe supported
- Bit 6:  Online PIN supported
- Bit 5–1:  No support for other CVMs

Byte 2: 90 = 10010000

- Bit 8:  Online cryptogram required
- Bit 5:  Mobile device transaction
- Bit 7–6, 4–1:  Not supported

Meaning:

- Card supports both EMV and magstripe contactless.
- Requires online cryptogram (i.e., must go online).
- Transaction was likely initiated via a mobile wallet.
- Only online PIN allowed; no signature or no-CVM.

◆ CTQ vs TTQ Summary Table

Feature	TTQ (Terminal)	CTQ (Card)
Who sends it?	Terminal	Card

Feature	TTQ (Terminal)	CTQ (Card)
Format	Tag 9F66 – 4 bytes	Tag 9F6C – 2 bytes
Sent during	GPO (in PDOL)	GPO response
Purpose	Terminal's capabilities	Card's supported modes based on TTQ
Influences	What the terminal <i>asks</i> for	What the card <i>allows</i>
Helps decide	Mode, CVM, flow path	Final mode, CVM, online/offline

◆ How TTQ & CTQ Work Together

Terminal says via TTQ:

"I support EMV mode, magstripe fallback, online and offline PIN, and no CVM."

Card replies via CTQ:

"Great, I allow EMV mode, but I only support online PIN and I require online cryptogram."

✓ The final transaction will:

- Use EMV mode
 - Require online PIN entry
 - Force online authorization
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◆ CTQ & AIP Together

Along with CTQ, the **AIP (Application Interchange Profile)** — Tag 82 — is also returned in the GPO response and indicates:

- Card supports SDA/DDA/CDA
- Card supports offline data auth
- Card supports offline risk management
- Card supports issuer authentication

So:

- **CTQ + AIP + TTQ** = final decision matrix for contactless EMV.
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◆ CTQ in Logs

In transaction logs, you'll often see:

objectivec

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9F66 (TTQ): E0 20 C0 00

9F6C (CTQ): E0 90

Then the log might say:

yaml

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→ Mode: EMV

→ CVM: Online PIN

→ Online Authorization Required: Yes

That comes directly from interpreting TTQ/CTQ combo.

◆ What Happens If CTQ & TTQ Don't Align?

- If **CTQ doesn't support EMV mode**, but TTQ asks for it → card may fallback to magstripe.
- If **CTQ requires online**, but terminal can't go online → transaction **declined**.
- If **no matching CVM method**, card may decline or fallback to No CVM.

← Summary

Key Point	Details
Tag	9F6C
Length	2 bytes
Direction	Card → Terminal
Used in	GPO response
Works with	TTQ, AIP

Key Point	Details
Determines	Final mode (EMV/Magstripe), CVM, Online requirement
Common CVMs in CTQ	Online PIN, Signature, No CVM, CDCVM
Risk control	Online required, fallback allowed, deferred auth supported