Cboe Titanium US Options Timestamping Service Specification

Version 1.0.7

March 18, 2026

Contents

Introduction

Cboe Timestamping Service is offered for selected Cboe Options markets to provide timestamp information for orders, quotes, and cancels to market participants. Timestamping Service reports will provide numerous timestamps relating to the message lifecycle throughout the exchange system. This document describes the format, specifications, and content of the Cboe Timestamping Service across three reports – Missed Liquidity Report, Missed Cancels Report, and All Cancels Report. All content is subject to change.

Reports and Availability

Cboe Timestamping Service reports will only be available for Production traffic. No Certification reports will be generated.

Each report will be made available at the times indicated below on a best-efforts basis. These times are presented as a guide and are not intended to constitute a definitive SLA. All times listed below are in the local market time.

FILE	DESCRIPTION	TIME AVAILABLE
Missed Liquidity Report	A report showing order and quote messages for a firm where the firm sent an order or quote within defined time window (-50 μs to + 500 μs) of the network discovery time of the aggressor who executed a resting order or quote or competitive auction (e.g. SUM).	5:00 p.m., T+1
Missed Cancels Report	A report showing cancel messages for a firm where at least one cancel was sent within defined time window (-50 μs to + 500 μs) of the network discovery time of the aggressor who executed resting order or quote belonging to the subscriber.	5:00 p.m., T+1
All Cancels Report	A report showing all cancel-related messages, regardless of outcome. This includes successful cancels, missed cancels, and any other cancel-related interactions relevant for latency analysis.	5:00 p.m., T+1

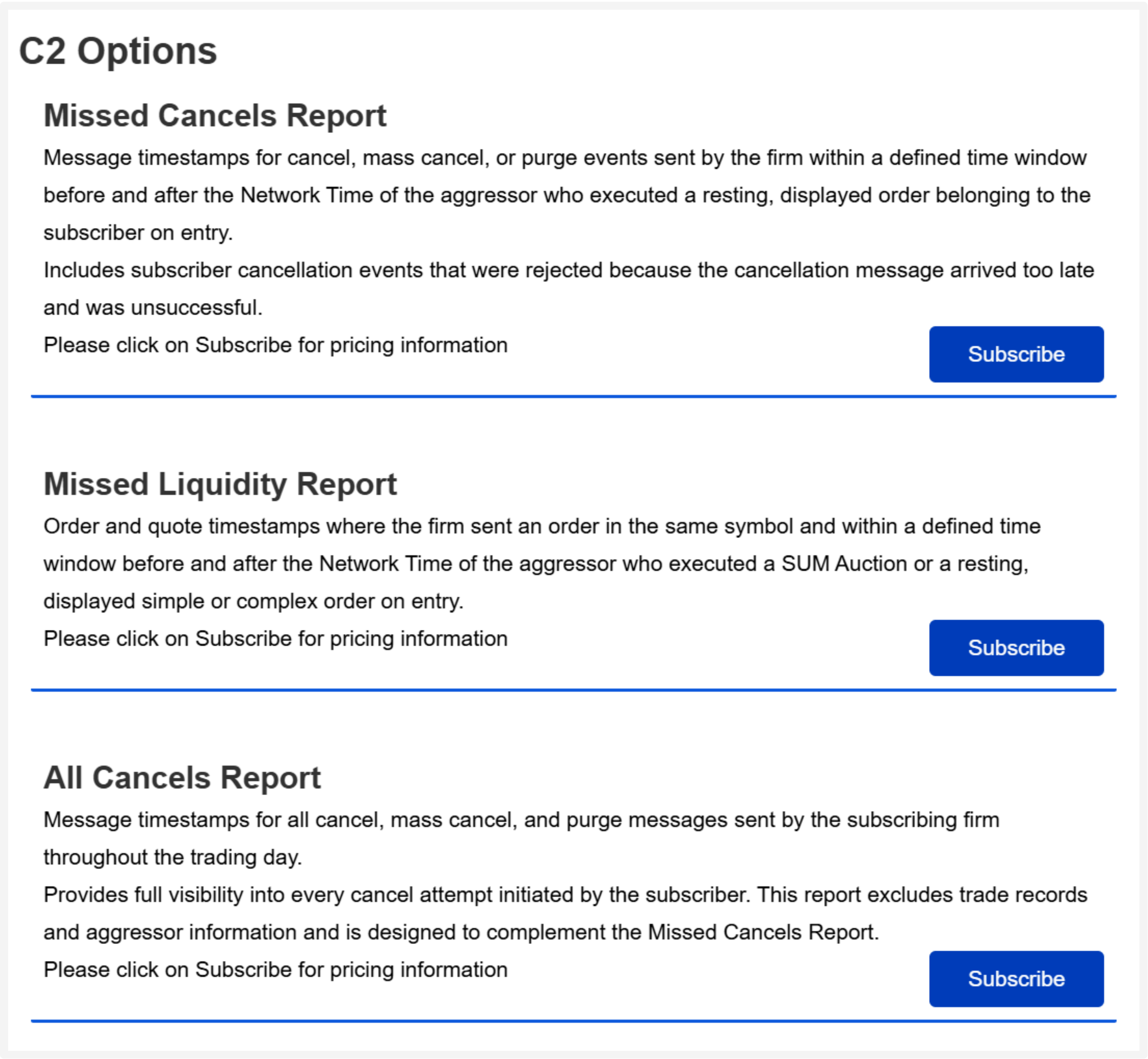
Report Retrieval

Customer Web Portal

The Missed Liquidity Report, Missed Cancels Report, and All Cancels Report files are available to subscribers only. As a result, only users with a Customer Web Portal account that is associated with a specific subscriber Firm will be provided with the ability to download these files. Reports going back three months from the current date will be available for download.

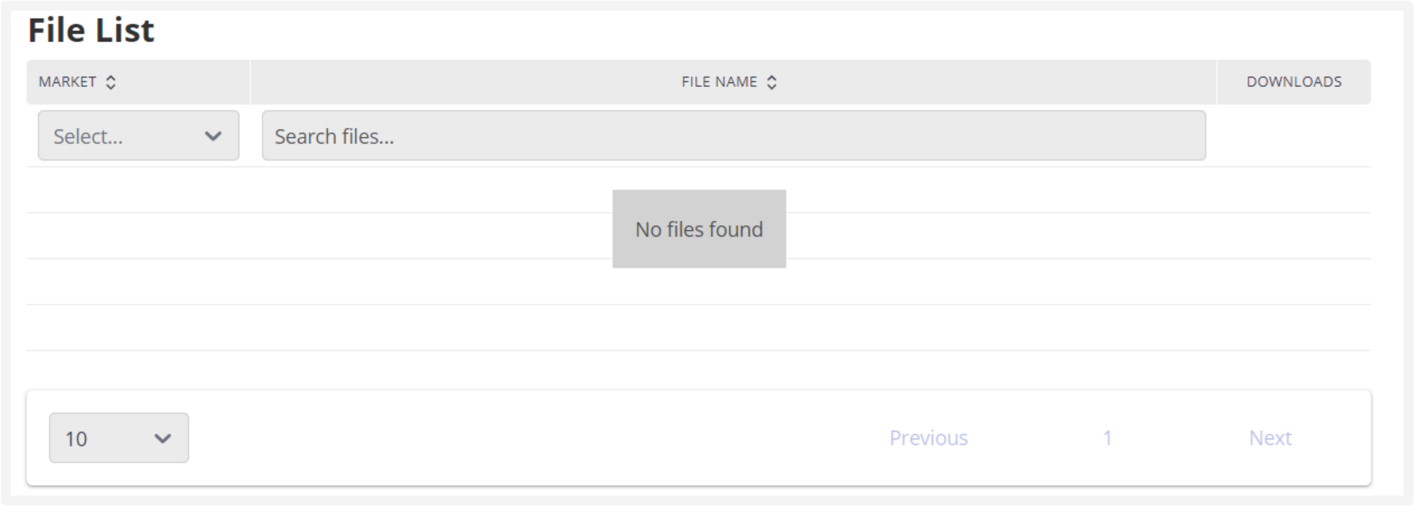
Report subscriptions are made using the Report Subscriptions application.

Figure 1. Reports



Reports will be delivered in the File List area at the bottom of the application on a T+1 basis on or prior to 5 p.m. local market time.

Figure 2. File List



Order Entry Architecture Timestamps

Timestamps included in the reports will depend upon which order entry protocol and architecture is being used to send messages as defined below.

Cboe endeavors to capture and include all available timestamps but does not guarantee 100% coverage of timestamps on all messages. Reasons why timestamps may not be captured include internal Cboe drops, lack of unique message identifiers or missing identifiers from customers, or other customer behavior that results in unusual or missing timestamps (e.g. customer retransmissions or incorrect TCP checksums).

Figure 3. Cboe Timestamping Service Architecture Diagram: C1, C2, EDGX Options

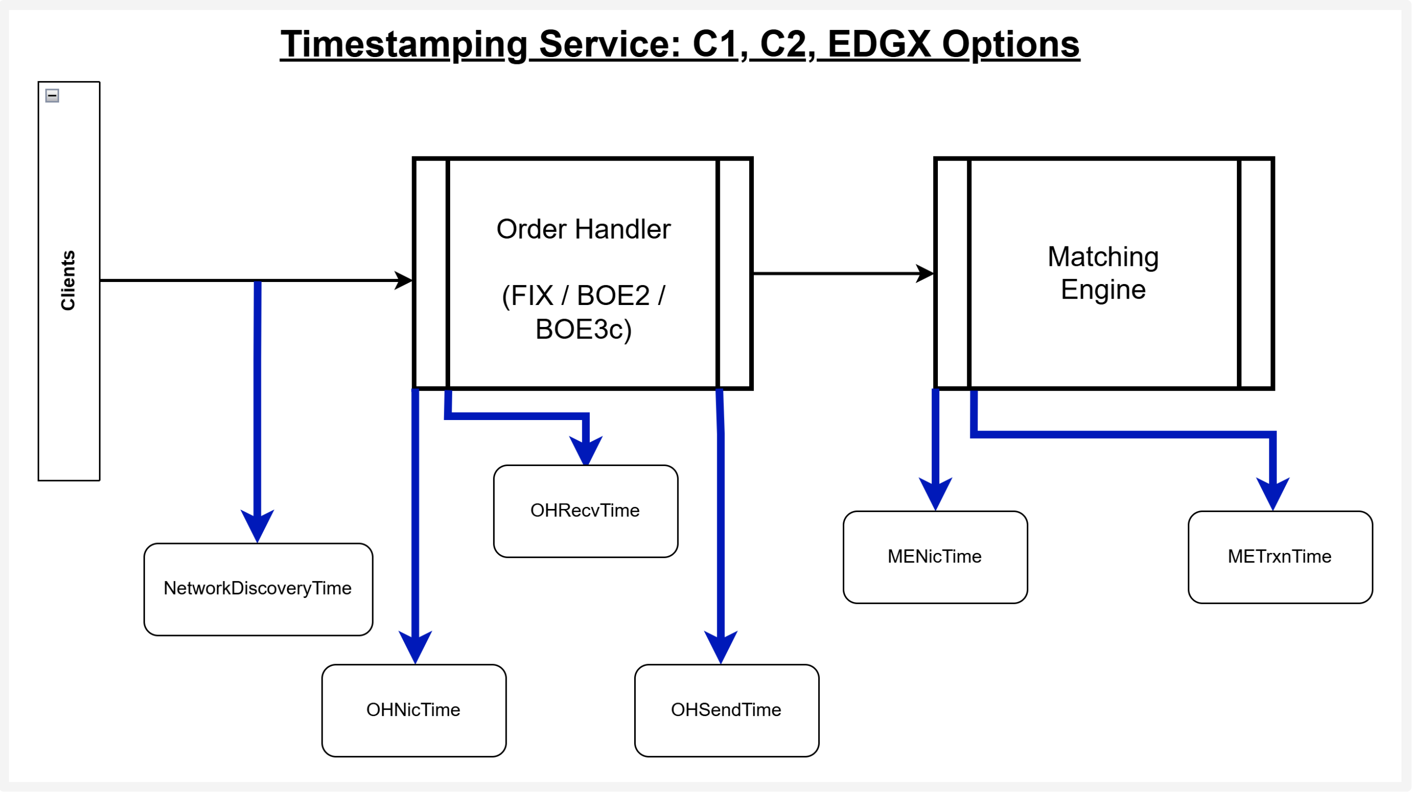


Figure 4. Cboe Timestamping Service Architecture Diagram: BZX Options

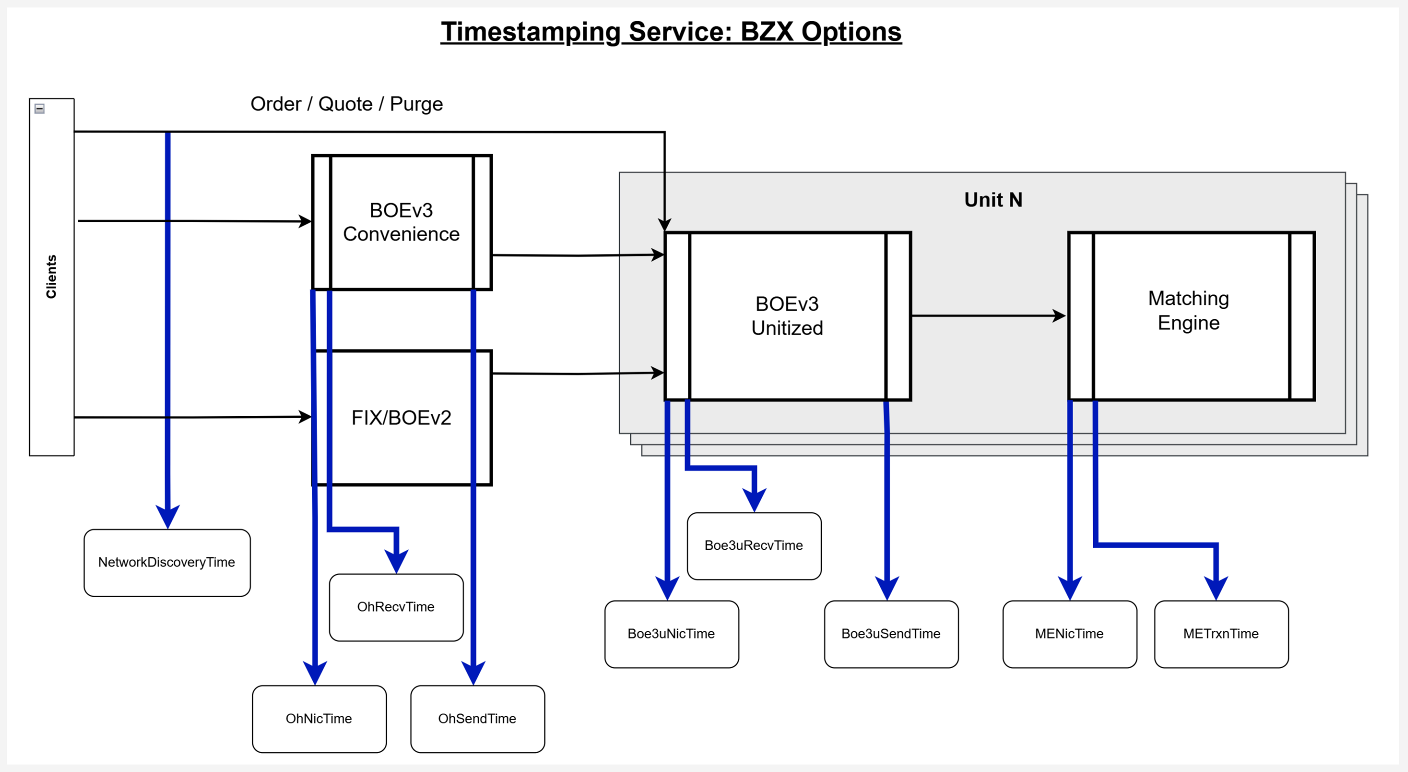


Table 1. Timestamp Availability by Protocol Table

	FIX	BOE	BOE3C	BOE3U
NetworkDiscTime	X	X	X	X
OHNicTime		X	X	
OHRecvTime	X	X	X	
OHSendTime	X	X	X	
BOE3uNicTime	X	X	X	X
BOE3uRecvTime	X	X	X	X
BOE3uSendTime	X	X	X	X
MENicTime	X	X	X	X
METrxnTime	X	X	X	X

- OHNicTime available only on BOE.
- Convenience and unitized order handler times may not be available for certain reject cases.

> ⓘ NOTE: FIX users must request that the most granular timestamps (e.g. microseconds or nanoseconds) be enabled on any sessions where timestamp data is desired.

Table 2. Timestamp Definitions Table

TIMESTAMP NAME	PRECISION	DESCRIPTION
Network Discovery Time	nanoseconds	A network switch timestamp taken at the network capture point identified in the Cboe Connectivity Manual.

TIMESTAMP NAME	PRECISION	DESCRIPTION
		Optical taps are used at each uplink and tap output is sent to an aggregation switch that adds a timestamp header to each packet. The aggregation switch receives time feeds from Cboe's GPS time sources and is synchronized using PTP.
OH NIC Time	nanoseconds	A hardware timestamp that represents when the order handler server NIC observed the message. Will be set to zero for aggressor. Supported only for BOE and will otherwise be set to zero.
OH Recv Time	nanoseconds	A software timestamp that represents when the FIX or BOE order handler has begun processing the order after the socket read.
OH Send Time	nanoseconds	A software timestamp that represents when the FIX or BOE order handler has finished processing the order and begun sending it downstream, either to the BOEv3 Unitized Order Handler or the Matching Engine.
Boe3u NIC Time	nanoseconds	A hardware timestamp that represents when the BOE unitized order handler server NIC observed the message. Will be set to zero for aggressor. Supported only for BOE unitized and will otherwise be set to zero.
Boe3u Recv Time	nanoseconds	A software timestamp that represents when the BOE unitized order handler has begun processing the order after the socket read. Supported only for BOE unitized and will otherwise be set to zero.
Boe3u Send Time	nanoseconds	A software timestamp that represents when the BOE unitized order handler has finished processing the order and begun sending to the matching engine. Supported only for BOE unitized and will otherwise be set to zero.
ME NIC Time	nanoseconds	A hardware timestamp that represents when the target matching engine server NIC observed the message.
ME Trxn Time	microseconds (nanoseconds)	A software timestamp that represents when the matching engine has started processing an event.

Missed Liquidity Report

This report is generated each trading day for subscribed Logical Ports and contains trade, order, and quote records as defined below:

- Order, modify, and quote records for the subscriber are included where at least one message sent by the subscriber is found within a 500 μs window of time after the Network Discovery Time of the aggressor as well as a 50 μs window of time before the Network Discovery Time of a trade aggressor.
- Trade records in which no orders or quotes in the symbol from the subscriber were found within the defined window will be excluded from the report for that subscriber.
- Trade records where the subscriber firm itself was also the aggressor are included. In these cases, the Network Discovery Time of the aggressor will match the Network Discovery Time of a subscriber order, modify, or quote record.
- Trade records where the aggressor quote is not in the first position of the repeating group of the Quote Update message are excluded as these trades are generally not competitive. For example, a Quote Update message is sent with 5 quotes. The fourth quote in the block results in a trade. This trade would not appear in the report.
- Quotes and orders that are marked as "Post Only" will be excluded since they cannot remove liquidity.
- Quotes and orders sent on the same side as the resting quote or order being executed will be excluded.
- Quote messages sent to cancel an existing quote (*quoteResult*=U or O) will be excluded.
- Complex symbols will be included:
  - Complex trades will have a row for the complex trade only
- The report only includes those trade events which are triggered by an aggressor that removed displayed, simple or complex liquidity on entry or where an aggressor participated in a SUM auction and will exclude trade events resulting from:
  - Elected stop orders
  - Complex orders that legged into the simple books
  - Orders routed and executed at away venues
  - Floor trades
  - Trades in non-SUM auctions (FLEX, AIM, SAM, QCC, COA, etc)
- The report includes auction response orders for SUM auctions that were rejected.

Message Types

All new order messages, user modifications and quotes that are sent via BOE by a subscriber and meet the criteria above will be included in the Missed Liquidity report.

ⓘ NOTE: FIX users must request that the most granular timestamps (e.g. microseconds or nanoseconds) be enabled on any sessions where timestamp data is desired.

Data Field Definitions

Each record in the Missed Liquidity Report will contain these fields:

Table 3. Missed Liquidity Report

FIELD NAME	POSITION	DESCRIPTION
Message Type	1	The message type of the row. M = Firm modify record O = Firm order record Q = Firm quote record R = Firm order reject record T = Trade record with aggressor information
Date	2	Date in YYYY-MM-DD format.
Firm ID	3	Firm which sent the message. Will be blank for trade records.
Session Sub ID	4	Session sub id of the originating logical port. Will be blank for trade records. Left padded with zeros.
Clearing Identifier	5	EFID identified on the message. Will be blank for aggressor.
Client Identifier	6	The unique *ClOrdID* or *QuoteUpdateID* assigned by the client. Will be blank for trade records. This ID may appear multiple times in a firm's report if it is not unique.
Cboe Order ID	7	The 12-character, base 36 Cboe Order ID assigned to the order by Cboe. Will be blank for trade records.
Execution ID	8	Nine-character, base 36 Execution ID supplied by Cboe for each trade. Populated for trade records only. For complex trades the Execution ID of the complex package will be provided.
Trade Condition	9	The Trade Condition of the trade. Populated for trade records only. I = Electronic trade f = Complex to complex electronic trade r = SUM auction
Auction ID	10	The base 36 Auction ID for a SUM auction, if available.
Symbol	11	Cboe 6-character symbology symbol.
Network Discovery Time	12	Refer to Table 2. Timestamp Definitions Table on page 6.
OH NIC Time	13	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
OH Recv Time	14	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
OH Send Time	15	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
BOE3u NIC Time	16	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records and non-unitized options markets.
BOE3u Recv Time	17	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records and non-unitized options markets.
BOE3u Send Time	18	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records and non-unitized options markets.
ME NIC Time	19	Refer to Table 2. Timestamp Definitions Table on page 6.
ME Trxn Time	20	Refer to Table 2. Timestamp Definitions Table on page 6.
Unit Number	21	Represents the matching unit number.

FIELD NAME	POSITION	DESCRIPTION
Queued	22	Boolean flag to indicate whether message was delayed due to message in flight limits. Will be blank for trade records. Y = Yes N = No
Port Type	23	Refers to the port type used by the session to send the message. B = BOE2 Order C = BOE3 Convenience Order D = BOE3 Unitized Order E = BOE3 Unitized Quote F = FIX I = BOE3 Convenience Quote Q = BOE2 Quote
Aggressor Order Type	24	Indicates whether order type of a trade record was a New Order, Modify or Quote. M = Modify of Existing Order N = New Order Q = Quote Update

Missed Cancels Report

This report is generated each trading day for subscribed firms and contains trade and cancel records as defined below:

- The subscriber participated in a trade.
- Cancel, cancel rejected, purge/mass cancel, or quote update cancel (*quoteResult* = f, s, +, U, or O) records for the subscriber are included where at least one cancel-related messages sent by the subscriber is found within a 500 μs window of time after the Network Discovery Time of the aggressor as well as a 50 μs window of time before the Network Discovery Time of a trade aggressor that executed against a resting, visible subscriber order.
- Trade events in which no cancel messages from the subscriber were found within the defined window will be excluded from the report for that subscriber.
- Some cancellation messages are rejected because they are received by Cboe after an execution has occurred. Limited timestamp information is available for these messages, but a Network Discovery Time is expected to be available for messages, including most cancel rejects.
- All successful and unsuccessful cancel-related messages found within the time window defined above sent to the matching unit where the trade occurred will be included.
- Due to resource constraints, subscriber quote cancel records that are not in the first position of the repeating group within a **`Quote Update`** message are excluded from reporting. For example, if a **`Quote Update`** message contains five quote cancels for different symbols, and the fourth quote cancel is associated with a subscriber trade, that specific record will not be included in the report.

Message Types

All individual order cancellations, mass cancellation, purge cancels, and quote update cancel messages that are sent via FIX or BOE by a subscriber and meet the criteria above will be included in the Missed Cancels Report.

Data Field Definitions

Each record in the Missed Cancels Report will contain these fields:

Table 4. Missed Cancels Report

FIELD NAME	POSITION	DESCRIPTION
Message Type	1	The message type of the row. C = Firm cancel record P = Firm mass cancel or purge record Q = Firm quote update cancel record R = Firm cancel rejected record T = Trade record with aggressor information
Date	2	Date in YYYY-MM-DD format
Firm ID	3	Firm which sent the message. Will be blank for trade records.
Session Sub ID	4	Session sub id of the originating logical port. Will be blank for trade records. Left padded with zeros.
Client Identifier	5	The unique *ClOrdID* or *MassCancelID* assigned by the client. Will be blank for trade records. This ID may appear multiple times in a firm's report if a firm uses a purge message that is directed towards multiple matching units or if it is not unique.
Close Order ID	6	The 12-character, base 36 Cboe Order ID assigned to the order by Cboe. Will be blank for trade records
Execution ID	7	Nine-character, base 36 Execution ID supplied by Cboe for each trade. Populated for trade records only.
Trade Condition	8	The Trade Condition of the trade. Populated for trade records only. I = Electronic trade
Symbol	9	Cboe symbology symbol. For purge records, this will be set to the RiskRoot if one was specified on the purge.
Network Discovery Time	10	Refer to Table 2. Timestamp Definitions Table on page 6.
OH NIC Time	11	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
OH Recv Time	12	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
OH Send Time	13	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
BOE3u NIc Time	14	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
Boe3u Recv Time	15	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
BOE3u Send Time	16	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
ME NIC Time	17	Refer to Table 2. Timestamp Definitions Table on page 6.
ME Trxn Time	18	Refer to Table 2. Timestamp Definitions Table on page 6.
Unit Number	19	Represents the matching unit number.
Queued	20	Boolean flag to indicate whether message was delayed due to message in flight limits. Will be blank for trade records. Y = Yes

FIELD NAME	POSITION	DESCRIPTION
		N = No
Port Type	21	Refers to the port type used by the session to send the message. B = BOE2 Order C = BOE3 Convenience Order D = BOE3 Unitized Order E = BOE3 Unitized Quote F = FIX H = BOE3 Convenience Purge I = BOE3 Convenience Quote Q = BOE2 Quote P = BOE2 Purge R = BOE3 Unitized Purge U = FIX Purge
Aggressor Order Type	22	Indicates whether order type of a trade record was a New Order or Modify. M = Modify of Existing Order N = New Order Q = Quote Update

All Cancels Report

The All Cancels Report is intended to supplement the Missed Cancels Report by offering a comprehensive view of cancel behavior and messaging activity. It is particularly useful for analyzing cancel patterns across all market scenarios, including those where no trade occurred.

This report is generated each trading day for subscribed firms and contains cancel-related records as defined below:

- The subscriber is the originator of the cancel-related message.
- Cancel, cancel rejected, purge/mass cancel, or quote update cancel (*quoteResult* = U, O) records for the subscriber of the trading day are included regardless of their timing or relation to a trade.
- The report includes **all cancel-related messages** sent by the subscriber, irrespective of whether the cancel attempt was successful or associated with a trade event.
- This report does **not** include any trade records or aggressor information
- All messages will populate the *Firm ID* and *Session Sub ID* fields to reflect the **subscriber**.
- For **`Quote Update`** messages containing multiple cancel entries, only the first cancel will be recorded in the report. Clients may refer to the original quote update package ID for full context.

Message Types

All individual order cancellations, cancel rejections, and purge orders sent by a subscriber via FIX or BOE and meet the criteria outlined above will be included in the All Cancels Report.

Data Field Definitions

Each record in the All Cancels Report will contain these fields:

Table 5. All Cancels Report

FIELD NAME	POSITION	DESCRIPTION
Message Type	1	The message type of the row. C = Firm cancel record P = Firm mass cancel or purge record R = Firm cancel rejected record Q = Firm quote update cancel record
Date	2	Date in YYYY-MM-DD format
Firm ID	3	Firm which sent the message. Will be blank for trade records.
Session Sub ID	4	Session sub id of the originating logical port. Will be blank for trade records. Left padded with zeros.
Client Identifier	5	The unique *ClOrdID* or *MassCancelID* assigned by the client. Will be blank for trade records. This ID may appear multiple times in a firm's report if a firm uses a purge message that is directed towards multiple matching units or if it is not unique.
Cboe Order ID	6	The 12-character, base 36 Cboe Order ID assigned to the order by Cboe.
Symbol	7	Cboe symbology symbol. For purge records, this will be set to the RiskRoot if one was specified on the purge.
Network Discovery Time	8	Refer to Table 2. Timestamp Definitions Table on page 6.
OH NIC Time	9	Refer to Table 2. Timestamp Definitions Table on page 6.
OH Recv Time	10	Refer to Table 2. Timestamp Definitions Table on page 6.
OH Send Time	11	Refer to Table 2. Timestamp Definitions Table on page 6.
BOE3u NIc Time	12	Refer to Table 2. Timestamp Definitions Table on page 6.
Boe3u Recv Time	13	Refer to Table 2. Timestamp Definitions Table on page 6.
BOE3u Send Time	14	Refer to Table 2. Timestamp Definitions Table on page 6.
ME NIC Time	15	Refer to Table 2. Timestamp Definitions Table on page 6.
ME Trxn Time	16	Refer to Table 2. Timestamp Definitions Table on page 6.
Unit Number	17	Represents the matching unit number.
Queued	18	Boolean flag to indicate whether message was delayed due to message in flight limits. Y = Yes N = No
Port Type	19	Refers to the port type used by the session to send the message. B = BOE2 Order C = BOE3 Convenience Order D = BOE3 Unitized Order E = BOE3 Unitized Quote F = FIX H = BOE3 Convenience Purge I = BOE3 Convenience Quote Q = BOE2 Quote P = BOE2 Purge R = BOE3 Unitized Purge

FIELD NAME	POSITION	DESCRIPTION
		U = FIX Purge

Support

Please direct questions or comments regarding this specification to tradedesk@cboe.com.

Revision History

DOCUMENT VERSION	DATE	DESCRIPTION
1.0.0	01/21/25	Initial publication.
1.0.1	07/08/25	Updated *ME Trxn Time* precision from microseconds to nanoseconds (effective 09/08/25)
1.0.2	07/23/25	Updated *ME NIC Time* description in Cancels Report on page 12 and Missed Liquidity Report on page 8 to indicate it will no longer be blank for trade records. In Missed Liquidity Report on page 8, added *Message Type* = R (Firm order reject record). Updated *Auction ID* description in Missed Liquidity Report on page 8 to the base 36 Auction ID for a SUM auction, if available. Updated Missed Liquidity Report on page 8 to indicate auction response orders for SUM auctions that were rejected are included in the report.
1.0.3	08/08/25	Updated note in Order Entry Architecture Timestamps on page 6 and Missed Liquidity Report Message Types on page 8 to indicate FIX users must request that the most granular timestamps (e.g. microseconds or nanoseconds) be enabled on any sessions where timestamp data is desired.
1.0.4	08/14/25	Added All Cancels Report and renamed Cancels Report to Missed Cancels Report (effective 08/25/25).
1.0.5	08/19/25	Updated All Cancels Report on page 15 to specify that only quote update cancel records with *quoteResult* = U, O for the subscriber of the trading day are included.
1.0.6	09/08/25	Updated Missed Cancels Report on page 12 to indicate that due to resource constraints, subscriber quote cancel records that are not in the first position of the repeating group within a `Quote Update` message are excluded from reporting. Updated ME Trxn Time timestamp description to remove Padded with zeros for nanosecond digits.
1.0.7	03/18/26	Add new value of I = BOE3 Convenience Quote to Port Type for Missed Liquidity, Missed Cancels, and All Cancels Reports. Added new value of H = BOE3 Convenience Purge for Missed Cancels and All Cancels Report.

