Cboe Titanium Equities Timestamping Service Specification

Version 1.0.12

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Contents

Introduction

Cboe Timestamping Service is offered for selected Cboe Equities markets to provide timestamp information for orders 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 (US Only) (effective 08/25/25). 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 messages for a firm where the firm sent an order within defined time window (-50 μs to + 500 μs) of the network discovery time of the aggressor who executed a resting order.	7:00 a.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 belonging to the subscriber.	7:00 a.m., T+1
All Cancels Report (US Only) (effective 08/25/25)	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 (US Only)(effective 08/25/25) 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. Automation instructions are available within the application for customers interested in automating the download of files on an ongoing basis.

Figure 1. Reports

BYX Equities

Missed Liquidity Report

Order timestamps where the firm sent an order in the same symbol and within 500 μs of the Network Time of the aggressor who executed a resting, displayed order on entry.

Please click on Subscribe for pricing information

[Subscribe]

Missed Cancels Report

Message timestamps for cancel, mass cancel, or purge events sent by the firm within 500 μs of the Network Time of the aggressor who executed a resting, displayed order on entry.

Includes cancellation events that were rejected because the cancellation message arrived too late and was unsuccessful.

Please click on Subscribe for pricing information

[Subscribe]

All Cancels Report

Message timestamps for all cancel, mass cancel, and purge messages sent by the subscribing firm throughout the trading day.

Provides full visibility into every cancel attempt initiated by the subscriber. This report excludes trade records and aggressor information and is designed to complement the Missed Cancels Report.

Please click on Subscribe for pricing information

[Subscribe]

Reports will be delivered in the File List area at the bottom of the application on T+1 on or prior to 7 a.m.

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
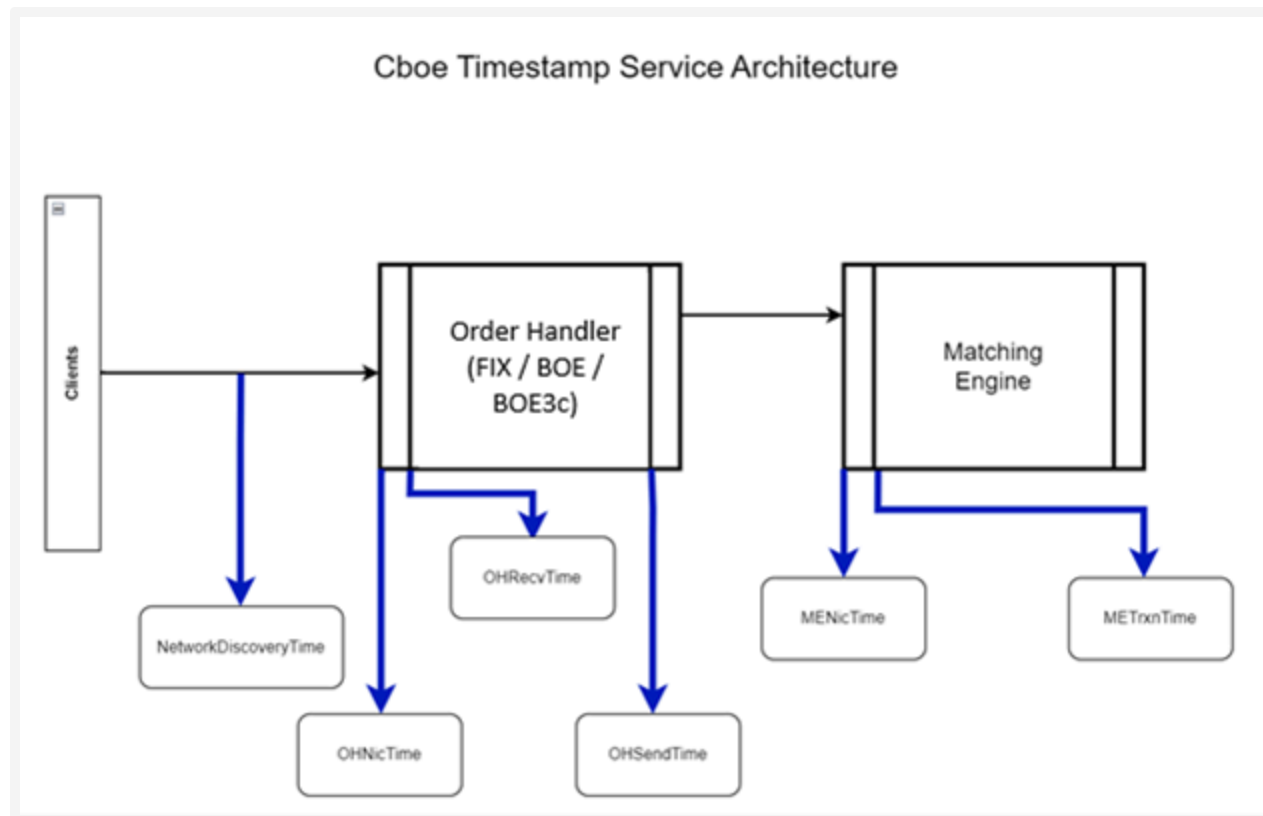
Table 1. Timestamp Availability by Protocol Table

PROTOCOL	NETWORKDISCTIME	OHNICTIME	OHRECVTIME	OHSENDTIME	MENICTIME	METRXNTIME
FIX	X		X	X	X	X
BOE	X	X	X	X	X	X
BOE3c	X	X	X	X	X	X

- OHNicTime available only on BOE.
- OHRecvTime, OHSendTime, and OHNicTime 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. 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 to the matching engine.
ME NIC Time	nanoseconds	A hardware timestamp that represents when the target matching engine server NIC observed the message.
ME Trxn Time	microseconds	A software timestamp that represents when the matching engine has started processing an event. Padded with zeros for nanosecond digits.

Missed Liquidity Report

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

- Order or modify 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 order.

- Trade records in which no orders 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 or modify record.

- Orders and modifies sent on the same side as the resting order being executed will be excluded.

- The report only includes those trade events which are triggered by an aggressor that removed displayed liquidity on entry and will exclude trade events resulting from:

  - Elected stop orders

  - Orders routed and executed at away venues

  - Peg order movements

  - Auctions

Message Types

All new order messages and user modifications 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 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	MPID identified on the message. Will be blank for aggressor.
Client Identifier	6	The unique ClOrdID 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.
Trade Condition	9	The Trade Condition of the trade. Populated for trade records only. I = Electronic trade
Symbol	10	Cboe symbology symbol.
Network Discovery Time	11	Refer to Table 2. Timestamp Definitions Table on page 6.
OH NIC Time	12	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
OH Recv Time	13	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
OH Send Time	14	Refer to Table 2. Timestamp Definitions Table on page 6. Will be blank for trade records.
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. Will be blank for trade records. Y = Yes N = No
Port Type	19	Refers to the port type used by the session to send the message. B = BOE C = BOE3 D = BOE Dedicated Core F = FIX
Aggressor Order Type	20	Indicates whether order type of a trade record was a New Order or Modify. N = New Order M = Modify of Existing Order

Missed Cancels Report

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

- The subscriber is on at least one side of the trade.

- Cancel, cancel rejected, or purge/mass cancel 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 all messages, including cancel rejects.

- All successful and unsuccessful cancel-related messages found within the time window defined above sent to matching unit will be included.

Message Types

All individual order cancellations and purge orders 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 purge 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.
Cboe 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.
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.
ME NIC Time	14	Refer to Table 2. Timestamp Definitions Table on page 6.
ME Trxn Time	15	Refer to Table 2. Timestamp Definitions Table on page 6.
Unit Number	16	Represents the matching unit number.
Queued	17	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	18	Refers to the port type used by the session to send the message. B = BOE C = BOE3 D = BOE Dedicated Core F = FIX P = BOE Purge U = FIX Purge
Aggressor Order Type	19	Indicates whether order type of a trade record was a New Order or Modify.

FIELD NAME	POSITION	DESCRIPTION
		N = New Order
		M = Modify of Existing Order

All Cancels Report (US Only) - (Effective 08/25/25)

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, or purge/mass cancel 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**.

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
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, if available.
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.
ME NIC Time	12	Refer to Table 2. Timestamp Definitions Table on page 6.
ME Trxn Time	13	Refer to Table 2. Timestamp Definitions Table on page 6.
Unit Number	14	Represents the matching unit number.
Queued	15	Boolean flag to indicate whether message was delayed due to message in flight limits. Y = Yes N = No
Port Type	16	Refers to the port type used by the session to send the message. B = BOE2 C = BOE3 D = BOE Dedicated Core F = FIX P = BOE2 Purge U = FIX Purge

Support

Please direct questions or comments regarding this specification to the corresponding trade desk:

NAME	CONTACT INFO
AU Trade Desk	tradedeskau@cboe.com
EU Trade Desk	tradedeskeu@cboe.com
JP Trade Desk	tradedeskjp@cboe.com
U.S. Trade Desk	tradedesk@cboe.com

Revision History

DOCUMENT VERSION	DATE	DESCRIPTION
1.0.0	10/15/24	Initial publication.
1.0.1	10/28/24	Added detail around new Report Subscriptions made available within customer web portal for Timestamping Service subscriptions and file retrieval.
1.0.2	11/14/24	Updated the Date format to YYYY-MM-DD.
1.0.3	01/15/25	Added additional records included in the Missed Liquidity Report and Cancels Report. Updated with Cboe Titanium branding.
1.0.4	01/17/25	Updated Network Discovery Time field to clarify optical taps are used at each uplink and tap output.
1.0.5	02/03/25	Removed "ET" from the specification. Added EU Trade Desk contact information.
1.0.6	25/02/04	Updated dates in the Revision History and on the Cover Page to the universal date format (YYYY-MM-DD).
1.0.7	25/03/21	Added BOE3c to the Cboe Timestamping Service Architecture Diagram and Timestamp Availability by Protocol Table. Added AU and JP Trade Desk contact information.
1.0.8	25/04/24	Added C = BOE3 Convenience value to Port Type field for the Missed Liquidity and Cancels reports.
1.0.9	25/07/23	Updated *ME Nic Time* in the Missed Liquidity Report on page 7 and Cancels Report on page 9 to indicate it will not be blank for trade records.
1.0.10	25/08/08	Updated note in Order Entry Architecture Timestamps on page 5 and Missed Liquidity Report Message Types on page 7 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.
1.0.11	25/08/14	Added All Cancels Report and renamed Cancels Report to Missed Cancels Report (effective 08/25/25). Updated *Port Type* description in Missed Liquidity Report and Missed Cancels Report.
1.0.12	25/08/19	Updated to indicate All Cancels Report is specific to US only.