

Cboe Titanium Futures Timestamping Service Specification

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Introduction

Cboe Futures Exchange, LLC (CFE) Timestamping Service provides 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 four reports – Missed Liquidity Report, Missed Cancels Report, All Cancels Report, and TAS Report. All content is subject to change.

Note that references to Orders below refers to both orders and quotes.

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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 U.S. Central time.

Table 1. Cboe Timestamping Service Reports and Availability

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.	6:00 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.	6:00 a.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.	6:00 a.m., T+1
TAS Report	A report showing timestamp details for TAS Orders submitted by a firm within defined time window (-50 µs to + 500 µs) of the network discovery time of the first Order to post in the symbol/side during the TAS pre-open queuing window. It includes anonymized data for each TAS Order that was initially first to post in any TAS instrument side in which the firm participated, allowing comparison of time differentials between submitted Orders and the first-to-post TAS Order.	6:00 a.m., T+1

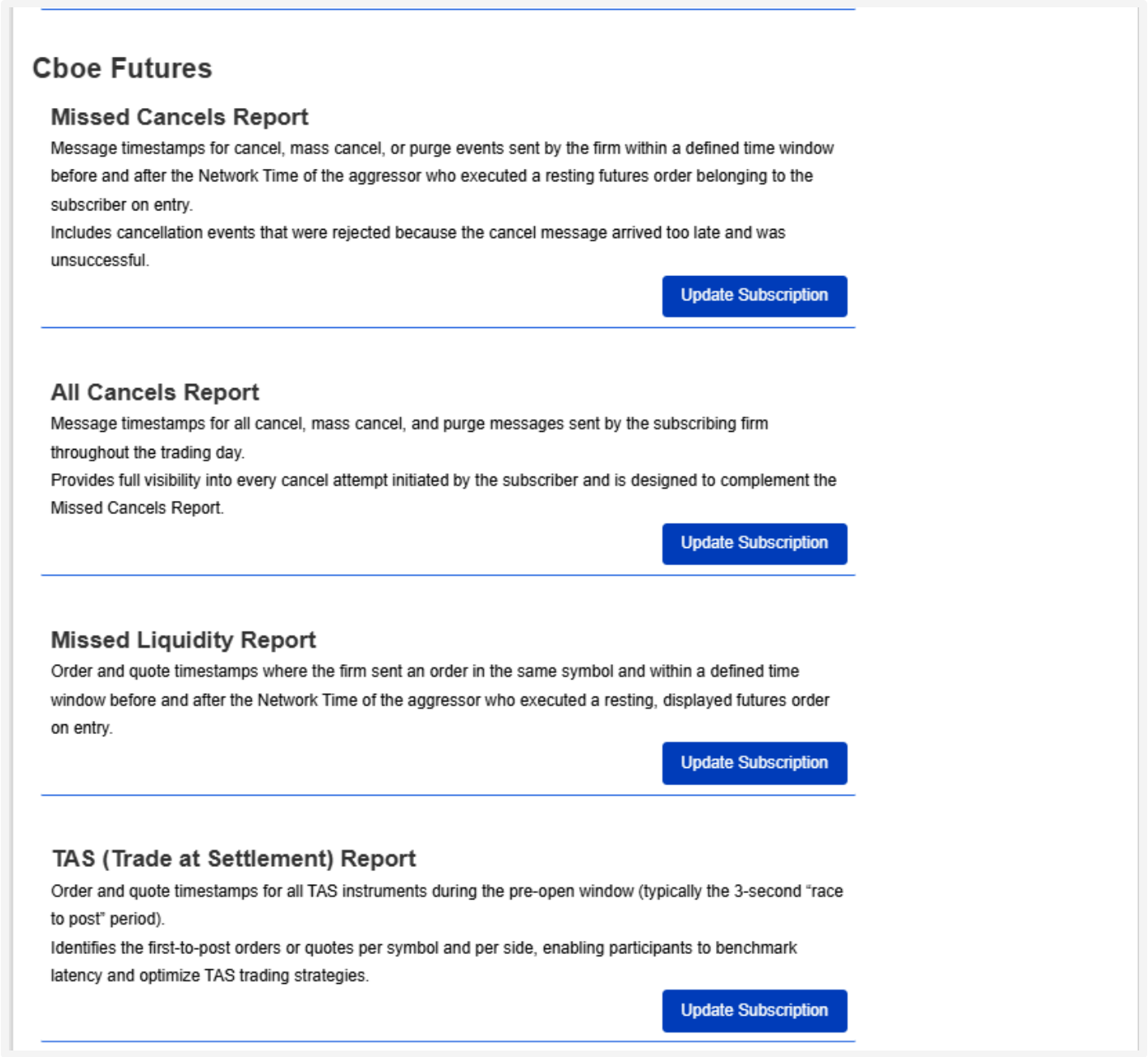
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Report Retrieval - Customer Web Portal

The Missed Liquidity Report, Missed Cancels Report, All Cancels Report, and TAS 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.

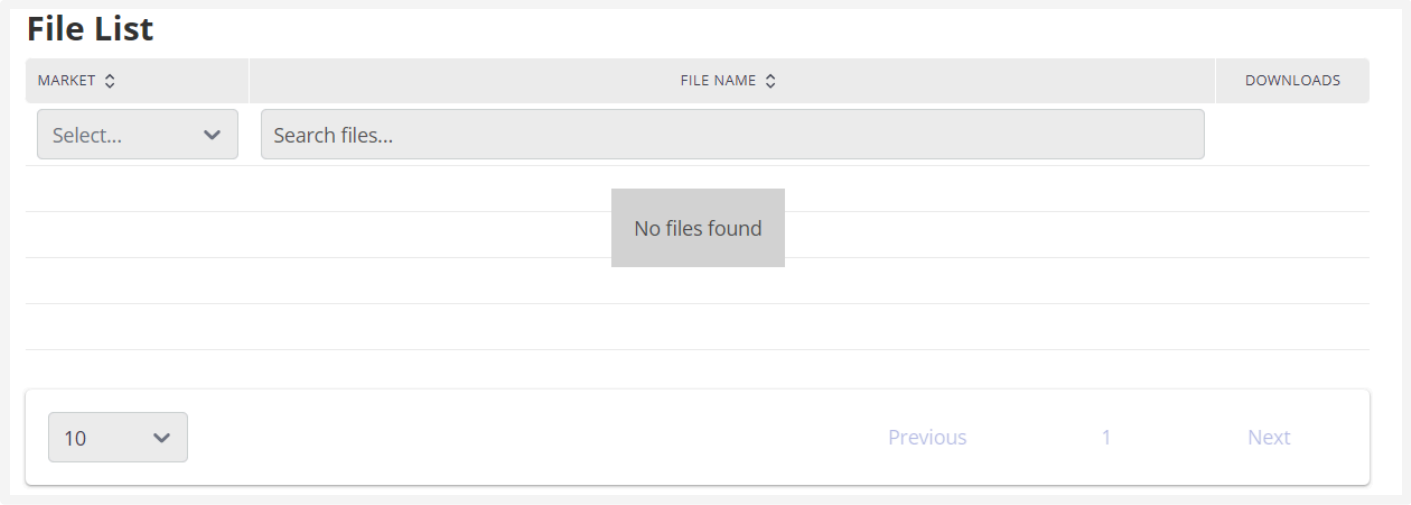
Figure 1. Reports



Reports will be delivered in the File List area at the bottom of the application on a T+1 basis on or prior to 6:00 a.m. U.S. Central Time.

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Figure 2. File List



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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

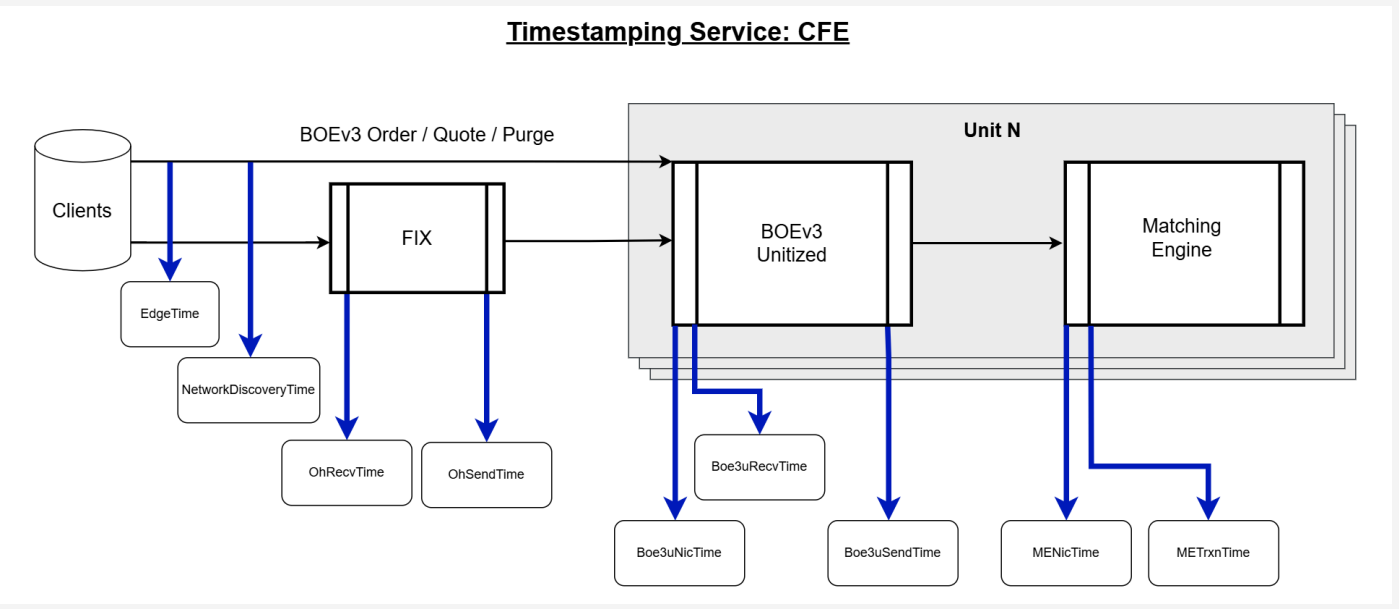


Table 2. Timestamp Availability by Protocol Table

	FIX	BOE3U
EdgeTime (Effective 09/14/26)	X	X
NetworkDiscTime	X	X
OHRecvTime	X	
OHSendTime	X	
BOE3uNicTime	X	X
BOE3uRecvTime	X	X
BOE3uSendTime	X	X
MENicTime	X	X
METrxnTime	X	X

Please note that 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.

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Table 3. Timestamp Definitions Table

TIMESTAMP NAME	PRECISION	DESCRIPTION
Edge Time (Effective 09/14/26)	nanoseconds	A network switch hardware timestamp taken at the L1 Edge Timestamping layer identified in the CFE Connectivity Manual. Edge Time and Network Discovery Time are both synchronized to the same Cboe clock but have different levels of precision.
Network Discovery Time	nanoseconds	A network switch timestamp taken at the network capture point identified in the CFE 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. Edge Time and Network Discovery Time are both synchronized to the same Cboe clock but have different levels of precision.
OH Recv Time	nanoseconds	A software timestamp that represents when the FIX order handler has begun processing the order after the socket read.
OH Send Time	nanoseconds	A software timestamp that represents when the FIX order handler has finished processing the order and begun sending it downstream, to the BOEv3 Unitized Order Handler.
Boe3u NIC Time	nanoseconds	A hardware timestamp that represents when the BOE3 unitized order handler server NIC observed the message. Will be set to zero for aggressor.
Boe3u Recv Time	nanoseconds	A software timestamp that represents when the BOE3 unitized order handler has begun processing the order after the socket read.
Boe3u Send Time	nanoseconds	A software timestamp that represents when the BOE3 unitized 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 (nanoseconds, effective 08/31/26)	A software timestamp that represents when the matching engine has started processing an event.

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Missed Liquidity Report

The Missed Liquidity Report details the following:

- The Missed Liquidity Report contains historical data from the prior trading day for all Futures products and is available after the end of the trading day on a T+1 basis.
- This report provides timestamp details for executions of Orders that rest on the book where the Trading Privilege Holder (TPH) receiving the report attempted to execute against a resting Order within an Exchange-determined period of time (not to exceed 1 millisecond) after receipt of the first attempt to execute against that resting Order and within an Exchange determined period of time (not to exceed 100 microseconds) before receipt of the first attempt to execute against that resting Order.
- The timestamp details in the report include information relating to each Order submitted by the subscribing TPH during the applicable time period and anonymized information relating to the Order that successfully executed against the resting Order.
- The subscribing TPH may utilize this information to calculate time differences between timestamps of each of those Orders and the successfully executed Order.

This report is generated each trading day for all subscriber-owned 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 Order 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 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.
- Orders that are marked as "Post Only" will be excluded since they cannot remove liquidity.
- 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.
- Spread symbols will be included:
  - Spread trades will have a row for the spread trade only
- The report only includes those trade events which are triggered by an aggressor that removed displayed, simple or complex liquidity on entry and will exclude trade events resulting from:

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- Elected stop orders
- Spread orders that legged into the simple books

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Message Types

All new order messages, user modifications, and quotes sent via BOE3 or FIX 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.

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Data Field Definitions

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

Table 4. 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
Symbol	10	Cboe 6-character symbology symbol.
Edge Time (Effective 09/14/26)	11	Refer to Table 3. Timestamp Definitions Table on page 7.
Network Discovery Time	12	Refer to Table 3. Timestamp Definitions Table on page 7.
OH NIC Time	13	Always blank for CFE.
OH Recv Time	14	Refer to Timestamp Definitions Table. Will be blank for trade records.
OH Send Time	15	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records.
BOE3u NIC Time	16	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records and non-unitized options markets.
BOE3u Recv Time	17	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records and non-unitized options markets.
BOE3u Send Time	18	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records and non-unitized options markets.
ME NIC Time	19	Refer to Table 3. Timestamp Definitions Table on page 7.
ME Trxn Time	20	Refer to Table 3. Timestamp Definitions Table on page 7.
Unit Number	21	Represents the matching unit number.

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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. D = BOE3 Unitized Order E = BOE3 Unitized Quote F = FIX
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

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Missed Cancels Report

The Missed Cancels Report will detail the following:

- The Missed Cancels Report contains historical data from the prior trading day for all Futures products and is available after the end of the trading day on a T+1 basis.
- This report provides timestamp details for executions of Orders that rest on the book where the TPH receiving the report attempted to cancel a resting Order within an Exchange-determined period of time (not to exceed 1 millisecond) after receipt of the first attempt to execute against that resting Order and within an Exchange determined period of time (not to exceed 100 microseconds) before receipt of the first attempt to execute against that resting Order.
- The timestamp details in the report include information relating to each cancel-related message (including cancel, cancel rejected, or purge/mass cancel records) submitted by the subscribing TPH during the applicable time period and anonymized information relating to the Order that successfully executed against the resting Order.
- The subscribing TPH may utilize this information to calculate time differences between time stamps of each of those cancel-related messages and the successfully executed Order.

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.

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Message Types

All individual order cancellations, mass cancellation, purge cancels, and quote update cancel messages sent via FIX or BOE3 by a subscriber and meet the criteria above will be included in the Missed Cancels Report.

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Data Field Definitions

Each record in the Missed Cancels Report contains these fields:

Table 5. 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.
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. For purge records, this will be set to the RiskRoot if one was specified on the purge.
Edge Time (Effective 09/14/26)	10	Refer to Table 3. Timestamp Definitions Table on page 7.
Network Discovery Time	11	Refer to Table 3. Timestamp Definitions Table on page 7.
OH NIC Time	12	Always blank for CFE.
OH Recv Time	13	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records.
OH Send Time	14	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records.
BOE3u NIc Time	15	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records.
Boe3u Recv Time	16	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records.
BOE3u Send Time	17	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for trade records.
ME NIC Time	18	Refer to Table 3. Timestamp Definitions Table on page 7.
ME Trxn Time	19	Refer to Table 3. Timestamp Definitions Table on page 7.
Unit Number	20	Represents the matching unit number.

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FIELD NAME	POSITION	DESCRIPTION
Queued	21	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	22	Refers to the port type used by the session to send the message. D = BOE3 Unitized Order E = BOE3 Unitized Quote F = FIX R = BOE3 Unitized Purge U = FIX Purge
Aggressor Order Type	23	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

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All Cancels Report

The All Cancels Report details the following:

- The All Cancels Report contains historical data from the prior trading day for all Futures products and is available after the end of the trading day on a T+1 basis.
- It provides timestamp details relating to all cancel-related messages (including cancel, cancel rejected, or purge/mass cancel records) submitted by the TPH receiving the report, irrespective of whether the cancel attempt was successful or associated with a trade event.
- This report does not include information regarding trade executions.

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.

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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.

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Data Field Definitions

Each record in the All Cancels Report contains these fields:

Table 6. 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.
Edge Time (Effective 09/14/26)	8	Refer to Table 3. Timestamp Definitions Table on page 7.
Network Discovery Time	9	Refer to Table 3. Timestamp Definitions Table on page 7.
OH NIC Time	10	Always blank for CFE.
OH Recv Time	11	Refer to Table 3. Timestamp Definitions Table on page 7.
OH Send Time	12	Refer to Table 3. Timestamp Definitions Table on page 7.
BOE3u NIc Time	13	Refer to Table 3. Timestamp Definitions Table on page 7.
Boe3u Recv Time	14	Refer to Table 3. Timestamp Definitions Table on page 7.
BOE3u Send Time	15	Refer to Table 3. Timestamp Definitions Table on page 7.
ME NIC Time	16	Refer to Table 3. Timestamp Definitions Table on page 7.
ME Trxn Time	17	Refer to Table 3. Timestamp Definitions Table on page 7.
Unit Number	18	Represents the matching unit number.
Queued	19	Boolean flag to indicate whether message was delayed due to message in flight limits. Y = Yes N = No
Port Type	20	Refers to the port type used by the session to send the message. D = BOE3 Unitized Order E = BOE3 Unitized Quote F = FIX R = BOE3 Unitized Purge U = FIX Purge

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TAS Report

The TAS Report details the following:

- The TAS Report contains historical data from the prior trading day and is available after the end of the trading day on a T+1 basis.
- It provides timestamp details for TAS Orders submitted by the TPH during an Exchange-determined period of time within the TAS pre-open queuing period at the beginning of a trading day for all CFE products with TAS and anonymized information relating to each accepted TAS Order that was initially first in time priority in any TAS instrument side in which the subscribing TPH submitted a TAS Order during this time period on the applicable trading day.
- The subscribing TPH may utilize this information to calculate time differences between timestamps of each of those TAS Orders submitted by the TPH and the TAS Order that was initially first in time priority.
- The Exchange-determined period of time covered by this report is a designated time period (not to exceed 1 millisecond) after receipt of the TAS Order that was initially first in time priority.
- This report does not include information regarding trade executions.

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

- Order records for the subscriber are included where at least one TAS Order message sent by the subscriber is found within a 500 µs window of time after the Network Discovery Time of the first TAS Order to post as well as a 50 µs window of time before the Network Discovery Time of the first TAS Order to post.
- A First to Post (FTP) record will be supplied for each TAS symbol and side where a subscriber order is found within the aforementioned time window. If a subscriber does not send an order within the window, then no FTP record will be included.
- FTP records where the subscriber firm itself was the first to post are included. In these cases, the Network Discovery Time of the FTP record will match the Network Discovery Time of a subscriber Order.
- Quote messages that are first to post and where the quote is not in the first position of the repeating group of the Quote Update message are excluded as these messages are generally not competitive. For example, a **`Quote Update`** message is sent with 5 quotes. The fourth quote in the block results is the first to post in a TAS symbol/side. This event would not appear in the report.
- TAS Spread symbols will be included.

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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 TAS Report.

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Data Field Definitions

Each record in the TAS Report contains these fields:

Table 7. TAS Report

FIELD NAME	POSITION	DESCRIPTION
Message Type	1	The message type of the row. F = First to Post (FTP) record with anonymized information O = Firm order record Q = Firm quote record R = Firm Order reject record
Date	2	Date in YYYY-MM-DD format.
Firm ID	3	Firm which sent the message. Will be blank for FTP records.
Session Sub ID	4	Session sub id of the originating logical port. Will be blank for FTP records. Left padded with zeros.
Clearing Identifier	5	EFID identified on the message. Will be blank for FTP.
Client Identifier	6	The unique *ClOrdID* or *QuoteUpdateID* assigned by the client. Will be blank for FTP 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 FTP records.
Symbol	8	Cboe 6-character symbology symbol.
Side	9	Identifies the order side. B = Buy S = Sell
Edge Time(Effective 09/14/26)	10	Refer to Table 3. Timestamp Definitions Table on page 7.
Network Discovery Time	11	Refer to Table 3. Timestamp Definitions Table on page 7.
OH NIC Time	12	Always blank for CFE.
OH Recv Time	13	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for FTP records.
OH Send Time	14	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for FTP records.
BOE3u NIC Time	15	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for FTPrecords.
BOE3u Recv Time	16	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for FTP records.
BOE3u Send Time	17	Refer to Table 3. Timestamp Definitions Table on page 7. Will be blank for FTP records.
ME NIC Time	18	Refer to Table 3. Timestamp Definitions Table on page 7.
ME Trxn Time	19	Refer to Table 3. Timestamp Definitions Table on page 7.
Unit Number	20	Represents the matching unit number.
Queued	21	Boolean flag to indicate whether message was delayed due to message in flight limits. Will be blank for FTP records. Y = Yes N = No
Port Type	22	Refers to the port type used by the session to send the message. D = BOE3 Unitized Order

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FIELD NAME	POSITION	DESCRIPTION
		E = BOE3 Unitized Quote F = FIX
First to Post Order Type	23	Indicates whether order type of a trade record was a New Order or Quote. N = New Order Q = Quote Update

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Support

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

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Revision History

DOCUMENT VERSION	DATE	DESCRIPTION
1.0.0	01/12/25	Initial publication.
1.0.1	12/16/25	Updated Close Order ID to Cboe Order ID in the Missed Cancels Report Data Field Definitions on page 15.
1.0.2	06/18/26	Removed note that *Queued* field is currently not applicable for CFE and will be set to "N".
1.0.3	06/30/26	Updated ME Trxn Time precision from microseconds to nanoseconds (effective 08/31/26).
1.0.4	08/13/26	Added Edge Time column to all reports (effective 09/14/26).

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