



# Cboe Titanium U.S. Options Opening Process Feed Specification

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# Cboe Titanium U.S. Options Opening Process Feed Specification

## Introduction

This specification will be the standard specification used for the Cboe Titanium U.S. Options Opening Process Feed on the Cboe Options (C1) Exchange platform.

Cboe customers may use the Cboe U.S. Options Opening Process Feed specification to receive real-time Opening Auction message information including auction updates and execution information. The Cboe U.S. Options Opening Process Feed cannot be used to enter orders.

A WAN-Shaped version of the Cboe U.S. Options Opening Process Feed is available from both of Cboe's datacenters. Customers may choose to take one or more of the following feed options depending on their location and connectivity to Cboe.

| Exchange   | Shaping | Served From Data Center (Primary/Secondary) | Multicast Feed ID |
|------------|---------|---------------------------------------------|-------------------|
| C1 Options | WAN     | Primary                                     | CCO               |
| C1 Options | WAN     | Primary                                     | CDO               |
| C1 Options | WAN     | Secondary                                   | CEO               |

Cboe customers may also use Cboe Titanium U.S. Options Multicast PITCH, Cboe Titanium U.S. Options Multicast TOP, and Cboe Titanium U.S. Options Auction data feeds to receive opening process messages. Refer to the specifications for the respective feeds for more information.

## 24x5 Feed Hours and System Restart

For C1 Options operating in 24x5 mode, the Opening Process feed starts on Sunday at approximately 1:00 p.m. ET and shuts down on Friday at approximately 5:30 p.m. ET. A daily restart occurs between 5:30 and 7:00 p.m. ET each day at which time sequences will be reset. The daily restart is typically observed between 5:30 p.m. and 6:00 p.m. ET, but could occur later (between 6:00 p.m. and 7:00 p.m. ET) if needed for operational reasons. Feed startup and shutdown times may be adjusted without notice.

Under normal operations, it is expected that the order books are cleared (Delete Order messages sent for any open orders, including GTC and GTD orders), prior to the daily restart and reset of sequences. Persisted GTC and GTD orders will be added back onto the order books starting at approximately 10 minutes prior to the scheduled queuing time for each underlying symbol.

## Feed Connectivity Requirements

WAN Shaped feeds are available to customers with a minimum of 100 Mbps/s of connectivity to Cboe via cross connect or dedicated circuit.

Customers with sufficient connectivity may choose the WAN-Shaped feeds from any of the Cboe datacenters. It should be noted that feeds from the secondary datacenter will have additional latency for those connected with Cboe in the primary data center due to proximity and business continuity processing.

Cboe Titanium U.S. Options Opening Process Feed real-time events are delivered using a single published multicast address for all symbol ranges.

## Gap Request Proxy and Message Retransmission

Recovery of missed data is not available on the Cboe Titanium U.S. Options Opening Process Feed as this feed contains only unsequenced messages.

## Spin Servers

A spin is not available on the Cboe Titanium U.S. Options Opening Process Feed as this feed contains only unsequenced messages.

# Protocol

C1 Options customers may receive the Cboe Titanium U.S. Options Opening Process Feed protocol over multicast to receive auction update and summary execution information.

## Message Format

Cboe Titanium U.S. Options Opening Process Feed protocol messages are delivered unsequenced and may not be retrieved if missed.

All UDP delivered events will be self-contained. Developers can assume that UDP delivered data will not cross frame boundaries and a single Ethernet frame will contain only one Sequenced Unit Header with associated data.

The Cboe Titanium U.S. Options Opening Process Feed is comprised of a series of dynamic length un-sequenced messages. Each message begins with **Length** and **Message Type** fields. Cboe reserves the right to add message types and grow the length of any message without notice. Customers should develop their decoders to handle unknown message types and messages beyond the expected length. Messages will only be grown to add additional data to the end of a message.

## Data Types

The following field types are used within the **Sequenced Unit Header** and PITCH 2.X.

- Alphanumeric fields are left justified ASCII fields and space padded on the right.
- Binary fields are unsigned and sized to Length bytes and ordered using Little Endian convention (least significant byte first).
- Binary Long Price fields are unsigned Little Endian encoded 8 byte binary fields with 4 implied decimal places (denominator=10,000).
- Multiplier fields are unsigned Little Endian encoded 4 byte binary fields with 1 implied decimal place (denominator=10).
- Printable ASCII fields are left justified ASCII fields that are space padded on the right that may include ASCII values in the range of 0x20 - 0x7e.
- Binary Date fields are 4 byte unsigned Little Endian values where the base-10 representation is the YYYYMMDD representation of that date. For example, October 30, 2023 would be represented as 20,231,030 (20231030).
- Time Offset fields are 4 byte unsigned Little Endian values that represent the number of nanoseconds since the last **Time** message. These fields are populated to nanosecond precision. For example, a nano time of 1,737,580,407,123,456,789 ("Wednesday, January 22, 2025 9:13:27.123456789") would return value = 123456789.

## Message Framing

Messages will be combined into single UDP frame where possible to decrease message overhead and total bandwidth. The count of messages in a UDP frame will be communicated using the **Sequenced Unit Header**. Framing will be determined by the server for each site. The content of the multicast across feeds (e.g. C/D WAN-Shaped) will be identical, but framing will not be consistent across feeds.

## Sequenced Unit Header

**Sequenced Unit Header** is used for all Cboe Titanium U.S. Options Opening Process Feed messages.

This feed will deliver only unsequenced data using the **Sequenced Unit Header**. Unsequenced headers will have a 0 value for the sequence field and unit field.

**Table 1. Sequenced Unit Header**

| Field | Offset | Length | Value/Type | Description |
|-------|--------|--------|------------|-------------|
|-------|--------|--------|------------|-------------|

| Field                      | Offset | Length | Value/Type | Description                                                                                              |
|----------------------------|--------|--------|------------|----------------------------------------------------------------------------------------------------------|
| <b><i>Hdr Length</i></b>   | 0      | 2      | Binary     | Length of entire block of messages. Includes this header and <b><i>Hdr Count</i></b> messages to follow. |
| <b><i>Hdr Count</i></b>    | 2      | 1      | Binary     | Number of messages to follow this header.                                                                |
| <b><i>Hdr Unit</i></b>     | 3      | 1      | Binary     | Unit that applies to messages included in this header.                                                   |
| <b><i>Hdr Sequence</i></b> | 4      | 4      | Binary     | Will be zero.                                                                                            |
| Total Length = 8 bytes     |        |        |            |                                                                                                          |

## Heartbeat Messages

The **Sequenced Unit Header** with a count field set to 0 will be used for heartbeat messages. During trading hours heartbeat messages will be sent if no data has been delivered within 1 second. Heartbeat messages never increment the sequence number.

Outside of trading hours Cboe sends heartbeat messages are sent to help users validate multicast connectivity. Heartbeat messages may not be sent from 12:00 a.m. - 1:00 a.m. ET or during maintenance windows.

# Cboe U.S. Options Opening Process Feed Messages

## Time Reference

The **Time Reference** message is used to provide a midnight reference point for recipients of the feed. It is sent whenever the system starts up and when the system crosses a midnight boundary. All subsequent **Time** messages for the same unit will use the last **Midnight Reference** until another **Time Reference** message is received for that unit. The **Time Reference** message includes the **Trade Date**, so most other sequenced messages will not include that information.

**Time Reference** messages will be included in a spin response.

Table 1. Time Reference

| Field Name                | Offset | Length | Type/(Value) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------|--------|--------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Length</b>             | 0      | 1      | Binary       | <b>Length</b> of this message including this field.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Message Type</b>       | 1      | 1      | 0xB1         | <b>Time Reference</b> Message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Midnight Reference</b> | 2      | 4      | Binary       | Midnight Eastern Time reference time for subsequent <b>Time</b> messages, expressed as number of whole seconds since the Epoch (Midnight January 1, 1970 UTC).                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Time</b>               | 6      | 4      | Binary       | Number of whole seconds elapsed since the start of the current Eastern Time calendar day, derived by converting the current Eastern wall clock time (HH:MM:SS) to seconds.<br><br>On Daylight Saving Time transition days, <b>Time</b> reflects wall clock seconds and does not adjust for the UTC offset change. On a DST spring-forward day, the maximum value will be 82,799 (23 hours). On a DST fall-back day, values between 3,600 and 7,199 will appear twice. Recipients requiring unambiguous absolute timestamps should use <b>Epoch Time</b> (where available) or <b>Midnight Reference</b> in the <b>Time Reference</b> message. |
| <b>Time Offset</b>        | 10     | 4      | Time Offset  | Nanosecond offset from last unit timestamp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Trade Date</b>         | 14     | 4      | Binary Date  | Current Trade Date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Total Length=18 bytes     |        |        |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Time

A **Time** message is sent whenever the source time for a unit passes over a second boundary. The **Time** field is the number of seconds relative to midnight Eastern Time. All subsequent time offset fields for the same unit will use the new **Time** value as the base until another **Time** message is received for the same unit. The **Time** message will also include the **Epoch Time** field, which is the current time represented as the number of whole seconds since the Epoch (midnight January 1, 1970).

A trading day may span multiple calendar days. Therefore, C1 options market data recipients must prepare for a crossing of the midnight ET boundary. At such time, a new **Time Reference** message will be sent and the **Time** field in subsequent **Time** messages will reset to reflect the number of seconds from the most recent midnight ET time.

Table 1. Time

| Field Name    | Offset | Length | Type/(Value) | Description                                        |
|---------------|--------|--------|--------------|----------------------------------------------------|
| <b>Length</b> | 0      | 1      | Binary       | <b>Length</b> of this message including this field |

| Field Name              | Offset | Length | Type/(Value) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|--------|--------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message Type</b>     | 1      | 1      | 0x20         | <b>Time</b> Message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Time</b>             | 2      | 4      | Binary       | Number of whole seconds elapsed since the start of the current Eastern Time calendar day, derived by converting the current Eastern wall clock time (HH:MM:SS) to seconds.<br><br>On Daylight Saving Time transition days, <b>Time</b> reflects wall clock seconds and does not adjust for the UTC offset change. On a DST spring-forward day, the maximum value will be 82,799 (23 hours). On a DST fall-back day, values between 3,600 and 7,199 will appear twice. Recipients requiring unambiguous absolute timestamps should use <b>Epoch Time</b> (where available) or <b>Midnight Reference</b> in the <b>Time Reference</b> message. |
| <b>Epoch Time</b>       | 6      | 4      | Binary       | Number of whole seconds since the Epoch (midnight January 1, 1970 UTC).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Total Length = 10 bytes |        |        |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Options Auction Update

**Options Auction Update** messages are used to disseminate price and size information and Composite Market bid and offer prices during Opening and Re-Opening (halt) auctions on the Cboe Options Exchange. **Options Auction Update** messages are sent every five seconds during an opening period provided that one of the field values has changed. When no values have changed, a message is sent once every 60 seconds. Refer to the [Cboe Titanium U.S. Options Opening Process](#) for more information.

The **Options Auction Update** message has the following format:

**Table 1. Options Auction Update**

| Field Name                | Offset | Length | Type/(Value)      | Description                                                                                                                                                            |
|---------------------------|--------|--------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Length</b>             | 0      | 1      | Binary            | <b>Length</b> of this message including this field.                                                                                                                    |
| <b>Message Type</b>       | 1      | 1      | 0xD1              | <b>Options Auction Update</b> Message                                                                                                                                  |
| <b>Time Offset</b>        | 2      | 4      | Time Offset       | Nanosecond offset from last unit timestamp.                                                                                                                            |
| <b>Symbol</b>             | 6      | 8      | Printable ASCII   | <b>Symbol</b> right padded with spaces.                                                                                                                                |
| <b>Auction Type</b>       | 14     | 1      | Alphanumeric      | G=GTH Opening<br>O=RTH Opening<br>H=Halt Re-Opening<br>V=Volatility Opening                                                                                            |
| <b>Reference Price</b>    | 15     | 8      | Binary Long Price | Collared VMIM price computed on the queuing book only.                                                                                                                 |
| <b>Buy Contracts</b>      | 23     | 4      | Binary            | Cumulative Buy contracts at the <b>Reference Price</b> and above.                                                                                                      |
| <b>Sell Contracts</b>     | 27     | 4      | Binary            | Cumulative Sell contracts at the <b>Reference Price</b> and below.                                                                                                     |
| <b>Indicative Price</b>   | 31     | 8      | Binary Long Price | Collared VMIM price computed on the combined queuing book and the continuous book. Equal to <b>Reference Price</b> for options that do not have a GTH trading session. |
| <b>Auction Only Price</b> | 39     | 8      | Binary Long Price | Uncollared VMIM price computed on the queuing book only.                                                                                                               |

| Field Name                          | Offset | Length | Type/(Value)      | Description                                                                                                     |
|-------------------------------------|--------|--------|-------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Opening Condition</b>            | 47     | 1      | Alphanumeric      | O=Would open<br>Q=Need quote to open<br>B=Need more buyers<br>S=Need more sellers<br>C=Crossed Composite Market |
| <b>Composite Market Bid Price</b>   | 48     | 8      | Binary Long Price | Bid Price of the prevailing Composite Market                                                                    |
| <b>Composite Market Offer Price</b> | 56     | 8      | Binary Long Price | Offer Price of the prevailing Composite Market.                                                                 |
| Total Length=64 bytes               |        |        |                   |                                                                                                                 |

## Auction Summary

**Auction Summary** messages are used to disseminate the results of an auction. An Opening or Re-Opening **Auction Summary** message for each symbol is sent at the conclusion of its Opening or Re-Opening auction and represents the Cboe Opening Price.

The **Auction Summary** message has the following format:

**Table 1. Auction Summary**

| Field Name            | Offset | Length | Type/(Value)      | Description                                                                 |
|-----------------------|--------|--------|-------------------|-----------------------------------------------------------------------------|
| <b>Length</b>         | 0      | 1      | Binary            | Length of this message including this field.                                |
| <b>Message Type</b>   | 1      | 1      | 0x96              | <b>Auction Summary</b> Message                                              |
| <b>Time Offset</b>    | 2      | 4      | Time Offset       | Nanosecond offset from last unit timestamp.                                 |
| <b>Symbol</b>         | 6      | 8      | Printable ASCII   | <b>Symbol</b> right padded with spaces.                                     |
| <b>Auction Type</b>   | 14     | 1      | Alphanumeric      | G=GTH Opening<br>O=RTH Opening<br>H=Halt Re-Opening<br>V=Volatility Opening |
| <b>Price</b>          | 15     | 8      | Binary Long Price | Auction price.                                                              |
| <b>Quantity</b>       | 23     | 4      | Binary            | Cumulative number of contracts executed during the auction.                 |
| Total Length=27 bytes |        |        |                   |                                                                             |

## Width Update

The **Width Update** message is used to communicate the opening quote width multiplier. This message will be sent at the beginning of the day for all underlyings and in the event that the exchange decides to change the quote width multiplier on a per underlying basis. For complete details on the opening collars, see the [Cboe Titanium U.S. Options Opening Process](#).

**Table 1. Width Update**

| Field Name          | Offset | Length | Type/(Value)    | Description                                         |
|---------------------|--------|--------|-----------------|-----------------------------------------------------|
| <b>Length</b>       | 0      | 1      | Binary          | <b>Length</b> of this message including this field. |
| <b>Message Type</b> | 1      | 1      | 0xD2            | <b>Width Update</b> Message                         |
| <b>Time Offset</b>  | 2      | 4      | Time Offset     | Nanosecond offset from last unit timestamp.         |
| <b>Underlying</b>   | 6      | 8      | Printable ASCII | Underlying right padded with spaces.                |
| <b>Width Type</b>   | 14     | 1      | Alphanumeric    | R=Regular<br>V=Volatility                           |

| Field Name            | Offset | Length | Type/(Value) | Description       |
|-----------------------|--------|--------|--------------|-------------------|
| <b>Multiplier</b>     | 15     | 4      | Multiplier   | Width multiplier. |
| Total Length=19 bytes |        |        |              |                   |

## Symbol Mapping

A **Symbol Mapping** message is used to map the 6 character multicast feed symbol field to an OSI symbol. These messages are sent continuously through the day at variable rates as bandwidth allows.

**Table 1. Symbol Mapping**

| Field Name              | Offset | Length | Type/(Value)    | Description                                        |
|-------------------------|--------|--------|-----------------|----------------------------------------------------|
| <b>Length</b>           | 0      | 1      | Binary          | <b>Length</b> of this message including this field |
| <b>Message Type</b>     | 1      | 1      | 0x2E            | <b>Symbol Mapping</b> Message                      |
| <b>Feed Symbol</b>      | 2      | 6      | Printable ASCII | Symbol right padded with spaces                    |
| <b>OSI Symbol</b>       | 8      | 21     | Printable ASCII | OSI Symbol                                         |
| <b>Symbol Condition</b> | 29     | 1      | Alphanumeric    | N = Normal<br>C = Closing Only                     |
| <b>Underlying</b>       | 30     | 8      | Alphanumeric    | Underlying right padded with spaces.               |
| Total Length = 38 bytes |        |        |                 |                                                    |

## End of Session

The **End of Session** message is sent for the feed when all the units have shut down. No more auction messages will be delivered for this feed.

**Table 1. End of Session**

| Field Name             | Offset | Length | Type/(Value) | Description                                        |
|------------------------|--------|--------|--------------|----------------------------------------------------|
| <b>Length</b>          | 0      | 1      | Binary       | <b>Length</b> of this message including this field |
| <b>Message Type</b>    | 1      | 1      | 0x2D         | <b>End of Session</b> Message                      |
| <b>Timestamp</b>       | 2      | 4      | Binary       | Nanosecond offset from last timestamp              |
| Total Length = 6 bytes |        |        |              |                                                    |

## SOQ Strike Range Update

The **SOQ Strike Range Update** message is only available on the C1 Exchange. This message disseminates the minimum and maximum strike prices in the strike price range used to calculate the Special Opening Quote ( SOQ) on a Volatility Settlement date. In the event that multiple distinct SOQ calculations occur on the same day, the applicable SOQ is differentiated by the **SOQ Identifier** field, which is set to the CSMi symbol on which the final settlement SOQ value is disseminated

The **SOQ Strike Range Update** message has the following format:

**Table 1. SOQ Strike Range Update**

| Field Name            | Offset | Length | Type/(Value)    | Description                                                     |
|-----------------------|--------|--------|-----------------|-----------------------------------------------------------------|
| <b>Length</b>         | 0      | 1      | Binary          | Length of this message including this field                     |
| <b>Message Type</b>   | 1      | 1      | 0x9D            | <b>SOQ Strike Range Update</b> Message                          |
| <b>Time Offset</b>    | 2      | 4      | Time Offset     | Nanosecond offset from last unit timestamp                      |
| <b>SOQ Identifier</b> | 6      | 20     | Printable ASCII | Dissemination symbol of the final SOQ right padded with spaces. |

| Field Name                | Offset | Length | Type/(Value)      | Description            |
|---------------------------|--------|--------|-------------------|------------------------|
| <b>Lower Strike Price</b> | 26     | 8      | Binary Long Price | SOQ lower strike price |
| <b>Upper Strike Price</b> | 34     | 8      | Binary Long Price | SOQ upper strike price |
| Total Length=42 bytes     |        |        |                   |                        |

## Constituent Symbol Mapping

The **Constituent Symbol Mapping** message is only available on the C1 Exchange. This message is used to communicate which options series (if any) are Constituent Series in a Volatility Settlement Special Opening Quote (SOQ). The message is identical to the **Symbol Mapping** message with the addition of the **SOQ Identifier** field, which is set to the CSMi symbol on which the final settlement SOQ value is disseminated. The **Constituent Symbol Mapping** message is sent as an unsequenced message with one message sent for each Constituent Series in a continuous loop as bandwidth allows.

The **Constituent Symbol Mapping** message has the following format:

**Table 1. Constituent Symbol Mapping**

| Field Name              | Offset | Length | Type/(Value)    | Description                                                     |
|-------------------------|--------|--------|-----------------|-----------------------------------------------------------------|
| <b>Length</b>           | 0      | 1      | Binary          | Length of this message including this field.                    |
| <b>Message Type</b>     | 1      | 1      | 0x9E            | <b>Constituent Symbol Mapping</b> Message                       |
| <b>Feed Symbol</b>      | 2      | 6      | Printable ASCII | <b>Symbol</b> right padded with spaces                          |
| <b>OSI Symbol</b>       | 8      | 21     | Printable ASCII | OSI Symbol                                                      |
| <b>Symbol Condition</b> | 29     | 1      | Alphanumeric    | N = Normal<br>C = Closing Only                                  |
| <b>Underlying</b>       | 30     | 8      | Alphanumeric    | Symbol of underlying equity right padded with spaces.           |
| <b>SOQ Identifier</b>   | 38     | 20     | Printable ASCII | Dissemination symbol of the final SOQ right padded with spaces. |
| Total Length = 58 bytes |        |        |                 |                                                                 |

## Message Types

|      |                            |
|------|----------------------------|
| 0xB1 | Time Reference             |
| 0x20 | Time                       |
| 0xD1 | Options Auction Update     |
| 0x96 | Auction Summary            |
| 0xD2 | Width Update               |
| 0x2E | Symbol Mapping             |
| 0x2D | End of Session             |
| 0x9D | SOQ Strike Range Update    |
| 0x9E | Constituent Symbol Mapping |

## Example Messages

Each of the following message types must be wrapped by a sequenced unit header as described in [Sequenced Unit Header](#). Note that in the following examples, each byte is represented by two hexadecimal digits.

### Sequenced Unit Header

| Field        | Value       | Value Description          |
|--------------|-------------|----------------------------|
| Hdr Length   | 31 00       | 49 bytes, including header |
| Hdr Count    | 02          | 2 messages to follow       |
| Hdr Unit     | 01          | Unit 1                     |
| Hdr Sequence | 00 00 00 00 | Always set to zero         |

### Time Reference

| Field          | Value       | Value Description                            |
|----------------|-------------|----------------------------------------------|
| Length         | 12          | 18 bytes                                     |
| Type           | B1          | Time Reference                               |
| Midnight       | D0 8B 34 60 | 2021-02-23 00:00:00                          |
| Reference Time |             | Eastern (1614056400 seconds since the Epoch) |
| Time           | 00 E1 00 00 | 16:00:00                                     |
| Time Offset    | 00 00 00 00 | Exactly 16:00:00                             |
| Trade Date     | 2F 62 34 01 | 2021-02-23 February 23, 2021                 |

### Time Message

| Field  | Value       | Value Description                 |
|--------|-------------|-----------------------------------|
| Length | 06          | 6 bytes                           |
| Type   | 20          | Time                              |
| Time   | 98 85 00 00 | 34,200 seconds = 09:30 AM Eastern |

### Time Message

| Field      | Value       | Value Description                     |
|------------|-------------|---------------------------------------|
| Length     | 10          | 10 bytes                              |
| Type       | 20          | Time                                  |
| Time       | 98 85 00 00 | 34,200 seconds = 09:30 AM Eastern     |
| Epoch Time | 68 11 35 60 | 1,614,090,600 seconds since the Epoch |

### Options Auction Update

| Field  | Value | Value Description      |
|--------|-------|------------------------|
| Length | 40    | 64 bytes               |
| Type   | D1    | Options Auction Update |

| Field                        | Value                   | Value Description                  |
|------------------------------|-------------------------|------------------------------------|
| Time Offset                  | 18 D2 06 00             | 447,000 ns since last Time Message |
| Symbol                       | 30 30 6D 45 56 4F       | 00mEVO                             |
| Auction Type                 | 56                      | Volatility Auction                 |
| Reference Price              | E8 A3 0F 00 00 00 00 00 | \$102.50                           |
| Buy Contracts                | 64 00 00 00             | 100 Contracts                      |
| Sell Contracts               | C8 00 00 00             | 200 Contracts                      |
| Indicative Price             | E8 A3 0F 00 00 00 00 00 | \$102.50                           |
| Auction Only Price           | E8 A3 0F 00 00 00 00 00 | \$102.50                           |
| Opening Condition            | 4F                      | O = Would Open                     |
| Composite Market Bid Price   | 50 69 0F 00 00 00 00 00 | \$101.00                           |
| Composite Market Offer Price | 70 B7 0F 00 00 00 00 00 | \$103.00                           |

## Auction Summary

| Field        | Value                   | Value Description                 |
|--------------|-------------------------|-----------------------------------|
| Length       | 1B                      | 27 bytes                          |
| Type         | 96                      | Auction Summary                   |
| Time Offset  | 18 D2 06 00             | 447,000 ns since lastTime Message |
| Symbol       | 30 30 6D 45 56 5F 20 20 | 00mEVO                            |
| Auction Type | 4F                      | O = Opening                       |
| Price        | E8 A3 0F 00 00 00 00 00 | \$102.50                          |
| Quantity     | 4B 00 00 00             | 75                                |

## Width Update

| Field       | Value                   | Value Description                 |
|-------------|-------------------------|-----------------------------------|
| Length      | 13                      | 19 bytes                          |
| Type        | D2                      | Width Update                      |
| Time Offset | 18 D2 06 00             | 447,000 ns since lastTime Message |
| Underlying  | 5A 56 5A 5A 54 20 20 20 | ZVZZT                             |
| Width Type  | 52                      | R = Regular                       |
| Multiplier  | 0F 00 00 00             | Multiplier of 1.5                 |

## Symbol Mapping

| Field               | Value                                                          | Value Description    |
|---------------------|----------------------------------------------------------------|----------------------|
| Length              | 26                                                             | 38 bytes             |
| Type                | 2E                                                             | Symbol Mapping       |
| MessageFeed Symbol  | 30 30 6D 45 56 4F                                              | 00mEVO               |
| OSI Symbol          | 4D 53 46 54 20 20 31 39 30 39 32 30 43 30 30 31 35 30 30 30 30 | MSFT 190920C00150000 |
| Symbol              | 4E                                                             | 'N' - Closing Only   |
| ConditionUnderlying | 4D 53 46 54 20 20 20 20                                        | MSFT                 |

# End of Session

Table 1. End of Session

| Field       | Value       | Value Description                  |
|-------------|-------------|------------------------------------|
| Length      | 06          | 6 bytes                            |
| Type        | 2D          | End of Session                     |
| Time Offset | 18 D2 06 00 | 447,000 ns since last Time Message |

# SOQ Strike Range Update

| Field              | Value                                                       | Value Description                  |
|--------------------|-------------------------------------------------------------|------------------------------------|
| Length             | 2A                                                          | 42 bytes                           |
| Type               | 9D                                                          | SOQ Strike Range Update            |
| Time Offset        | 18 D2 06 00                                                 | 447,000 ns since last Time Message |
| SOQ Identifier     | 56 58 53 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 | VXS                                |
| Lower Strike Price | 40 66 03 01 00 00 00 00                                     | \$1,700                            |
| Upper Strike Price | 00 48 E8 01 00 00 00 00                                     | \$3,200                            |

# Constituent Symbol Mapping

| Field               | Value                                                          | Value Description                  |
|---------------------|----------------------------------------------------------------|------------------------------------|
| Length              | 3A                                                             | 58 bytes                           |
| Type                | 9E                                                             | Constituent Symbol Mapping Message |
| Feed Symbol         | 30 30 6D 45 56 4F                                              | 00mEVO                             |
| OSI Symbol          | 53 50 58 57 20 20 31 39 30 39 32 37 43 30 32 33 39 30 30 30 30 | SPXW 190927C02390000               |
| Symbol              | 4E                                                             | 'N' - Normal                       |
| ConditionUnderlying | 53 50 58 20 20 20 20 20                                        | SPX                                |
| SOQ Identifier      | 56 58 53 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20    | VXS                                |

# Multicast Configuration

## US Options Production Environment Configuration

### C1 Unit/Product Distribution

| Unit | C1 Symbol Range                                                                                                                                                                       | C1 Exceptions                                                        |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| 1    | A - AIPA~                                                                                                                                                                             |                                                                      |
| 2    | AIPB - AO~                                                                                                                                                                            |                                                                      |
| 3    | AP - AVGO~                                                                                                                                                                            |                                                                      |
| 4    | AVGP - BOIL~                                                                                                                                                                          |                                                                      |
| 5    | BOIM - CMPR~                                                                                                                                                                          | Excludes CBTX, CBTXW                                                 |
| 6    | CMPS - CSIQ~                                                                                                                                                                          |                                                                      |
| 7    | CSIR - DJTA~                                                                                                                                                                          |                                                                      |
| 8    | DJTB - FARO~                                                                                                                                                                          | Excludes DJX, DJXW                                                   |
| 9    | FARP - GLC~                                                                                                                                                                           |                                                                      |
| 10   | GLD - HAYW~                                                                                                                                                                           |                                                                      |
| 11   | HAYX - IYWA~                                                                                                                                                                          | Excludes IWM                                                         |
| 12   | IYWB - LMTA~                                                                                                                                                                          |                                                                      |
| 13   | LMTB - MES~                                                                                                                                                                           | Excludes MBTX, MBTXW                                                 |
| 14   | MET - MRM~                                                                                                                                                                            | Excludes MGTN, MGTNW                                                 |
| 15   | MRN - MSTR~                                                                                                                                                                           | Excludes MRUT                                                        |
| 16   | MSTS - NKEA~                                                                                                                                                                          | Excludes NANOS                                                       |
| 17   | NKEB - PDC~                                                                                                                                                                           | Excludes NVDA, OEX                                                   |
| 18   | PDD - RDDS~                                                                                                                                                                           | Excludes QQQ                                                         |
| 19   | RDDT - SEAA~                                                                                                                                                                          | Excludes RLG, RLV, RUI, RUT/RUTW                                     |
| 20   | SEAB - SMHA~                                                                                                                                                                          | Excludes SIXB, SIXC, SIXE, SIXI, SIXR, SIXRE, SIXT, SIXU, SIXV, SIXY |
| 21   | SMHB - TEQ~                                                                                                                                                                           | Excludes SPEQX, SPESG, SPX/SPXW, SPY                                 |
| 22   | TER - TTC~                                                                                                                                                                            | Excludes TSLA                                                        |
| 23   | TTD - VB~                                                                                                                                                                             | Excludes UKXM                                                        |
| 24   | VC - WYNN~                                                                                                                                                                            | Excludes VIX, VIXW                                                   |
| 25   | WYNO - Z~                                                                                                                                                                             | Excludes XEO, XSP, XSPBW                                             |
| 26   | NVDA                                                                                                                                                                                  |                                                                      |
| 27   | TSLA                                                                                                                                                                                  |                                                                      |
| 28   | QQQ                                                                                                                                                                                   |                                                                      |
| 29   | IWM                                                                                                                                                                                   |                                                                      |
| 30   | SPY                                                                                                                                                                                   |                                                                      |
| 31   | CBTX, CBTXW, DJX, DJXW, MBTX, MBTXW, MGTN, MGTNW, MRUT, NDX, OEX, RLG, RLV, RUI, RUT, RUTW, SIXB, SIXC, SIXE, SIXI, SIXR, SIXRE, SIXT, SIXU, SIXV, SIXY, SPEQX, SPESG, UKXM, XEO, XND |                                                                      |
| 32   | NANOS, VIX, VIXW, XSP, XSPBW                                                                                                                                                          |                                                                      |

| Unit | C1 Symbol Range                 | C1 Exceptions |
|------|---------------------------------|---------------|
| 33   | SPX                             |               |
| 34   | SPXW                            |               |
| 35   | SPX/SPXW, Cross Product Spreads |               |

Note - Cboe reserves the right to add units and/or change symbol distribution with 48 hours of notice and no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

### C1 Options Production Multicast Routing Parameters

| Data Center                      | Rendezvous Point |
|----------------------------------|------------------|
| NY5 Primary Data Center A feed   | 74.115.128.183   |
| NY5 Primary Data Center B feed   | 74.115.128.184   |
| CH4 Secondary Data Center E feed | 174.136.181.249  |

### C1 Options Production Address/Unit Distribution

The following tables describe the unit distribution across the C1 Options Opening Process Feed.

| NY5 Primary Datacenter |         | WAN Shaped [CCO]<br>170.137.114.80 /28 | WAN Shaped [CDO]<br>170.137.115.80 /28 |
|------------------------|---------|----------------------------------------|----------------------------------------|
| Unit                   | IP Port | Real-time MC                           | Real-time MC                           |
| 1                      | 30551   | 224.0.74.94                            | 233.182.199.222                        |
| 2                      | 30552   |                                        |                                        |
| 3                      | 30553   |                                        |                                        |
| 4                      | 30554   |                                        |                                        |
| 5                      | 30555   |                                        |                                        |
| 6                      | 30556   |                                        |                                        |
| 7                      | 30557   |                                        |                                        |
| 8                      | 30558   |                                        |                                        |
| 9                      | 30559   |                                        |                                        |
| 10                     | 30560   |                                        |                                        |
| 11                     | 30561   |                                        |                                        |
| 12                     | 30562   |                                        |                                        |
| 13                     | 30563   |                                        |                                        |
| 14                     | 30564   |                                        |                                        |
| 15                     | 30565   |                                        |                                        |
| 16                     | 30566   |                                        |                                        |
| 17                     | 30567   |                                        |                                        |
| 18                     | 30568   |                                        |                                        |
| 19                     | 30569   |                                        |                                        |
| 20                     | 30570   |                                        |                                        |
| 21                     | 30571   |                                        |                                        |
| 22                     | 30572   |                                        |                                        |

| NY5 Primary Datacenter |         | WAN Shaped [CCO]<br>170.137.114.80 /28 | WAN Shaped [CDO]<br>170.137.115.80 /28 |
|------------------------|---------|----------------------------------------|----------------------------------------|
| Unit                   | IP Port | Real-time MC                           | Real-time MC                           |
| 23                     | 30573   |                                        |                                        |
| 24                     | 30574   |                                        |                                        |
| 25                     | 30575   |                                        |                                        |
| 26                     | 30576   |                                        |                                        |
| 27                     | 30577   |                                        |                                        |
| 28                     | 30578   |                                        |                                        |
| 29                     | 30579   |                                        |                                        |
| 30                     | 30580   |                                        |                                        |
| 31                     | 30581   |                                        |                                        |
| 32                     | 30582   |                                        |                                        |
| 33                     | 30583   |                                        |                                        |
| 34                     | 30584   |                                        |                                        |
| 35                     | 30585   |                                        |                                        |

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

| CH4 Secondary Datacenter |         | WAN Shaped [CEO]<br>170.137.124.224/28 |
|--------------------------|---------|----------------------------------------|
| Unit                     | IP Port | Real-time MC                           |
| 1                        | 31551   | 233.19.3.254                           |
| 2                        | 31552   |                                        |
| 3                        | 31553   |                                        |
| 4                        | 31554   |                                        |
| 5                        | 31555   |                                        |
| 6                        | 31556   |                                        |
| 7                        | 31557   |                                        |
| 8                        | 31558   |                                        |
| 9                        | 31559   |                                        |
| 10                       | 31560   |                                        |
| 11                       | 31561   |                                        |
| 12                       | 31562   |                                        |
| 13                       | 31563   |                                        |
| 14                       | 31564   |                                        |
| 15                       | 31565   |                                        |
| 16                       | 31566   |                                        |
| 17                       | 31567   |                                        |
| 18                       | 31568   |                                        |
| 19                       | 31569   |                                        |
| 20                       | 31570   |                                        |

| CH4 Secondary Datacenter |         | WAN Shaped [CEO]<br>170.137.124.224/28 |
|--------------------------|---------|----------------------------------------|
| Unit                     | IP Port | Real-time MC                           |
| 21                       | 31571   |                                        |
| 22                       | 31572   |                                        |
| 23                       | 31573   |                                        |
| 24                       | 31574   |                                        |
| 25                       | 31575   |                                        |
| 26                       | 31576   |                                        |
| 27                       | 31577   |                                        |
| 28                       | 31578   |                                        |
| 29                       | 31579   |                                        |
| 30                       | 31580   |                                        |
| 31                       | 31581   |                                        |
| 32                       | 31582   |                                        |
| 33                       | 31583   |                                        |
| 34                       | 31584   |                                        |
| 35                       | 31585   |                                        |

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

## US Options Certification Environment Configuration

### C1 Unit/Product Distribution

| Unit | C1 Symbol Range | C1 Exceptions        |
|------|-----------------|----------------------|
| 1    | A - AIPA~       |                      |
| 2    | AIPB - AO~      |                      |
| 3    | AP - AVGO~      |                      |
| 4    | AVGP - BOIL~    |                      |
| 5    | BOIM - CMPR~    | Excludes CBTX, CBTXW |
| 6    | CMPS - CSIQ~    |                      |
| 7    | CSIR - DJTA~    |                      |
| 8    | DJTB - FARO~    | Excludes DJX, DJXW   |
| 9    | FARP - GLC~     |                      |
| 10   | GLD - HAYW~     |                      |
| 11   | HAYX - IYWA~    | Excludes IWM         |
| 12   | IYWB - LMTA~    |                      |
| 13   | LMTB - MES~     | Excludes MBTX, MBTXW |
| 14   | MET - MRM~      | Excludes MGTN, MGTNW |
| 15   | MRN - MSTR~     | Excludes MRUT        |
| 16   | MSTS - NKEA~    | Excludes NANOS       |
| 17   | NKEB - PDC~     | Excludes NVDA, OEX   |

| Unit | C1 Symbol Range                                                                                                                                                                       | C1 Exceptions                                                        |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| 18   | PDD - RDDS~                                                                                                                                                                           | Excludes QQQ                                                         |
| 19   | RDDT - SEAA~                                                                                                                                                                          | Excludes RLG, RLV, RUI, RUT/RUTW                                     |
| 20   | SEAB - SMHA~                                                                                                                                                                          | Excludes SIXB, SIXC, SIXE, SIXI, SIXR, SIXRE, SIXT, SIXU, SIXV, SIXY |
| 21   | SMHB - TEQ~                                                                                                                                                                           | Excludes SPEQX, SPESG, SPX/SPXW, SPY                                 |
| 22   | TER - TTC~                                                                                                                                                                            | Excludes TSLA                                                        |
| 23   | TTD - VB~                                                                                                                                                                             | Excludes UKXM                                                        |
| 24   | VC - WYNN~                                                                                                                                                                            | Excludes VIX, VIXW                                                   |
| 25   | WYNO - Z~                                                                                                                                                                             | Excludes XEO, XSP, XSPBW                                             |
| 26   | NVDA                                                                                                                                                                                  |                                                                      |
| 27   | TSLA                                                                                                                                                                                  |                                                                      |
| 28   | QQQ                                                                                                                                                                                   |                                                                      |
| 29   | IWM                                                                                                                                                                                   |                                                                      |
| 30   | SPY                                                                                                                                                                                   |                                                                      |
| 31   | CBTX, CBTXW, DJX, DJXW, MBTX, MBTXW, MGTN, MGTNW, MRUT, NDX, OEX, RLG, RLV, RUI, RUT, RUTW, SIXB, SIXC, SIXE, SIXI, SIXR, SIXRE, SIXT, SIXU, SIXV, SIXY, SPEQX, SPESG, UKXM, XEO, XND |                                                                      |
| 32   | NANOS, VIX, VIXW, XSP, XSPBW                                                                                                                                                          |                                                                      |
| 33   | SPX                                                                                                                                                                                   |                                                                      |
| 34   | SPXW                                                                                                                                                                                  |                                                                      |
| 35   | SPX/SPXW, Cross Product Spreads                                                                                                                                                       |                                                                      |

Note - Cboe reserves the right to add units and/or change symbol distribution with 48 hours of notice and no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

## C1 Options Certification Multicast Routing Parameters

| Data Center                   | Rendezvous Point |
|-------------------------------|------------------|
| NY5 Certification Data Center | 74.115.128.131   |

## C1 Options Certification Address/Unit Distribution

The following tables describe the unit distribution across the C1 Options Certification Opening Process Feed.

| NY5 Primary Datacenter |         | Certification<br>170.137.126.16/28 |
|------------------------|---------|------------------------------------|
| Unit                   | IP Port | Real-time MC                       |
| 1                      | 32551   | 233.103.126.20                     |
| 2                      | 32552   |                                    |
| 3                      | 32553   |                                    |
| 4                      | 32554   |                                    |
| 5                      | 32555   |                                    |
| 6                      | 32556   |                                    |

| NY5 Primary Datacenter |         | Certification<br>170.137.126.16/28 |
|------------------------|---------|------------------------------------|
| Unit                   | IP Port | Real-time MC                       |
| 7                      | 32557   |                                    |
| 8                      | 32558   |                                    |
| 9                      | 32559   |                                    |
| 10                     | 32560   |                                    |
| 11                     | 32561   |                                    |
| 12                     | 32562   |                                    |
| 13                     | 32563   |                                    |
| 14                     | 32564   |                                    |
| 15                     | 32565   |                                    |
| 16                     | 32566   |                                    |
| 17                     | 32567   |                                    |
| 18                     | 32568   |                                    |
| 19                     | 32569   |                                    |
| 20                     | 32570   |                                    |
| 21                     | 32571   |                                    |
| 22                     | 32572   |                                    |
| 23                     | 32573   |                                    |
| 24                     | 32574   |                                    |
| 25                     | 32575   |                                    |
| 26                     | 32576   |                                    |
| 27                     | 32577   |                                    |
| 28                     | 32578   |                                    |
| 29                     | 32579   |                                    |
| 30                     | 32580   |                                    |
| 31                     | 32581   |                                    |
| 32                     | 32582   |                                    |
| 33                     | 32583   |                                    |
| 34                     | 32584   |                                    |
| 35                     | 32585   |                                    |

Note - Cboe reserves the right to add multicast addresses with prior notice, but no migration period. Notice will be given that the distribution will change on a certain date. Care should be taken to support mappings in these tables via software configuration.

# Connectivity

## Supported Extranet Carriers

The Cboe U.S. Options Opening Process Feed will be made available to customers through extranet carriers that have completed their multicast implementation and certified with Cboe on a per-market basis. Cboe has certified a number of carriers for redistribution of Cboe Multicast data feeds as outlined in the [Cboe Titanium U.S. Equities/Options Connectivity Manual](#). For more information on receiving the Cboe U.S. Options Opening Process Feed through any of these providers, please refer to the vendor contact information noted in the Extranet Providers section of the Connectivity Manual.

## Bandwidth Recommendation

The WAN-shaped feeds require 1Gbps of bandwidth. Cboe will use 90% of these respective bandwidths for Multicast to allow customers to use the same physical connection for FIX order entry if desired.

## References

For more information on Cboe Symbology, please refer to the [Cboe Titanium U.S. Symbology Reference](#).

## Support

Please direct questions or comments regarding this specification to [tradedesk@cboe.com](mailto:tradedesk@cboe.com).

## Revision History

| Document Version | Date     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.0.0            | 11/16/18 | Initial version 1.0.0.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1.0.1            | 02/14/19 | Removed Trading Status from Message Types as it was included in error.<br>Added certification IP addresses and unit distribution information.                                                                                                                                                                                                                                                                                                          |
| 1.0.2            | 03/05/19 | Updated narrative description and field descriptions for <b>Options Auction Update</b> message.                                                                                                                                                                                                                                                                                                                                                        |
| 1.0.3            | 04/15/19 | Added Production IP addresses for C1 Options.                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1.0.4            | 05/08/19 | Corrected C1 Production IP addresses for Primary WAN Shaped [CCO] and [CDO] source network IP addresses.                                                                                                                                                                                                                                                                                                                                               |
| 1.0.5            | 05/14/19 | Updated <b>Options Auction Update</b> message with <b>Opening Condition</b> = C (Crossed Composite Market), and added <b>Composite Market Bid Price</b> and <b>Composite Market Offer Price</b> fields.<br>Added new <b>SOQ Strike Range Update</b> message.<br>Updated example for <b>Options Auction Update</b> and added example for <b>SOQ Strike Range</b> messages.<br>Added additional proprietary products to matching unit 31 in C1.          |
| 1.0.6            | 05/20/19 | Added <b>Constituent Symbol Mapping</b> message with example.                                                                                                                                                                                                                                                                                                                                                                                          |
| 1.0.7            | 09/25/19 | Updated OSI Symbol example values in <b>Symbol Mapping</b> and <b>Constituent Symbol Mapping</b> message type examples.                                                                                                                                                                                                                                                                                                                                |
| 1.0.8            | 02/01/21 | Corrected QQQ, UKXM, and SPESG symbol exclusion entries in Unit Distribution table. Added SPESG to the symbol range entries in Unit Distribution table.<br>Added MRUT to Unit/Symbol Distribution table (effective 03/01/21).<br>Added new updated Unit/Symbol Distribution tables with harmonized symbol ranges (effective 03/22/21).                                                                                                                 |
| 1.0.9            | 03/25/21 | Added Binary Date field type to Section 2.2 - Data Types (effective 10/10/21 TBD 09/27/21 Q3 2021).<br>Added new <b>Time Reference</b> message (effective 10/10/21 TBD 09/27/21 Q3 2021).<br>Added <b>EpochTime</b> field to <b>Time</b> message (effective 10/10/21 TBD 09/27/21 Q3 2021).<br>Updated description of <b>Auction Type</b> field on <b>Options Auction Update</b> and <b>Auction Summary</b> messages (effective TBD 09/27/21 Q3 2021). |
| 1.0.10           | 05/13/21 | Updated Curb session related effective date to TBD 09/27/21.                                                                                                                                                                                                                                                                                                                                                                                           |
| 1.0.11           | 06/15/21 | Updated extended GTH session effective date to 11/21/21.                                                                                                                                                                                                                                                                                                                                                                                               |
| 1.0.12           | 08/25/21 | Updated Curb session effective date to TBD.                                                                                                                                                                                                                                                                                                                                                                                                            |
| 1.0.13           | 09/09/21 | Updated description of <b>Auction Type</b> field on <b>Options Auction Update</b> and <b>Auction Summary</b> messages (effective TBD).                                                                                                                                                                                                                                                                                                                 |
| 1.0.14           | 09/30/21 | Updated effective date for new <b>Time Reference</b> message, <b>EpochTime</b> field on <b>Time</b> message, and Binary Date field type to Section 2.2 - Data Types to 10/10/21.<br>Added new section 1.2 - '24x5 Feed Hours and System Restart ' (effective 10/10/21).                                                                                                                                                                                |
| 1.0.15           | 11/4/21  | Removed note indicating AuctionType value O will be sent prior to Curb session. This value will only be sent for the RTH Opening.                                                                                                                                                                                                                                                                                                                      |
| 1.0.16           | 12/9/21  | Updated hyperlinks to technical specifications.                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1.0.17           | 02/02/22 | Added NANOS to the C1 unit 32 Unit/Product Distribution tables (effective 03/14/22).                                                                                                                                                                                                                                                                                                                                                                   |
| 1.0.18           | 11/07/22 | Moved XSP to the C1 unit 32 Unit/Production Distribution tables (effective 12/04/22).                                                                                                                                                                                                                                                                                                                                                                  |
| 1.0.19           | 03/30/23 | Removed past effective dates.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1.0.20           | 01/29/24 | Added MXACW, MXUSA, and MXWLD to the C1 unit 31 Unit/Product Distribution tables (effective 03/18/24).                                                                                                                                                                                                                                                                                                                                                 |

| Document Version | Date     | Description                                                                                                                                                                                                                                               |
|------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.0.21           | 11/22/24 | Added CBTX, CBTXW, MBTX, and MBTXW to the C1 unit 31 Unit/Product Distribution tables (effective 12/02/24).                                                                                                                                               |
| 1.0.22           | 12/13/24 | Added new Unit/Product Distribution for Units 1-30 (effective 03/31/25).                                                                                                                                                                                  |
| 1.0.23           | 01/15/25 | Updated with Cboe Titanium branding.                                                                                                                                                                                                                      |
| 1.0.24           | 03/25/25 | Added SPEQX to C1 unit 31 <a href="#">unit/product distribution</a> (effective 04/14/25).                                                                                                                                                                 |
| 1.0.25           | 07/08/25 | Added Time Offset data type. Effective 09/08/25, Time Offset fields will be populated to nanosecond precision.                                                                                                                                            |
| 1.0.26           | 10/20/25 | Added MGTN and MGTNW to unit 31 in <a href="#">C1 Unit/Product Distribution</a> and excluded MGTN and MGTNW from unit 14 (effective 12/08/25 <del>TBD 11/17/25</del> ).                                                                                   |
| 1.0.27           | 11/06/25 | Updated MGTN and MGTNW effective date to <del>TBD</del> .                                                                                                                                                                                                 |
| 1.0.28           | 11/18/25 | Updated MGTN and MGTNW effective dates to 12/08/25.                                                                                                                                                                                                       |
| 1.0.29           | 01/12/26 | Updated <a href="#">24x5 Feed Hours and System Restart</a> to document the new time at which persisted orders are added back into the order book (effective 02/02/26).                                                                                    |
| 1.0.30           | 04/01/26 | Removed references to MXEA, MXEF, MXACW, MXUSA, and MXWLD.<br>Updated <b>Time</b> description in <b>Time</b> and <b>Time Reference</b> messages.<br>Added XSPBW to C1 unit 32 Unit/Product Distribution tables (effective 06/15/26 <del>06/01/26</del> ). |
| 1.0.31           | 05/14/26 | Updated XSPBW effective date to 06/15/26.<br>Updated C1 Unit/Product Distribution to include DJXW (effective 05/18/26).                                                                                                                                   |
| 1.0.32           | 07/27/26 | Removed VIX and VIXW exclusion from unit 23 and added VIX and VIXW exclusion to unit 24 C1 Unit/Product Distribution tables.                                                                                                                              |