Cboe Titanium Cboe One Equities Feed Specification

Version 1.4.11

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Contents

Introduction

The Cboe Titanium Cboe One Equities Feed delivers consolidated quote, trade, and Aggregated Depth At Price (ADAP) information for Cboe BYX Equities Exchange (BYX), BZX Equities Exchange (BZX), EDGA Equities Exchange (EDGA), and EDGX Equities Exchange (EDGX) (Cboe One US) and MATCHNow, NEO-L, NEO-N, and NEO-D Trading Books of Cboe Canada Inc. (Cboe One Canada) via TCP/IP and UDP using the binary Cboe One protocol. The feed consists of **`Clear Quote`**, **`Symbol Summary`**, **`Best Quote Update`**, **`Market Status`**, **`ADAP`**, **`RPI`**, **`Trade`**, **`Trade Break`**, **`Trading Status`**, **`Opening/Closing Price`**, and **`End of Day Summary`** messages.

The TCP/IP delivered feed can be used as a standalone product or to augment the UDP feed for recovery and start up purposes. The TCP/IP feed is available from the Cboe One Server and sends a replay of missed trades and refreshes the current state of the Cboe books followed by real-time updates to the books after a connection is established.

The UDP delivered feed is sourced from the Cboe One Feed Server (FS). Users may also connect to the Cboe One Gap Request Proxy for retransmission of missed packets on the UDP feed by the Cboe One Gap Server (GS).

While the TCP/IP and UDP delivered feeds offer equivalent real-time updates with matching sequence numbers, the consumer should assume message framing will be different between the transmission protocols.

It is important to note that the Cboe One feed is an aggregated feed. Updates for a symbol are sent as capacity for the feed allows. The image for a symbol will be current at the time of delivery, but multiple updates maybe combined into a single update. The interval between updates is dependent on the market conditions and the capacity configuration of the particular Cboe One feed.

The Cboe One Feed is available with different combinations of ADAP levels and update rates to meet the needs of our Cboe One US and Canada users.

Table 1. Current Cboe One Feed Descriptions

NAME	BEST QUOTE	ADAP LEVELS	BANDWIDTH
Cboe One US Summary	Yes	0	100Mb
Cboe One US Premium	Yes	5	250Mb
Cboe One Canada Summary	Yes	0	50Mb
Cboe One Canada Premium	Yes	5	125Mb

Cboe One Server (TCP)

The user connects to an assigned host and port using a TCP/IP socket.

Upon connection, the user must send a **`Cboe One Login`** message. The **`Cboe One Login`** message ***Next Sequence*** field allows Cboe One users to specify the next sequence number they expect to receive. If a Cboe One user logs in after trading begins or after connection loss, the ***Next Sequence*** field can be used to tell the server to replay any **`Trade`** and **`Trade Break`** messages that have occurred since the last received **`Trade`** or **`Trade Break`** message.

If the *Next Sequence* field is set to 1 (one), then all **Trade** and **Trade Break** messages from the beginning of the day will be replayed after the server sends a successful **Login Response** message. Once the server has replayed any **Trade** and **Trade Break** messages, it will deliver relevant **Market Status** message information, **RPI** message information, **Trading Status** messages, and a spin of **Symbol Summary**, **Opening/Close Price** and **ADAP** messages from its cache for each active symbol. Then the server will send the user a **Replay Complete** message followed by the live stream of **Symbol Summary**, **Best Quote Update**, **ADAP**, **RPI**, **Trade**, **Trade Break**, **Market Status**, **Trading Status**, **Opening/Closing Price**, and **End of Day Summary** messages.

If the *Next Sequence* field is set to 0 (zero), then no **Trade** or **Trade Break** messages will be replayed after the server sends a successful **Login Response** message. However, Cboe One users may still receive a spin of **Market Status**, **RPI**, **Trading Status**, **Symbol Summary**, **Opening/Close Price** and **ADAP** messages followed by a **Replay Complete** message before receiving the live stream of **Symbol Summary**, **Best Quote Update**, **ADAP**, **RPI**, **Trade**, **Trade Break**, **Market Status**, **Trading Status**, **Opening/Closing Price** , and **End of Day Summary** messages.

If a Cboe One user's process cannot keep up with the Cboe One feed's rate of transmission, the connection will be closed by the server. The user should then reconnect and login with the appropriate *Next Sequence* number to receive any missed trades, and spin of the latest image for all symbols.

Cboe One Feed Server (UDP)

The UDP delivered Cboe One Feed is sourced by the Cboe One Feed Server (FS). The FS generates the multicast events for the Cboe One feed and performs throttling of events to ensure the bandwidth requirements of the feed are not exceeded.

The FS does not receive messages from users and no login is necessary.

Multicast addresses and ports for the Cboe One feed are listed in Cboe One Multicast Addresses on page 48.

Cboe One Gap Request Proxy and Message Retransmission via Gap Server

Requesting delivery of missed data is achieved by connecting to a Cboe One Gap Request Proxy (Cboe One GRP). Cboe One Users who do not wish to request missed messages do not need to connect to a GRP for any reason or listen to the multicast addresses reserved for message retransmission. Users choosing to request missed data will need to connect to their assigned GRP, log in, and request gap ranges as necessary. All gap requests will be responded to with a **`Gap Response`** message. A **`Gap Response`** message *Status* code of Accepted signals that the replayed messages will be delivered via the appropriate gap response multicast address. Any other **`Gap Response`** message *Status* code will indicate the reason that the request cannot be serviced.

Gap requests are limited in message count, frequency, and age by the GRP. Gap requests will only be serviced if they are within a defined sequence range of the current multicast sequence number. Larger sequence number gaps should be recovered via the Cboe One Server over TCP. Cboe One users will receive a total daily allowance of gap requested messages. In addition, each user is given renewable one second and one minute gap request limits.

If more than one gap request is received for a particular sequence/count combination within a short timeframe, all requests will receive a successful **`Gap Response`** message from the GRP, but only a single replayed message will be sent on the gap response multicast address.

If overlapping gap requests are received within a short period of time, the gap server will only send the union of the sequence ranges across grouped gap requests. Cboe One users will receive gap responses for their requested sequence/count, but receivers should be prepared for the gap responses to be delivered via multicast in non-contiguous blocks.

Gap acknowledgements or rejects will be delivered to users for every gap request received by the GRP. Users should be prepared to see replayed multicast data before or after the receipt of the gap response acknowledgement from the GRP.

Cboe One Disaster Recovery

Users of Cboe One that are interested in disaster recovery must maintain connectivity to the Cboe Disaster Recovery (DR) site in Chicago, IL. To establish new connectivity to the DR site, contact the Cboe NOC.

The Cboe One US feed that is disseminated from the DR site takes the incoming SIP trade feeds and connects to Cboe PITCH services sourced in the DR site for BZX, BYX, EDGX, and EDGA. The same data sources are used to distribute Cboe One from both the Cboe Primary site and Cboe DR site, so Cboe One customers can fail-over to or utilize the Cboe One feed out of the DR site at any time. However, message content, packet framing, and sequence numbers are not guaranteed to be the same between the Primary and DR sites due to message coalescing differences.

The Cboe One Canada feed disseminated from the DR site takes MATCHNow and NEO Multicast Market Data sourced from their DR sites.

The Cboe DR site is designed to support Cboe One inter data center resiliency in the following DR scenarios:

1. **Hardware failure in the primary Cboe One system.** Customers always have the option to switch to the DR site at will if they don't want to wait for remediation of failed hardware in the Primary data center to take place.
2. **Failover of one or more of Cboe's equities platforms to their respective DR site.** The Cboe One US feed in the Primary site currently only connects to market data for Cboe One US and Cboe One Canada within the Primary site. If one of the exchanges fails over to the DR site, then the Cboe One feed out of Primary site will not be able to disseminate updates from that exchange's market data feed in the DR site. In this scenario, customers should take the Cboe One feed out of the DR site to regain full coverage.
3. **Loss of any of the Cboe One input feeds.** Similarly to scenario #2, if Cboe experiences a market data (PITCH/NITCH) dissemination issue for any Cboe One US or Cboe One Canada exchange at the Primary site, but PITCH/NITCH market data is valid for the problem exchange at the DR site, then Cboe One customers have the option to switch over to the DR Cboe One feed to regain full coverage. The same situation applies if Cboe experiences an outage at the Primary site with respect to receipt of SIP feed data. If those feeds are still being received at the DR site, then customers have the option to switch over to the DR Cboe One feed to regain full coverage.

US and Canadian Markets

Cboe One market data is available for both US Equities markets (BZX, BYX, EDGA, EDGX) and Canadian Equities markets (NEO-L, NEO-N, NEO-D, MATCHNow) on two discrete sets of multicast channels, each with independent gap request and spin TCP services. Unless otherwise noted, the same message types will be used in both national markets. See Multicast Configuration on page 46 for connectivity details on the two national markets.

Cboe One feeds provide Long or Expanded forms of some messages. Cboe One will preference using the smallest form of the message that can fully represent the data. Consequently, messages for Canadian symbols that exceed the US messaging standard maximum length of 8 chars will use the alternate Expanded form of the message which can accommodate the longer symbol.

Protocol

Cboe users may use the Cboe One protocol over TCP/IP and/or multicast to receive the Cboe One feed direct from Cboe.

Cboe One cannot be used to enter orders. For order entry, refer to the Cboe FIX or BOE specifications.

Message Format

The messages that make up the Cboe One protocol are delivered using **`Sequenced Unit Header`** message header which handles sequencing and delivery integrity. All messages delivered via TCP/IP or multicast use the **`Sequenced Unit Header`** message header for handling message integrity.

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`** message header with associated data.

TCP/IP delivered events from the Cboe One Server or GRP may cross frames as the data will be delivered as a stream of data with the TCP/IP stack controlling Ethernet framing.

The Cboe One data feed is comprised of a series of dynamic length 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. Cboe One users should develop their decoders to deal with unknown message types and messages that grow 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 Cboe One feed.

- **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 4.4 Price** fields are unsigned Little Endian encoded 4 byte binary fields with 4 implied decimal places (denominator = 10,000).
- **Binary 8.4 Price** fields are unsigned Little Endian encoded 8 byte binary fields with 4 implied decimal places (denominator = 10,000).
- **Bit Field** fields are fixed width fields with each bit representing a boolean flag (the 0 bit is the lowest significant bit; the 7 bit is the highest significant bit).
- **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.

Message Framing

Depth of book update messages will be combined into a 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`** message header. Framing will be determined by the server for feed and site. The content of the multicast across feeds will be identical, **but framing will not be consistent across feeds**. Receiving processes that receive and arbitrate multiple feeds cannot use frame level arbitration.

Cboe Sequenced Unit Header Message Fields

The **`Sequence Unit Header`** message header is used for all Cboe One messages delivered via multicast or TCP/IP.

Sequenced and un-sequenced data may be delivered using the **`Sequenced Unit Header`** message header. Un-sequenced headers will have a 0 value for the sequence field and potentially for the unit field.

Sequenced messages have implied sequences with the first message having the sequence number contained in the header. Each subsequent message will have an implied sequence one greater than the previous message up to a maximum of count messages. Multiple messages can follow a **`Sequenced Unit Header`** message header, but a combination of sequenced and un-sequenced messages cannot be sent with one header.

The sequence number for the first message in the next frame can be calculated by adding the *Hdr Count* field to the *Hdr Sequence*. This technique will work for sequenced messages and heartbeats.

Table 2. Sequenced Unit Header

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Hdr Length	0	2	Binary	Length of entire block of messages. Includes this header and **`Hdr Count`** messages to follow.
Hdr Count	2	1	Binary	Number of messages to follow this header.
Hdr Unit	3	1	Binary	Unit that applies to messages included in this header (0 for all Cboe One messages).
Hdr Sequence	4	4	Binary	Sequence of first message to follow this header.
Total Length = 8 bytes				

Heartbeat Messages

The **`Sequenced Unit Header`** message header with a *Hdr Count* field set to 0 will be used for heartbeat messages. During trading hours heartbeat messages will be sent from the Cboe One Server, GRP and all multicast addresses if no data has been delivered within 1 second. Heartbeat messages never increment the sequence number, but can be used to detect gaps on the real-time multicast channels during low update rate periods.

Heartbeats on the real-time multicast addresses during trading hours will have a *Hdr Sequence* value equal to the sequence of the next sequenced message to be sent. Heartbeats on gap multicast addresses will always have the *Hdr Sequence* field set to 0. All heartbeat messages sent to and from the Cboe One Server and GRP are considered un-sequenced and should have *Hdr Sequence* and *Hdr Unit* fields set to 0.

Outside of trading hours Cboe sends heartbeat messages on all real-time and gap channels with a sequence of 0 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 expects heartbeat messages to be sent to the Cboe One Server and GRP on live connections no less than every 5 seconds. Failure to receive two consecutive heartbeat messages will result in the termination of the user connection.

Cboe One Server Session Messages (TCP)

The following messages are used for initializing a TCP/IP connection to the Cboe One Server. Cboe One users only need to implement the following messages if a TCP/IP connection to the Cboe One Server is desired. The following messages will not be delivered using multicast.

See the Cboe One Update Messages section of this document for a description of book and market related messages that are available from the Cboe One Server.

Cboe One Login Message Fields

The **`Cboe One Login`** message is the first message sent to the server by a user's process after its connection to the server is established. Failure to login before sending any other message type will result in the connection being dropped by the server.

Table 3. Cboe One Login

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xA0	**`Cboe One Login`** message
SessionSubId	2	4	Alphanumeric	*SessionSubId* supplied by Cboe.
Username	6	4	Alphanumeric	*Username* supplied by Cboe
Filler	10	2	Alphanumeric	(space filled)
Password	12	10	Alphanumeric	*Password* supplied by Cboe
Next Sequence	22	4	Binary	Sequence number of the next sequenced message expected by the user.
Total Length = 26 bytes				

Login Response Message Fields

The **`Login Response`** message is sent by the server to a user's process in response to a **`Login`** message. The status field is used to reflect an accepted login, or the reason the session was not accepted. If login fails, the connection will be dropped after the **`Login Response`** message is sent.

Table 4. Login Response Message Fields

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0x02	**`Login Response`** message
Status	2	1	Alphanumeric	Accepted or reason for reject
Total Length = 3 bytes				
Login Response - Status Codes				
'A'	Login Accepted			
'N'	Not authorized (Invalid Username/Password)			
'B'	Session in use			
'S'	Invalid Session			
'Q'	Next Sequence is ahead of sequence			

Replay Complete Message Fields

The **`Replay Complete`** message is sent to indicate that messages related to refreshing the state of the Cboe books have been delivered. After receipt of the **`Replay Complete`** message, message updates will be sent on the session as needed until the user disconnects.

`Market Status`, **`RPI`**, **`Trading Status`**, **`Symbol Summary`**, **`Opening/Close Price`**, **`End of Day Summary`**, and **`ADAP`** messages will be sent as needed to replay the current state of the Cboe books.

During the replay phase of the connection all messages except for **`Trade`** and **`Trade Break`** messages will be un-sequenced.

Table 5. Replay Complete

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xA1	**`Replay Complete`** message
Sequence	2	4	Binary	Sequence number that reflects that last update on the feed.
Total Length = 6 bytes				

Cboe One Gap Request Proxy Session Messages (TCP)

The following messages are used for initializing a TCP/IP connection to the Gap Request Proxy (GRP) and to request message retransmissions. Cboe One users only need to implement the following messages if gap requests will be made. The following messages will not be delivered using multicast.

GRP Login Message Fields

The **`GRP Login`** message is the first message sent to the GRP by a user's process after the connection to the GRP is established. Failure to login before sending any other message type will result in the connection being dropped by the GRP.

Table 6. GRP Login

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0x01	**`GRP Login`** message
SessionSubId	2	4	Alphanumeric	*SessionSubId* supplied by Cboe.
Username	6	4	Alphanumeric	*Username* supplied by Cboe
Filler	10	2	Alphanumeric	(space filled)
Password	12	10	Alphanumeric	*Password* supplied by Cboe
Total Length = 22 bytes				

Login Response Message Fields

The **`Login Response`** message is sent by the GRP to a user's process in response to a **`Login`** message. The status field is used to reflect an accepted login or the reason the session was not accepted. If login fails, the connection will be dropped after the **`Login Response`** message is sent.

Table 7. Login Response

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0x02	**`Login Response`** message
Status	2	1	Alphanumeric	Accepted or reason for reject
Total Length = 3 bytes				
Login Response - Status Codes				
'A'	Login Accepted			
'N'	Not authorized (Invalid Username/Password)			
'B'	Session in use			
'S'	Invalid Session			

Gap Request Message Fields

The **`Gap Request`** message is used by a user's process to request retransmission of a sequenced message (or messages) by one of Cboe's gap servers.

The **`Gap Request`** message for Cboe One is identical to the Multicast Pitch **`Gap Request`** message. The ***Unit*** field should be set to 0 since the Cboe One feed is not unitized.

Table 8. Gap Request

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0x03	**`Gap Request`** message
Unit	2	1	Binary	*Unit* that the gap is requested for (0 for Cboe One implementation).
Sequence	3	4	Binary	*Sequence* of first message (lowest sequence in range).
Count	7	2	Binary	*Count* of messages requested
Total Length = 9 bytes				

Gap Response Message Fields

The **`Gap Response`** message is sent by the GRP in response to a **`Gap Request`** message. The *Unit* and *Sequence* fields will match the values supplied in the **`Gap Request`** message. A **`Gap Response`** message, with a Status of Accepted or reason for failure, will be sent for each **`Gap Request`** message received by the GRP.

The **`GAP Response`** message for Cboe One is identical to the Multicast Pitch **`Gap Response`** message. The *Unit* field should be set 0 to since the Cboe One feed is not unitized.

Table 9. Gap Response Message Fields

GAP RESPONSE				
FIELD	**OFFSET**	**LENGTH**	**VALUE/TYPE**	**DESCRIPTION**
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0x04	**`Gap Response`** message
Unit	2	1	Binary	*Unit* the gap was requested for (0 for Cboe One implementation).
Sequence	3	4	Binary	*Sequence* of first message in request.
Count	7	2	Binary	*Count* of messages requested
Status	9	1	Alphanumeric	Accepted or reason for reject
Total Length = 10 bytes				
Gap Response - Status Codes				
'A'	Accepted			
'O'	Out of range (ahead of sequence or too far behind)			
'D'	Daily gap request allocation exhausted			
'M'	Minute gap request allocation exhausted			
'S'	Second gap request allocation exhausted			
'C'	Count request limit for one gap request exceeded			
'I'	Invalid Unit specified in request			
'U'	Unit is currently unavailable			

* - All non-'A' status codes should be interpreted as a reject.

Cboe One Update Messages (UDP & TCP)

The messages described in this section are delivered from the Cboe One Server (TCP), Cboe One Feed Server (UDP), and the Cboe One Gap Server (UDP gap responses).

Clear Quote Message Fields

The **`Clear Quote`** message instructs feed recipients to clear all quotes and Summary and/or ADAP information for the specified symbol on the specified market(s). This message does not affect the executed volume of the symbol.

Table 10. Clear Quote

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xA2	**`Clear Quote`** message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Market Center	18	1	Alphanumeric	* = All Cboe Markets for this feed Y = BYX (US only) Z = BZX (US only) A = EDGA (US only) X = EDGX (US only) L = NEO-L (Canada only) N = NEO-N (Canada only) t = NEO-SST (Canada only)
Total Length = 19 bytes				

Expanded Clear Quote Message Fields (Canada Only)

The **`Expanded Clear Quote`** message instructs feed recipients to clear all quotes and Summary and/or ADAP information for the specified symbol on the specified market(s). This message does not affect the executed volume of the symbol.

`Expanded Clear Quote` will be used if the data cannot be reported in the **`Clear Quote`** message (ex. if a Canadian symbol has length > 8).

Table 11. Expanded Clear Quote (Canada Only)

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xF0	**`Expanded Clear Quote`** message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	Symbol right padded with spaces.
Market Center	24	1	Alphanumeric	* = All markets for this feed L = NEO-L N = NEO-N t = NEO-SST
Total Length = 25 bytes				

Short Symbol Summary Message Fields

The **`Short Symbol Summary`** message delivers the Cboe consolidated best bid/offer and total executed volume across all applicable Cboe One US and Cboe One Canada books.

Table 12. Short Symbol Summary

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xA4	**`Short Symbol Summary`** message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	*Symbol* right padded with spaces.
Cboe CumulativeExecuted Volume	18	4	Binary	Cumulative number of shares traded today across all applicable Cboe books.
Consolidated Best Bid Price	22	4	Binary 4.4 Price	Cboe Consolidated best bid price.
Consolidated Best Bid Quantity	26	4	Binary	Cboe Consolidated number of buy-side shares available for this symbol.
Consolidated Best Ask Price	30	4	Binary 4.4 Price	Cboe Consolidated best ask price.
Consolidated Best Ask Quantity	34	4	Binary	Cboe Consolidated number of sell-side shares available for this symbol.
National Cumulative Volume	38	4	Binary	In the US, cumulative number of shares traded today as reported to the CTA and UTP SIPs. In Canada, the sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Flags	42	1	Bit Field	**Bit 0: National Volume Status** 0 : National volume data is complete 1 : National volume data may not be complete due to an unrecoverable gap on the incoming feed **Bit 1-7: Reserved**
Total Length = 43 bytes				

Long Symbol Summary Message Fields

The **`Long Symbol Summary`** message delivers the Cboe consolidated best bid/offer and total executed volume across all applicable Cboe One US and Cboe One Canada books.

Table 13. Long Symbol Summary

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xA3	**`Long Symbol Summary`** message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	*Symbol* right padded with spaces.
Cboe CumulativeExecuted Volume	18	8	Binary	Cumulative number of shares traded today across all applicable Cboe books.
Consolidated Best Bid Price	26	8	Binary 8.4 Price	Cboe Consolidated best bid price.
Consolidated Best Bid Quantity	34	8	Binary	Cboe Consolidated number of buy-side shares available for this symbol.
Consolidated Best Ask Price	42	8	Binary 8.4 Price	Cboe Consolidated best ask price.
Consolidated Best Ask Quantity	50	8	Binary	Cboe Consolidated number of sell-side shares available for this symbol.
National Cumulative Volume	58	8	Binary	In the US, cumulative number of shares traded today as reported to the CTA and UTP SIPs. In Canada, the sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Flags	66	1	Bit Field	**Bit 0: National Volume Status** 0 : National volume data is complete 1 : National volume data may not be complete due to an unrecoverable gap on the incoming feed **Bit 1-7: Reserved**
Total Length = 67 bytes				

Expanded Symbol Summary Message Fields (Canada Only)

The **`Expanded Symbol Summary`** message delivers the Cboe consolidated best bid/offer and total executed volume across all applicable Cboe One Canada books. The Expanded version of the message is used when the symbol exceeds eight characters.

Table 14. Expanded Symbol Summary (Canada Only)

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xF1	**`Expanded Symbol Summary`** message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	*Symbol* right padded with spaces.
Cboe CumulativeExecuted Volume	24	8	Binary	Cumulative number of shares traded today across all applicable Cboe books.
Consolidated Best Bid Price	32	8	Binary 8.4 Price	Cboe Consolidated best bid price.
Consolidated Best Bid Quantity	40	8	Binary	Cboe Consolidated number of buy-side shares available for this symbol.
Consolidated Best Ask Price	48	8	Binary 8.4 Price	Cboe Consolidated best ask price.
Consolidated Best Ask Quantity	56	8	Binary	Cboe Consolidated number of sell-side shares available for this symbol.
National Cumulative Volume	64	8	Binary	The sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Reserved	72	1	Binary	Reserved.
Total Length = 73 bytes				

Best Quote Update Message Fields

The **`Best Quote Update`** message is used to update one side of the Cboe consolidated quote information for a symbol. Since the message only updates one side of the quote the previous value for the other side of the quote remains in effect.

This message does not affect the executed volume of the symbol.

Table 15. Best Quote Update

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xA5	**`Best Quote Update`** message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Side Indicator	18	1	Alphanumeric	B = Buy Side S = Sell Side
Consolidated Best Quote Price	19	8	Binary 8.4 Price	Cboe Consolidated best price.
Consolidated Quote Quantity	27	8	Binary	Cboe Consolidated number of shares available for this symbol.
Total Length = 35 bytes				

Expanded Best Quote Update Message Fields (Canada only)

The **`Expanded Best Quote Update`** message is used to update one side of the Cboe consolidated quote information for a symbol. Since the message only updates one side of the quote the previous value for the other side of the quote remains in effect. The Expanded version of the message is used when the symbol exceeds eight characters.

This message does not affect the executed volume of the symbol.

Table 16. Expanded Best Quote Update Canada only

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xF2	**`Expanded Best Quote Update`**message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	Symbol right padded with spaces.
Side Indicator	24	1	Alphanumeric	B = Buy Side S = Sell Side
Consolidated Best Quote Price	25	8	Binary 8.4 Price	Cboe Consolidated best price.
Consolidated Quote Quantity	33	8	Binary	Cboe Consolidated number of shares available for this symbol.
Total Length = 41 bytes				

Cboe Market Status Message Fields

The **Cboe Market Status** message is disseminated to reflect a change in the status of a market. All markets should be assumed to be Normal unless otherwise indicated by a **Cboe Market Status** message.

The Incompletemarket status is used to indicate that the feed has not delivered updates for all of a market center's symbols and that the feed is transitioning to Normal. If a market center transitions from Normal to Excludedthe feed will deliver updates of symbol quote/ADAP information to properly reflect the state of the combined book. At the start of a market center's transition from Excluded to Normal, a **Cboe Market Status** message will be sent with Incomplete for the market center's status. Symbol quote/ADAP information will then be sent for all applicable symbols. Once the market center's symbol information has been disseminated a **Cboe Market Status** message will be delivered with a Normal market status.

Table 17. Cboe Market Status

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xA6	**Cboe Market Status** message
Timestamp	2	8	Binary	Timestamp of when the Market Status changed for the specified Market Center. Encoded as the number of nanoseconds since midnight.
Market Center	10	1	Alphanumeric	Y = BYX (US only) Z = BZX (US only) A = EDGA (US only) X = EDGX (US only) L = NEO-L (Canada only) N = NEO-N (Canada only) D = NEO-D (Canada only) M= MATCHNow (Canada only) r = NEO-Cross (Canada only) t = NEO-SST (Canada only)
Market Status	11	1	Alphanumeric	N = Normal E = Excluded from Symbol Summary and ADAP updates I = Incomplete
Session Indicator	12	1	Alphanumeric	R = Regular trading session P = Pre- or post-market session
Total Length = 13 bytes				

ADAP Message Fields

Each **ADAP** message delivers one or more updates for a Symbol's ADAP book. Each **ADAP** message contains one or more **ADAP Block** messages . A receiving process should interpret each **ADAP Block** message as a replacement for any previously delivered **ADAP Block** messages at that price level.

A quantity of 0 indicates that the price level is either no longer available or the price level is not within the number ADAP levels maintained by the feed. In either case a receiving process should delete a price level with a 0 quantity from its cache.

Table 18. ADAP

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field
Message Type	1	1	0xA7	**ADAP** message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Flags	18	1	Bit Field	**Bit 0: Clear ADAP** 0 : Keep any ADAP information for this symbol. 1 : Delete any ADAP information for this symbol before applying ADAP Block messages **Bit 1: ADAP Complete** 0 : The ADAP view for this symbol is complete. 1 : More ADAP updates for this symbol to follow in another ADAP message. **Bit 2: Short/Long Block(s)** 0 : Short Update ADAP Block message(s) to follow 1 : Long Update ADAP Block message(s) to follow **Bit 3-7: Reserved**
Reserved	19	1		Reserved
ADAP Blocks	20	1	Binary	Number of **ADAP Block** message to follow
ADAP Block Size	21	1	Binary	Size of each **ADAP Block** message
Header Length = 22 bytes				

Table 19. Short Update ADAP Block

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Market Center	0	1	Alphanumeric	Y = BYX (US only) Z = BZX (US only) A = EDGA (US only) X = EDGX (US only) L = NEO-L (Canada only) N = NEO-N (Canada only) t = NEO-SST (Canada only)
Side	1	1	Alphanumeric	B = Buy Side

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
				S = Sell Side
Price	2	4	Binary 4.4 Price	*Price* level to add/update for Market Center's ADAP book.
Quantity	6	4	Binary	*Quantity* of shares at this price level in the Market Center's ADAP book. A value of zero implies deletion of this ADAP level.
Short ADAP Block Length Indicated by ADAP Block Size in Header				

Table 20. Long Update ADAP Block

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Market Center	0	1	Alphanumeric	Y = BYX (US) Z = BZX (US) A = EDGA (US) X = EDGX (US) L = NEO-L (Canada) N = NEO-N (Canada) t = NEO-SST (Canada)
Side	1	1	Alphanumeric	B = Buy Side S = Sell Side
Price	2	8	Binary 8.4 Price	*Price* level to add/update for Market Center's ADAP book.
Quantity	10	8	Binary	*Quantity* of shares at this price level in the Market Center's ADAP book. A value of zero implies deletion of this ADAP level.
Long ADAP Block Length Indicated by ADAP Block Size in Header				
Total Length = Variable → (Header Length [22 bytes] + ADAP Blocks x ADAP Block Size)				

Expanded ADAP Message Fields (Canada only)

The **`Expanded ADAP`** message is identical to the **`ADAP`** message described previously, except for the length of the *Symbol* field which is expanded from 8 to 14.

Table 21. Expanded ADAP Message

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field
Message Type	1	1	0xF3	**`Expanded ADAP`** message
Last Update Timestamp	2	8	Binary	Timestamp of the last matching engine message that updated the quote information for this symbol in the Cboe One server's cache. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	Symbol right padded with spaces.
Flags	24	1	Bit Field	**Bit 0: Clear ADAP** 0 : Keep any ADAP information for this symbol. 1 : Delete any ADAP information for this symbol before applying ADAP Block messages **Bit 1: ADAP Complete** 0 : The ADAP view for this symbol is complete. 1 : More ADAP updates for this symbol to follow in another ADAP message. **Bit 2: Short/Long Block(s)** 0 : Short Update ADAP Block message(s) to follow 1 : Long Update ADAP Block message(s) to follow **Bit 3-7: Reserved**
Reserved	25	1		Reserved
ADAP Blocks	26	1	Binary	Number of **`ADAP Block`** messages to follow
ADAP Block Size	27	1	Binary	Size of each **`ADAP Block`** message
Header Length = 28 bytes				

Table 22. Short Update ADAP Block Message

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Market Center	0	1	Alphanumeric	L = NEO-L N = NEO-N t = NEO-SST
Side	1	1	Alphanumeric	B = Buy Side S = Sell Side
Price	2	4	Binary 4.4 Price	*Price* level to add/update for Market Center's ADAP book.
Quantity	6	4	Binary	*Quantity* of shares at this price level in the Market Center's ADAP book. A value of zero implies deletion of this ADAP level.
Short ADAP Block Length Indicated by ADAP Block Size in Header				

Table 23. Long Update ADAP Block Message

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Market Center	0	1	Alphanumeric	L = NEO-L N = NEO-N t = NEO-SST
Side	1	1	Alphanumeric	B = Buy Side S = Sell Side
Price	2	8	Binary 8.4 Price	*Price* level to add/update for Market Center's ADAP book.
Quantity	10	8	Binary	*Quantity* of shares at this price level in the Market Center's ADAP book. A value of zero implies deletion of this ADAP level.
Long ADAP Block Length Indicated by ADAP Block Size in Header				
Total Length = Variable → (Header Length [28 bytes] + ADAP Blocks x ADAP Block Size)				

Retail Price Improvement (RPI) Message Fields (US Only)

The **`Retail Price Improvement (RPI)`** message is a retail liquidity indicator that includes symbol and side, but not price and size. An **`RPI`** message will be disseminated when there is a retail price improving order present for a symbol on any Cboe Exchange order book OR to indicate a RPI order is no longer available. RPI orders offer price improvement in increments of $.001 to Retail Member Organizations. The RPI message is not available in Cboe One Canada.

Table 24. RPI

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xA8	**`RPI`** message
Timestamp	2	8	Binary	Timestamp of the matching engine RPI message emitted by the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Market Center	18	1	Alphanumeric	Y = BYX Z = BZX A = EDGA X = EDGX
Retail PriceImprovement	19	1	Alphanumeric	B = Buy Side RPI S = Sell Side RPI A = Buy & Sell RPI N = No RPI
Total Length = 20 bytes				

Trade Message Fields

`Trade` messages are sent when an order is executed in whole or in part on a Cboe exchange. The last-sale eligible status (*Flags* field Bit 1) is derived based on four criteria:

1. The *Session Indicator* (see **`Cboe Market Status`** message) must be in the regular session.
2. The *Last Quantity* must be at least one round lot.
3. The *Market Status* (see **`Cboe Market Status`** message) for the executing exchange must be Normal.
4. The *Transaction Time* of the event must be within 10 seconds of the current time.

Table 25. Trade

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xA9	**`Trade`** message
Transaction Time	2	8	Binary	The time the trade occurred on the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Market Center	18	1	Alphanumeric	Market Center on which the last trade was executed: Y = BYX (US only) Z = BZX (US only) A = EDGA (US only) X = EDGX (US only) L = NEO-L (Canada only) N = NEO-N (Canada only) D = NEO-D (Canada only) M= MATCHNow (Canada only) r = NEO-Cross (Canada only) t = NEO-SST (Canada only)
Market Center Execution ID	19	8	Binary	Market center specific execution identifier of this Execution. *Execution ID* is also referenced in the **`Trade Break`** message.
Last Price	27	8	Binary 8.4 Price	Last trade price.
Last Quantity	35	8	Binary	Last trade quantity.
Cboe CumulativeExecuted Volume	43	8	Binary	Cumulative number of shares traded today across all applicable books.
National Cumulative Volume	51	8	Binary	In the US, cumulative number of shares traded today as reported to the CTA and UTP SIPs. In Canada, the sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Flags	59	1	Bit Field	Bit 0: National Volume Status

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
				0 : National volume data is complete. 1 : National volume data may not be complete due to an unrecoverable gap on the incoming feed. **Bit 1: Last-Sale Eligible** 0 : Trade is not last-sale eligible 1 : Trade is last-sale eligible **Bit 2-7: Reserved**
Total Length = 60 bytes				

Expanded Trade Message Fields (Canada only)

The **`Expanded Trade`** message is identical to the **`Trade`** message described previously, except for the length of the Symbol fields which is expanded from 8 to 14.

Table 26. Expanded Trade Canada only

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xF4	**`Expanded Trade`** message
Transaction Time	2	8	Binary	The time the trade occurred on the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	Symbol right padded with spaces.
Market Center	24	1	Alphanumeric	Market Center on which the last trade was executed: L = NEO-L N = NEO-N D = NEO-D M= MATCHNow r = NEO-Cross t = NEO-SST
Market Center Execution ID	25	8	Binary	Market center specific execution identifier of this Execution. *Execution ID* is also referenced in the Trade Break message.
Last Price	33	8	Binary 8.4 Price	Last trade price.
Last Quantity	41	8	Binary	Last trade quantity.
Cboe CumulativeExecuted Volume	49	8	Binary	Cumulative number of shares traded today across all applicable books.
National Cumulative Volume	57	8	Binary	The sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Reserved	65	1	Binary	Reserved
Total Length = 66 bytes				

Trade Break Message Fields

The **`Trade Break`** message is sent whenever an execution on a Cboe exchange is broken. Trade breaks are rare and only affect applications that rely upon Cboe execution based data.

Table 27. Trade Break

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xAA	**`Trade Break`** message
Transaction Time	2	8	Binary	The time the trade break occurred on the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Market Center	18	1	Alphanumeric	Market Center on which the last trade was executed: Y = BYX (US only) Z = BZX (US only) A = EDGA (US only) X = EDGX (US only) L = NEO-L (Canada only) N = NEO-N (Canada only) D = NEO-D (Canada only) M= MATCHNow (Canada only) r = NEO-Cross (Canada only) t = NEO-SST (Canada only)
Market Center Execution ID	19	8	Binary	Market center specific execution identifier of trade to be broken.
Cboe CumulativeExecuted Volume	27	8	Binary	Cumulative number of shares traded today across all applicable Cboe books.
National Cumulative Volume	35	8	Binary	In the US, cumulative number of shares traded today as reported to the CTA and UTP SIPs. In Canada, the sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Flags	43	1	Bit Field	**Bit 0: SIP Volume Status** 0 : SIP volume data is complete. 1 : SIP volume data may not be complete due to an unrecoverable gap on the incoming feed. **Bit 1-7: Reserved**
Total Length = 44 bytes				

Expanded Trade Break Message Fields (Canada only)

The **`Expanded Trade Break`** message is sent whenever an execution on a Cboe exchange is broken. Trade breaks are rare and only affect applications that rely upon Cboe execution based data. The Expanded version of the message is used when the symbol exceeds eight characters.

Table 28. Expanded Trade Break Message Fields (Canada only)

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xF5	**`Expanded Trade Break`** message
Transaction Time	2	8	Binary	The time the trade break occurred on the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	Symbol right padded with spaces.
Market Center	24	1	Alphanumeric	Market Center on which the last trade was executed: L = NEO-L N = NEO-N D = NEO-D M= MATCHNow r = NEO-Cross t = NEO-SST
Market Center Execution ID	25	8	Binary	Market center specific execution identifier of trade to be broken.
Cboe CumulativeExecuted Volume	33	8	Binary	Cumulative number of shares traded today across all applicable books.
National Cumulative Volume	41	8	Binary	The sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Reserved	49	1	Binary	Reserved
Total Length = 50 bytes				

Trading Status Message Fields

The **`Trading Status`** message is used to indicate the current trading status of a security on a Cboe exchange. A **`Trading Status`** message is sent whenever a security's trading status changes. Sequenced **`Trading Status`** messages are sent upon system start up for all active securities with *Trading Status* = 'S' (suspended). **`Trading Status`** messages will continue to be published upon symbol state changes, such as at the beginning of order acceptance.

A **`Trading Status`** message will be sent:

- for Regulatory Halts in any security as well as the Trading resumption for the same security.
- for Cboe Listed securities that are in a Quoting period for auctions.
- to indicate a Reg SHO price test is in effect.

Table 29. Trading Status

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xAB	**`Trading Status`** message
Timestamp	2	8	Binary	Timestamp of the matching engine trading status message emitted by the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Market Center	18	1	Alphanumeric	Y = BYX (US only) Z = BZX (US only) A = EDGA (US only) X = EDGX (US only) L = NEO-L (Canada only) N = NEO-N (Canada only) D = NEO-D (Canada only) M= MATCHNow (Canada only) r = NEO-Cross (Canada only) t = NEO-SST (Canada only)
Trading Status	19	1	Alphanumeric	A = Accepting Orders for Queuing F = Halted (Full)(NEO only) (effective 08/11/25) H = Halted M= Delayed Closing (NEO only) (effective 08/11/25) O = Pre-close(NEO only) (effective 08/11/25) P = Post-close(NEO only) (effective 08/11/25) Q = Quote-Only S = Exchange Specific Suspension T = Trading X = Extended Trading(NEO only) (effective 08/11/25)
Reg SHO Action	20	1	Alphanumeric	0 = No price test in effect 1 = Reg SHO price test restriction in effect
Total Length = 21 bytes				

Expanded Trading Status Message Fields (Canada Only)

The **`Expanded Trading Status`** message is identical to the **`Trading Status`** message described previously, except for the length of the Symbol fields which is expanded from 8 to 14. Sequenced **`Trading Status`** messages are sent upon system start up for all active securities with *Trading Status* = 'S' (suspended). **`Trading Status`** messages will continue to be published upon symbol state changes, such as at the beginning of order acceptance.

Table 30. Expanded Trading Status (Canada only)

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xF6	**`Expanded Trading Status`** message
Timestamp	2	8	Binary	Timestamp of the matching engine trading status message emitted by the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	Symbol right padded with spaces.
Market Center	24	1	Alphanumeric	L = NEO-L N = NEO-N D = NEO-D M= MATCHNow r = NEO-Cross t = NEO-SST
Trading Status	25	1	Alphanumeric	A = Accepting Orders for Queuing F = Halted (Full)(NEO only)(effective 08/11/25) H = Halted M= Delayed Closing(NEO only)(effective 08/11/25) O = Pre-close(NEO only)(effective 08/11/25) P = Post-close(NEO only)(effective 08/11/25) Q= Quote-Only S = Exchange Specific Suspension T = Trading X = Extended Trading(NEO only)(effective 08/11/25)
Reg SHO Action	26	1	Alphanumeric	0 = No price test in effect 1 = Reg SHO price test restriction in effect
Total Length = 27 bytes				

Opening/Closing Price Message Fields

The **`Opening/Closing Price`** message is used to indicate the Opening or Closing price of a security on any of the Cboe markets and the primary listing market. An **`Opening/Closing Price`** message will be sent whenever the opening or closing price of a security is established. The opening or closing price is established once across all Cboe markets (not per-market). Additionally, an **`Opening/Closing Price`** message will be sent after it is received from the CTA or UTP SIP (in US markets) or from the TMX IP feeds (in Canadian markets) once the delay period has expired, currently 15 minutes.

US:

- For Cboe listed securities, the opening and closing prices will be sent when they are received from the listing market and again when received from the SIP feed and the delay period has expired.
- For non-Cboe listed securities, the opening price of a security is defined as the first eligible trade received that occurred on or after 9:30:00 from any Cboe exchange. If no eligible trade is received by 9:35:00, no opening price will be reported from a Cboe exchange. A message will also be sent after the official open from the listing exchange is received and the SIP delay period has expired with *Market Center* set to `C` or `U`.
- For non-Cboe listed securities, the closing price of a security is the last eligible trade received when any Cboe exchange timestamp exceeds the end of the regular session (normally 16:00:00). If no eligible trade has occurred prior to the close, no closing price will be reported from a Cboe exchange. A message will also be sent after the official close from the listing exchange is received, and the SIP delay period has expired with *Market Center* set to `C` or `U`.

Canada:

- For NEO-L, NEO-N, and NEO-D Trading Books of Cboe Canada Inc. listed securities, the opening and closing prices will be sent when they are received from NEO.
- For NEO-L, NEO-N, and NEO-D Trading Books of Cboe Canada Inc. non-listed securities, the opening price of a security is defined as the first round lot trade received from the security's listing exchange that occurred on or after the listing exchange's opening time (normally 9:30:00). If no eligible trade is received by 5 minutes after the opening time, no opening price will be reported. The opening price will be delayed by 15 minutes.
- For NEO-L, NEO-N, and NEO-D Trading Books of Cboe Canada Inc. non-listed securities, the closing price of a security is the last round lot trade received from the security's listing exchange when any timestamp exceeds the end of the listing exchange's regular session (normally 16:00:00). If no eligible trade has occurred prior to the close, no closing price will be reported from a Cboe market. The closing price will be delayed by 15 minutes.

The ***Market Center*** will identify the Cboe market that set the Opening or Closing Price for this security.

Table 31. Opening/Closing Price

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xB0	**`Opening/Closing Price`** message
Timestamp	2	8	Binary	The time the eligible trade occurred on the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Market Center	18	1	Alphanumeric	Y = BYX (US only) Z = BZX (US only) A = EDGA (US only) X = EDGX (US only) C = CTA (US only) U = UTP (US only) L = NEO-L (Canada only) N = NEO-N (Canada only) D = NEO-D (Canada only) M= MATCHNow (Canada only) T = TSX (Canada only) V = TSXV (Canada only) S = CSE (Canada only) r = NEO-Cross (Canada only) t = NEO-SST (Canada only)
Open/Close Indicator	19	1	Alphanumeric	O = *Price* is the Opening price C = *Price* is the Closing price
Price	20	8	Binary 8.4 Price	Opening/Closing Price.
Total Length = 28 bytes				

Expanded Opening/Closing Price Message Fields (Canada Only)

The **`Expanded Opening/Closing Price`** message is identical to the **`Opening/Closing Price`** message described previously, except for the length of the Symbol fields which is expanded from 8 to 14.

Table 32. Expanded Opening/Closing Price Canada only

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xF7	**`Expanded Opening/Closing Price`** message
Timestamp	2	8	Binary	The time the eligible trade occurred on the specified Market Center. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	Symbol right padded with spaces.
Market Center	24	1	Alphanumeric	L = NEO-L N = NEO-N D = NEO-D M= MATCHNow T = TSX V = TSXV S = CSE r = NEO-Cross t = NEO-SST
Open/Close Indicator	25	1	Alphanumeric	O = *Price* is the Opening price C = *Price* is the Closing price
Price	26	8	Binary 8.4 Price	Opening/Closing Price.
Total Length = 34 bytes				

End of Day Summary Message Fields

The **`End of Day Summary`** message is used to give a consolidated, high-level overview of a security for the day, based on an end of day summary message received from either the US CTA or UTP Securities Information Processor (SIP) feeds. The Canadian summary will be calculated using data from exchanges in the TMX IP feed. The message will be sent after it is received from the source and the delay period has expired, currently 15 minutes for US. Canada's summary will be sent at 17:15:00 for all symbols. The system may send more than one **`End of Day Summary`** message in the US after the end of a trading session due to multiple CTA/UTP end of day summary spins.

Table 33. End of Day Summary

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xE1	**`End of Day Summary`** message
Timestamp	2	8	Binary	The timestamp of the originating SIP summary message. Encoded as the number of nanoseconds since midnight.
Symbol	10	8	Alphanumeric	Symbol right padded with spaces.
Data Source	18	1	Alphanumeric	C = CTA (US only) U = UTP (US only) i = Indicative value (Canada only) c = Calculated value (from TMX IP) (Canada only)
Opening Price	19	8	Binary 8.4 Price	Opening Price. 0 if the system has not received an opening price for the security.
Closing Price	27	8	Binary 8.4 Price	Closing Price.
High Price	35	8	Binary 8.4 Price	Highest trade price of the day.
Low Price	43	8	Binary 8.4 Price	Lowest trade price of the day.
National Cumulative Volume	51	8	Binary	For US, cumulative volume of shares traded as reported to the national consolidators (SIPs). For Canada, the sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Total Length = 59 bytes				

Expanded End of Day Summary Message Fields (Canada Only)

The **`Expanded End of Day Summary`** message is identical to the **`End of Day Summary`** message described previously, except for the length of the Symbol field which is expanded from 8 to 14.

Table 34. Expanded End of Day Summary (Canada only)

FIELD	OFFSET	LENGTH	VALUE/TYPE	DESCRIPTION
Length	0	1	Binary	*Length* of this message including this field.
Message Type	1	1	0xF8	**`Expanded End of Day Summary`** message
Timestamp	2	8	Binary	The timestamp of the originating SIP summary message. Encoded as the number of nanoseconds since midnight.
Symbol	10	14	Alphanumeric	Symbol right padded with spaces.
Data Source	24	1	Alphanumeric	C = CTA (US only) U = UTP (US only) i = Indicative value (Canada only) c = Calculated value (from TMX IP) (Canada only)
Opening Price	25	8	Binary 8.4 Price	Opening Price. 0 if the system has not received an opening price for the security.
Closing Price	33	8	Binary 8.4 Price	Closing Price.
High Price	41	8	Binary 8.4 Price	Highest trade price of the day.
Low Price	49	8	Binary 8.4 Price	Lowest trade price of the day.
National CumulativeVolume	57	8	Binary	For US, cumulative volume of shares traded as reported to the national consolidators (SIPs). For Canada, the sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.
Total Length = 65 bytes				

Multicast Configuration

NA Equities Production Environment Configuration

Limitations/Configurations

The following table defines Cboe current configuration for network and gap request limitations. These limitations are session based. Cboe reserves the right to adjust the gap request limitations to improve the effectiveness of the gap request infrastructure.

Table 35. Limitations/Configurations

PERIOD/TYPE	LIMIT/SETTING	NOTES
MTU	1500	Cboe will send UDP messages up to 1500 bytes. Cboe One Users should ensure that their infrastructure is configured accordingly.
Gap Response Delay	2 ms	The Gap Server will delay resending sequenced messages via multicast for the specified limit in order to satisfy multiple GRP gap requests with one multicast response.
Count	100	Any single gap request may not be for more than this number of dropped messages.
1 Second	320 Requests	This is the maximum number of retransmission requests allowed per second for each session. This is renewed every clock second.
1 Minute	1500 Requests	This is the maximum number of retransmission requests allowed per minute for each session. This is renewed every clock minute.
Day	100,000 Requests	This is the maximum number of retransmission requests allowed per day for each session.
Within Range	1,000,000 Messages	Users' retransmission requests must be within this many messages of the most recent sequence sent by the real-time feed per session.

Cboe One Multicast Routing Parameters

Table 36. Cboe One Multicast Routing Parameters - Production

DATA CENTER	RENDEZVOUS POINT
Primary Data Center (NY5)	74.115.128.156
Secondary Data Center (CH4)	174.136.181.252

Cboe One Multicast Addresses

The following tables describe the distribution across production multicast Cboe One feeds.

Table 37. Cboe One Multicast Addresses - NY5 Primary, Production

NY5 PRIMARY DATA CENTER	REAL-TIME MC (SRC) IP ADDR	GAP RESP. MC (SRC) IP ADDR
Cboe One US Equities Summary	224.0.131.130:32201 (174.136.169.12)	224.0.131.131:32201 (174.136.169.12)
Cboe One US Equities Premium	224.0.131.128:32200 (174.136.169.12)	224.0.131.129:32200 (174.136.169.12)
Cboe One Canada Equities Summary	233.130.124.130:31902 (174.136.169.12/29)	233.130.124.131: 31902 (174.136.169.12/29)
Cboe One Canada Equities Premium	233.130.124.128:31901 (174.136.169.12/29)	233.130.124.129:31901 (174.136.169.12/29)

Table 38. Cboe One Multicast Addresses - CH4 Secondary, Production

CH4 SECONDARY DATA CENTER	REAL-TIME MC (SRC) IP ADDR	GAP RESP. MC (SRC) IP ADDR
Cboe One US Equities Summary	233.19.3.34:32201 (174.136.181.150)	233.19.3.35:32201 (174.136.181.150)
Cboe One US Equities Premium	233.19.3.36:32200 (174.136.181.150)	233.19.3.37:32200 (174.136.181.150)
Cboe One Canada Equities Summary	233.19.3.38:31902 (174.136.181.150/28)	233.19.3.39:31902 (174.136.181.150/28)
Cboe One Canada Equities Premium	233.19.3.32:31901 (174.136.181.150/28)	233.19.3.33:31901 (174.136.181.150/28)

North American Equities Certification Environment Configuration

Cboe One Certification Multicast Routing Parameters

Table 39. Cboe One Multicast Routing Parameters - Certification

DATA CENTER	RENDEZVOUS POINT
Certification Data Center (NY5)	74.115.128.129

Cboe One Certification Multicast Addresses

The following tables describe the current unit distribution across certification multicast Cboe One feeds.

Table 40. Cboe One Multicast Addresses - NY5 Primary, Certification

NY5 PRIMARY DATA CENTER	REAL-TIME MC (SRC) IP ADDR	GAP RESP. MC (SRC) IP ADDR
Cboe One US Equities Summary	224.0.74.222:32200 (174.136.174.253)	224.0.74.223:32200 (174.136.174.253)
Cboe One US Equities Premium	224.0.74.220:32200 (174.136.174.252)	224.0.74.221:32200 (174.136.174.252)
Cboe One Canada Equities Summary	224.0.74.191:32902 (174.136.174.248/29)	224.0.74.223:32902 (174.136.174.248/29)
Cboe One Canada Equities Premium	224.0.74.190:32901 174.136.174.248/29	224.0.74.221:32901 (174.136.174.248/29)

References

Symbology

For more information on Cboe Symbology, please refer to the Cboe Symbology Reference.

Support

Please direct questions or comments regarding this specification to tradedesk@cboe.com for Cboe One US or tradedeskca@cboe.com for Cboe One Canada.

Revision History

DOCUMENT VERSION	DATE	DESCRIPTION
1.0.0	06/30/14	Initial version.
1.0.1	07/15/14	Renamed Binary Long Price data type to Binary 8.4 Price. Renamed Binary Short Price data type to Binary 4.4 Price and changed from 2 to 4 bytes.
1.0.2	07/23/14	Added Certification Multicast Addresses.
1.0.3	09/11/14	Added Production (NJ2) Multicast Addresses.
1.0.4	09/28/14	Updated **`Trading Status`** message to include A Accepting Orders for Queueing and S Exchange Specific Suspension. Also updated section explaining recovery spin processing.
1.0.5	11/26/14	Bats One production systems will now be offered from the NY5 datacenter as opposed to from NJ2. Target availability date pending SEC approval. Bats One certification will be available in NY5 effective 12/01/14 and will be decommissioned in NJ2 effective 12/15/14.
1.1.0	05/01/15	Added *SIP Cumulative Volume* and *Flags* fields to **`Long Symbol Summary`**, **`Short Symbol Summary`**, **`Trade`**, and **`Trade Break`** messages effective 5/15/15.
1.1.1	12/29/15	Added Bats One Disaster Recovery section.
1.2.0	02/19/16	Bats branding/logo changes.
1.3.0	05/16/16	Added *Session Indicator* to the **`Market Status`** message, effective 08/01/16. Added last-sale eligible to the *Flags* on the **`Trade`** message, effective 08/01/16. `Added Opening/Closing Price` new message, effective 08/01/16.
1.3.1	06/14/16	**`Opening/Closing Price`** message type changed to 0xB0.
1.3.2	06/22/16	Added *Session Indica*tor to the **`Market Status`** message, effective date updated to 08/15/16. Added last-sale eligible to the Flags on the **`Trade`** message, effective date updated to 08/15/16. Added `Opening/Closing Price` new message, effective date updated to 08/15/16.
1.3.3	08/15/16	Bats formatting updates. Cleanup of old effective date references.
1.3.4	10/17/17	Cboe branding/logo changes.
1.3.5	06/09/20	Added C and U to the *Market Center* field for the **`Opening/Closing Price`** message.
1.3.6	04/29/21	Added new **`End of Day Summary`** message (effective 07/16/21).
1.3.7	12/15/21	Updated hyperlink to Symbology Reference document.
1.4.0	09/06/22	Added Canadian Equities and Long forms of some messages (effective 09/12/22). Added multicast IP addresses and routing parameters for Cboe One Canada (effective 09/12/22).
1.4.1	09/07/22	Updated multicast IP addresses, rendezvous points, and routing parameters for Cboe One Canada (effective 09/12/22).
1.4.2	09/09/22	The DR Cboe One Canada feed takes MATCHNow and NEO Multicast Market Data sourced from their DR sites.
1.4.3	04/10/23	*National Cumulative Volume* in Canada is the sum of two values: the current Cboe Cumulative Executed Volume and the 15-minute delayed executed volume of other Canadian exchanges as reported by TMX IP.

DOCUMENT VERSION	DATE	DESCRIPTION
		Added *National Cumulative Volume* to **`Expanded Symbol Summary`**, **`Expanded Trade`**, and **`Expanded Trade Break`** messages. Added *Market Center* = T, V, S, r, and t. Added *Data Source* = c.
1.4.4	10/18/23	Added values 'C' (US) and 'U' (US) to the *Market Center* field in the **`Opening/ Closing Price`** message.
1.4.5	01/31/24	Minor language updates to reflect amalgamation of MATCHNow into Cboe Canada Inc. exchange.
1.4.6	02/15/24	Clarified that the same data sources are used to distribute Cboe One from both the Cboe Primary site and Cboe DR site.
1.4.7	09/06/24	Removed r=NEO-Cross from **`Clear Quote`**, **`Expanded Clear Quote`**, **`ADAP`**, and **`Expanded ADAP`** messages. Effective 11/13/24, **`Trading Status`** messages will be sent upon system start up rather than at the start of order acceptance.
1.4.8	10/09/24	Effective 11/13/24, clarified initial **`Trading Status`** messages will be sent upon system start up in addition to sending at the start of order acceptance.
1.4.9	01/15/25	Updated with Cboe Titanium branding.
1.4.10	06/11/25	Added *Halt Status* = F, M, O, P, and X to the **`Trading Status`** messages (NEO Only)(effective 08/11/25).
1.4.11	06/23/25	Updated *Halt Status* to *Trading Status* on **`Trading Status`** messages.