



Cboe Titanium Cboe Futures Exchange Multicast TOP Specification

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Cboe Titanium Cboe Futures Exchange Multicast TOP Specification

Introduction

This specification is the standard Multicast TOP specification for the Cboe Futures Exchange (CFE) platform.

CFE participants may use the CFE Multicast TOP protocol to receive real-time top of book quotations direct from CFE. Market data received through Multicast TOP is less timely than receiving the same data from the CFE Multicast PITCH Depth of Book feed. The TOP protocol offers approximately 66% reduction in the number of events and 66% reduction in the number of bytes of application data sent, compared to the CFE Multicast PITCH protocol.

The quotations received via Multicast TOP provide an aggregated size and do not indicate the size or number of individual orders at the best bid or ask. The Multicast TOP protocol also provides last trade price and size and cumulative volume data.

Complete depth of book market data can be received via the CFE Multicast PITCH protocol.

TOP cannot be used to enter orders. For order entry, refer to the appropriate CFE FIX or BOE Specification.

All versions of the Multicast TOP feed are WAN-shaped (maximum 100 Mb/s) and are available from one or both of CFE's datacenters. Participants may choose to take one or more of the following Multicast TOP feeds depending on their location and connectivity to CFE.

Table 1. Multicast TOP Feed Descriptions

Exchange	Shaping	Served From Data Center (Primary/Secondary)	Multicast Feed ID
CFE	WAN	Primary	FCT
CFE	WAN	Primary	FDT
CFE	WAN	Secondary	FET

Feed Hours and System Restart

The TOP feed will start up on Sunday at approximately 10:30 a.m. CT and shutdown on Friday at approximately 4:05 p.m. CT. A daily restart occurs between 4:05 and 4:45 p.m. CT each day at which time sequences will be reset. The daily restart is typically observed between 4:05 and 4:10 p.m. CT, but could occur later 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 will be cleared (including GTC and GTD orders), prior to the daily restart and reset of sequences. Persisted GTC and GTD orders will be added back into the order book starting at approximately 10 minutes prior to the scheduled queuing time for each futures root.

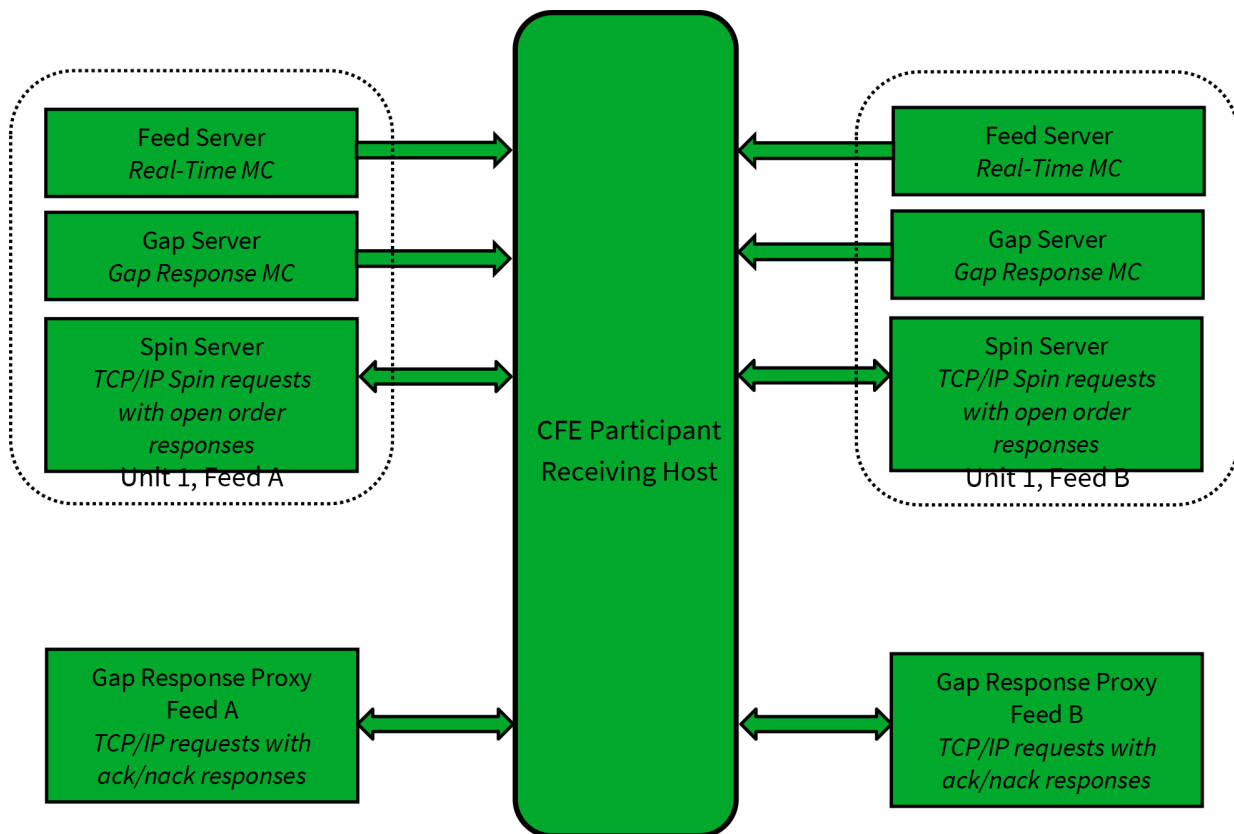
Feed Connectivity Requirements

WAN-Shaped feeds are available to participants who meet the minimum bandwidth requirements to CFE via cross-connect, dedicated circuit, or a supported carrier.

Participants with sufficient connectivity may choose to take both the FCT and FDT feeds from the CFE's primary datacenter and arbitrate the feeds to recover lost data. Alternatively, participants may choose to arbitrate feeds from both datacenters. It should be noted that feeds from the secondary datacenter will have additional latency for those connected with CFE in the primary datacenter due to proximity and business continuity processing.

CFE Multicast TOP real-time events are delivered using a published range of multicast addresses divided by symbol range units. Dropped messages can be requested using a TCP/IP connection to one of CFE's Multicast TOP Gap Request Proxy (GRP) servers with replayed messages being delivered on a separate set of multicast ranges reserved for packet retransmission. Intraday, a spin of all open orders may be requested from a Spin Server. Alternatively, the Periodic Refresh mechanism may be used by latency insensitive participants to recover missed messages or gaps. This allows a client to become current without requesting a gap for all messages up to that point in the day.

The following diagram is a logical representation Multicast TOP feed message flow between CFE and a participant feed handler that is listening to the A and B instances of two units:



Symbol Ranges, Units, and Sequence Numbers

Products are separated into units by a published distribution and will not change intra-day. CFE does, however, reserve the right to add multicast addresses or change the product distribution with 48 hours prior notice to participants. Care should be taken to ensure that address changes, address additions, and product distribution changes can be supported easily.

Message sequence numbers are incremented by one for every sequenced message within a particular symbol unit. It is important to understand that one or more units will be delivered on a single multicast address. As with symbol ranges, unit distribution across multicast addresses will not change intra-day, but may change after notice has been given.

Symbol distribution across units as well as unit distribution across multicast addresses are identical for real-time and gap response multicast addresses.

Futures Specific Symbol Processing

CFE has implemented a symbol mapping mechanism (**Futures Instrument Definition** message) for the Multicast TOP feeds, which maps each specific simple futures contract or spread instrument to a six character, ASCII **Symbol**. For example, the weekly VX11 contract expiring March 14, 2017 might be represented by the **Symbol** 0abC12. This symbol mapping significantly reduces the size of the Multicast TOP feed for futures and allows participants to use the same symbol handling mechanisms for the Cboe operated equity, options, and futures exchanges. This symbol mapping is the same as the Multicast PITCH feed.

Mapping occurs on a continuous basis on each unit's multicast feed. **Futures Instrument Definition** messages can be both un-sequenced and sequenced. Un-sequenced messages are sent from pre-market through the end of trading in a continuous loop that will complete approximately once every minute. Once the same contract has been seen twice, the user can be certain the full loop has been observed. The rate is variable and will be adjusted as bandwidth allows.

Spread instruments may be occasionally created intra-day. In these cases, the **Futures Instrument Definition** message will be sent as a sequenced message on the real-time feed and from the Spin Server before any other messages that reference an instrument created intra-day are sent.

In addition to the symbol mapping events available on the Multicast TOP feed, a downloadable file with current mappings

is available via the CFE website.

Production symbol files:

- [Simple](#)
- [Spread](#)

Certification symbol files:

- [Simple](#)
- [Spread](#)

Periodic Refresh

The CFE Multicast TOP feed will periodically broadcast un-sequenced **Futures Instrument Definition**, **Price Limits**, and **Market Snapshot** messages that participants can use to recover from gaps or that may be used by late joiners to obtain a current state of the top of book for each **Symbol**. Un-sequenced messages are sent in a continuous loop. The **Price Limits** and **Market Snapshot** messages complete their loop approximately once every 3 seconds. The **Futures Instrument Definition** message completes its loop once a minute.

Participants that are not latency sensitive can use the Periodic Refresh mechanism as a substitute for the sequenced, real-time TOP messages. These participants would process only the un-sequenced **Futures Instrument Definition**, **Price Limits**, and **Market Snapshot** messages to get a periodic view of the top of book quote and volume for each **Symbol**.

Gap Request Proxy and Message Retransmission

Requesting delivery of missed sequenced data is achieved by establishing a TCP connection to a CFE Gap Request Proxy (GRP) port. This GRP port is specific to Multicast TOP and is NOT shared with the Multicast PITCH GRP port. Participants who do not wish to request missed messages do not need to connect to a GRP port for any reason or listen to the multicast addresses reserved for message retransmission. Participants choosing to request missed data will need to connect to their assigned GRP port, 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 for the requested unit. Participants will receive a total daily allowance of gap requested messages. In addition, each participant is given renewable one second and one minute gap request limits.

If more than one gap request is received for a particular unit/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. Participants will receive gap responses for their requested unit/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.

Spin Servers

A Spin Server is available for each unit. The server allows participants to connect via TCP and receive a spin of the inside book and symbols with limited trading conditions on that unit. By using the spin, a participant can get the current CFE book quickly in the middle of the trading session without worry of gap request limits. The Spin Server for each unit is assigned its own address and/or TCP port.

Upon successful login and periodically thereafter, a **Spin Image Available** message is sent which contains a sequence number indicating the most recent message applied to the book. Using a **Spin Request** message, a participant may request a spin for the orders up to a sequence number noted within one of the last ten **Spin Image Available** messages distributed. If the **Spin Request** message submitted does not present a sequence number that matches one of the last ten **Spin Image Available** messages distributed, the spin will return orders up to the next closest sequence number reported through a **Spin Image Available** message that is greater than the sequence number requested.

In the case a participant sends a sequence number in a **Spin Request** message that is higher than the sequence number reported by the most recent **Spin Image Available** message, the next spin image to be generated will be returned when it is available. If the requested sequence number is still higher at that time, an O (Out of Range) error will be generated.

A spin consists only of **Market Snapshot**, **End of Day Summary**, **Futures Instrument Definition**, **Futures Variance Symbol Mapping**, **Settlement**, **Price Limits**, **Time Reference** and **Time** messages for symbols that have had orders that day or had a limited trading state. A **Time** message will be sent as the last message in a spin if the last **Time** message sent on a spin is older than the last received time from the internal market data producers.

While receiving the spin, the participant must buffer multicast messages received. If the **Spin Image Available** message sequence number is the participant's reference point, multicast messages with larger sequence numbers should be buffered. If a non- **Spin Image Available** message sequence number is the participant's reference point which they send in their **Spin Request** message, they should buffer from that point on, but note that within the spin they may receive sequence numbers beyond that point which they may disregard. When a **Spin Finished** message is received, the buffered messages must be applied to spun copy of the book to bring it current.

[Spin Server Usage Example](#) shows an example flow of messages between a participant and CFE's Multicast TOP feed and Spin Server.

Protocol

CFE users may use the TOP protocol over multicast to receive real-time top of book quotations and execution information direct from CFE.

TOP cannot be used to enter orders. For order entry, refer to [Cboe Titanium Cboe Futures Exchange FIX Specification](#) or [Cboe Titanium Cboe Futures Exchange BOE Version 3 Specification](#).

All orders and executions are reflected via the TOP feed. All orders and executions are anonymous, and do not contain any participant identity.

Message Format

The messages that make up the TOP protocol are delivered using the CFE **Sequenced Unit Header** message header which handles sequencing and delivery integrity. All messages delivered via multicast as well as to/from the Gap Request Proxy (GRP) or Spin Server will 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 with associated data.

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

The TOP data feed is comprised of a series of dynamic length sequenced messages. Each message begins with **Length** and **Message Type** fields. CFE reserves the right to add message types and grow the length of any message without notice. Participants 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 the **Sequenced Unit Header** message header, GRP messages, and TOP.

- 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).
- Signed Binary fields are signed and sized to Length bytes and ordered using Little Endian convention (least significant byte first).
- Binary Price fields are signed Little Endian encoded 8 byte binary fields with 4 implied decimal places (denominator = 10,000).
- Binary Short Price fields are signed Little Endian encoded 2 byte binary fields with 2 implied decimal places (denominator = 100).
- 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.
- 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 are 4 byte unsigned Little Endian values that represent the number of nanoseconds since the last **Time** message.

Trade Date

Throughout this document, the term "Trade Date" is synonymous with the term "Business Date". The term Trade Date is used within this document to match identically named fields in [Cboe Titanium Cboe Futures Exchange FIX Specification](#) and [Cboe Titanium Cboe Futures Exchange BOE Version 3 Specification](#).

Message Framing

Top of book update 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 CFE **Sequenced Unit Header** message header. Framing will be determined by the server for each unit and site. The content of the multicast across feeds (e.g. A/B) will be identical, but framing will not be consistent across feeds. Receiving processes that receive and arbitrate multiple feeds cannot use frame level arbitration to fill gaps.

CFE Sequenced Unit Header Message Fields

The CFE **Sequenced Unit Header** message header is used for all CFE Multicast TOP messages as well as messages to and from the Gap Request Proxy (GRP) and Spin Servers.

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 **Hdr Sequence** field and potentially for the **Hdr Unit** field. All messages sent to and from the GRP and Spin Server are un-sequenced while multicast may contain both sequenced and un-sequenced messages.

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 within 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 **Heartbeat** messages.

Table 1. Sequenced Unit Header

Field	Offset	Length	Value/Type	Description
Hdr Length	0	2	Binary	Length of entire block of messages. Includes this header and messages following Hdr Count .
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.
Hdr Sequence	4	4	Binary	Sequence of first message to follow this header.
Total Length = 8 bytes				

Heartbeat Message Fields

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

Heartbeat messages 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 for the unit. **Heartbeat** messages on gap multicast addresses will always have the **Hdr Sequence** field set to 0. All **Heartbeat** messages sent to and from the GRP and Spin Server are considered un-sequenced and should have sequence and unit fields set to 0.

Outside of trading hours CFE sends **Heartbeat** messages on all real-time and gap channels with a sequence of 0 to help users validate multicast connectivity. **Heartbeat** messages might not be sent outside of normal trading hours.

CFE expects **Heartbeat** messages to be sent to the GRP on live connections no less than every 5 seconds. Failure to receive two consecutive **Heartbeat** messages will result in the GRP or Spin Server terminating the client connection.

TOP Messages

With the exception of **Time** messages, each TOP message reflects the update of the top of book or execution of an order in the system.

Time Message Fields

A **Time** message is immediately generated and sent when there is a TOP event for a given clock second. If there is no new sequenced TOP event for a given clock second, then no **Time** message is sent for that second. 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** field is the number of seconds relative to midnight Central Time, which is provided in the **Time Reference** message. The **Time** message also includes the **Epoch Time** field, which is the current time represented as the number of whole seconds since the Epoch (Midnight January 1, 1970).

Table 1. Time

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0x20	Time Message.
Time	2	4	Binary	Number of whole seconds elapsed since the start of the current Central Time calendar day, derived by converting the current Central wall clock time (HH:MM:SS) to seconds. On Daylight Saving Time transition days, Time 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 Epoch Time (where available) or Midnight Reference in the Time Reference message.
Epoch Time	6	4	Binary	Number of whole seconds since the Epoch (Midnight January 1, 1970 UTC).
Total Length = 10 bytes				

Unit Clear Message Fields

The **Unit Clear** message instructs feed recipients to clear all market snapshots for the CFE book in the unit specified in the **Sequenced Unit Header** message header. It would be distributed in rare recovery events such as a data center fail-over. It may also be sent on system startup (after daily restart) when there are no persisted GTCs or GTDs.

Table 1. Unit Clear

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0x97	Unit Clear message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Total Length = 6 bytes				

Time Reference Message Fields

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
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB1	Time Reference message.
Midnight Reference	2	4	Binary	Midnight Central Time reference time for subsequent Time messages, expressed as number of whole seconds since the Epoch (Midnight January 1, 1970 UTC).
Time	6	4	Binary	Number of whole seconds elapsed since the start of the current Central Time calendar day, derived by converting the current Central wall clock time (HH:MM:SS) to seconds. On Daylight Saving Time transition days, Time 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 Epoch Time (where available) or Midnight Reference in the Time Reference message.
Time Offset	10	4	Binary	Nanosecond offset from last unit timestamp.
Trade Date	14	4	Binary Date	Current Trade Date
Total Length = 18 bytes				

Futures Instrument Definition Message Fields

The **Futures Instrument Definition** message can be sent as a sequenced message or an un-sequenced message. It is sent as a sequenced message when the system starts up at the beginning of a trading session or if an instrument is created or modified during a trading day. A new sequenced message may be sent for a **Symbol** that does not visibly change any attribute. One un-sequenced **Futures Instrument Definition** message for each **Symbol** is also sent in a continuous loop, which completes approximately once every minute as part of the Periodic Refresh mechanism.

If the instrument is a spread (**Leg Count** > 0) then the message contains one or more repeating groups of leg definitions beginning at the field indicated by **Leg Offset**. There is a limit of 4 leg definitions.

The **Leg Offset** field is provided to support adding additional fields to this message preceding the Leg definitions.

The **Report Symbol** field will contain either the weekly (e.g. VX01) or the monthly (e.g. VX) symbol for any simple futures contract. The **Report Symbol** will always contain the standard futures root symbol (e.g. VX) for all spread instruments.

Futures Instrument Definition messages are included in a spin response. Simple leg **Futures Instrument Definition** messages will be disseminated before complex leg **Futures Instrument Definition** messages sent in a spin response.

Table 1. Futures Instrument Definition

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.

Field Name	Offset	Length	Type/(Value)	Description
Message Type	1	1	0xBB	Futures Instrument Definition message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp or Unit Timestamp in this message if it is non-zero.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Unit Timestamp	12	4	Binary	Unit timestamp expressed as number of whole seconds since the Epoch (Midnight, January 1, 1970 UTC).
Report Symbol	16	6	Alphanumeric	Symbol for product or underlying security.
Futures Flags	22	1	Bit Field	Value will always be zero.
Expiration Date	23	4	Binary Date	Expiration Date of Instrument.
Contract Size	27	2	Binary	Contract size of Instrument. Contract sizes less than 1 are represented with a 0 value; refer to the product specification for the contract size.
Listing State	29	1	Alphanumeric	A = Active I = Inactive T = Test
Price Increment	30	8	Binary Price	Minimum Price Increment.
Leg Count	38	1	Binary	Values greater than 0 indicate this is a spread instrument.
Leg Offset	39	1	Binary	Leg definitions, if any, begin at this offset from the beginning of the message. Possible values are 0 (no legs present) or 45 (spread instrument). Cboe reserves the right to change these values without prior notice.
Reserved	40	1	Binary	Reserved. Value will always be zero.
Contract Date	41	4	Binary Date	Populated for single leg instruments only. Zero-filled for spread instruments. The date that should be used in describing the future's third party symbol and the measurement period of the contract. Set to same value as Expiration Date for futures that have a Contract Date that does not differ from expire date.
The following fields repeat Leg Count times (maximum of 4) for spread instruments.				
Leg Ratio	Leg Offset + (10 * Leg Index)	4	Signed Binary	Leg ratio (positive for buy, negative for sell).
Leg Symbol	Leg Offset + 4 + (10 * Leg Index)	6	Alphanumeric	Symbol of leg.
Variable Total Length = 45 + (Leg Count * 10) bytes				

Futures Variance Symbol Mapping Message Fields

The **Futures Variance Symbol Mapping** message is used to disseminate symbol reference data for S&P 500 Variance Futures (VA Futures) symbols. VA Futures symbol reference data are disseminated with both the **Futures Instrument Definition** and **Futures Variance Symbol Mapping** messages. The purpose of the **Futures Variance Symbol**

message is to disseminate product-specific supplemental information for VA Futures symbols (i.e., Accrued Day Variance, Num Final Returns, and Num Elapsed Returns).

The **Futures Variance Symbol Mapping** message can be sent as a sequenced message or an un-sequenced message. It is sent as a sequenced message when the system starts up at the beginning of a trading session or if an instrument is created or modified during a trading day. A new sequenced message may be sent for a symbol that does not visibly change any attribute. One un-sequenced **Futures Variance Symbol Mapping** message for each symbol is also sent in a continuous loop, which completes approximately once every minute as part of the Periodic Refresh mechanism.

Futures Variance Symbol Mapping messages are included in a spin response.

Table 1. Futures Variance Symbol Mapping Message Fields

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xFA	Futures Variance Symbol Mapping message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp or Unit Timestamp in this message if it is non-zero.
Unit Timestamp	6	4	Binary	Unit timestamp expressed as number of whole seconds since the Epoch (Midnight, January 1, 1970 UTC).
Feed Symbol	10	6	Printable ASCII	Six character, base 62 symbol.
Futures Symbol	16	12	Alphanumeric	Twelve character textual definition of the symbol where the first six characters contain the product symbol, left justified, and padded on the right with spaces, and the right most six characters are the expiration date in YYMMDD format.
Accrued Day Variance	28	8	Signed Binary	Accrued day variance as of the start of the trading day (signed 64-bit decimal with twelve implied decimal places).
Num Final Returns	36	2	Binary	Number of S&P 500 Index returns used in the Final Settlement Value calculation.
Num Elapsed Returns	38	2	Binary	Number of elapsed S&P 500 Index returns including the current day.
Total Length = 40 bytes				

Price Limits Message Fields

The **Price Limits** message can be sent as a sequenced or un-sequenced message. As a sequenced message, it is sent out at the start of the session for products that are subject to price limits per the contract specifications. The **Price Limits** message does not signal whether price limits are in effect for that symbol; it simply provides those values for when they are in effect. If multiple **Price Limits** messages are received for the same **Symbol**, the most recent values will override the previous values.

As an un-sequenced message, it is sent out with a **Market Snapshot** message as part of the Periodic Refresh mechanism.

Price Limits messages are included in a spin response.

Table 1. Price Limits

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xBE	Price Limits message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Upper Price Limit	12	8	Binary Price	Upper price limit
Lower Price Limit	20	8	Binary Price	Lower price limit
Total Length = 28 bytes				

Refresh and Spin Messages

Market Snapshot

A **Market Snapshot** message provides a snapshot of the price and size for the bid and ask, last trade price, total number of contracts traded, and the current trading status of a single symbol. The **Market Snapshot** message will be included during a Spin for all products traded so far this Trade Date. Finally, **Market Snapshot** messages will also be sent in a continuous loop as part of the Periodic Refresh mechanism.

The **Unit Timestamp** field is provided because the timestamp for a **Market Snapshot** message is the last time an event occurred on that **Symbol**. Since the Futures market can cross midnight Central Time, the Epoch (midnight, January 1, 1970 UTC) is used as a reference point.

The **Market Snapshot** message comes in two variants: **Market Snapshot (Long)** message and **Market Snapshot (Short)** message. The **Market Snapshot (Short)** message is used whenever possible, but the **Market Snapshot (Long)** message version is used if any of the **Price** fields cannot be represented by a Binary Short Price (-327.68 to +327.67) or any of the **Quantity** fields cannot be represented by an unsigned 16-bit value (65536).

Table 1. Market Snapshot (Short)

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB2	Market Snapshot (Short) message.
Time Offset	2	4	Binary	Nanosecond offset from Unit Timestamp in this message.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Unit Timestamp	12	4	Binary	Last unit timestamp expressed as number of whole seconds since the Epoch (Midnight, January 1, 1970 UTC).
Bid Price	16	2	Binary Short Price	Bid price (may be a zero or negative price for some instruments).
Bid Quantity	18	2	Binary	Number of contracts on the bid side of the inside book (a zero value denotes the Bid Price is invalid).
Ask Price	20	2	Binary Short Price	Ask price (may be a zero or negative price for some instruments).
Ask Quantity	22	2	Binary	Number of contracts on the ask side of the inside book (a zero value denotes the Ask Price is invalid).
Last Trade Price	24	2	Binary Short Price	Price of last execution (this can be zero or negative for some instruments).

Field Name	Offset	Length	Type/(Value)	Description
Last Trade Size	26	2	Binary	Number of contracts traded on the last trade (if this value is 0 the Last Trade Price is invalid).
Last Trade Condition	28	1	Alphanumeric	Trade Condition for Last Trade (Space)=Normal trade O = Opening trade S = Spread trade B = Block trade E = ECRP trade X = Trade break D = Derived
Total Volume	29	4	Binary	Total number of contracts traded on the current business day.
Trading Status	33	1	Alphanumeric	See Trading Status field of Trading Status message.
Reserved	34	3	Alphanumeric	Reserved for use in other markets.
Total Length = 37 bytes				

Table 2. Market Snapshot (Long)

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB3	Market Snapshot (Long) message.
Time Offset	2	4	Binary	Nanosecond offset from Unit Timestamp in this message.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Unit Timestamp	12	4	Binary	Last unit timestamp expressed as number of whole seconds since the Epoch (Midnight, January 1, 1970 UTC).
Bid Price	16	8	Binary Price	Bid price (may be a zero or negative price for some instruments).
Bid Quantity	24	4	Binary	Number of contracts on the bid side of the inside book (a zero value denotes the Bid Price is invalid).
Ask Price	28	8	Binary Price	Ask price (may be a zero or negative price for some instruments).
Ask Quantity	36	4	Binary	Number of contracts on the ask side of the inside book (a zero value denotes the Ask Price is invalid).
Last Trade Price	40	8	Binary Price	Price of last execution (this can be zero or negative for some instruments).
Last Trade Size	48	4	Binary	Number of contracts traded on the last trade (if this value is 0 the Last Trade Price is invalid).

Field Name	Offset	Length	Type/(Value)	Description
Last Trade Condition	52	1	Alphanumeric	Trade Condition for Last Trade (Space)=Normal trade O = Opening trade S = Spread trade B = Block trade E = ECRP trade X = Trade break D = Derived
Total Volume	53	4	Binary	Total number of contracts traded on the current business day.
Trading Status	57	1	Alphanumeric	See Trading Status field of Trading Status message.
Reserved	58	3	Alphanumeric	Reserved for use in other markets.
Total Length = 61 bytes				

Market Update Messages

Market Update messages reflect real-time events to the current state of the market. These messages are always sequenced and may be recovered via the Gap Request Proxy (GRP).

Single Side Update Message Fields

Single Side Update messages provide an updated price and size for a single side of a **Symbol**. The side is denoted by the **Side** field. One **Single Side Update** message may reflect one or more updates to the inside book that were processed at the same time, but will only be done so in a way that can be arbitrated between A/B feeds.

Single Side Update messages come in two variants: **Single Side Update (Long)** message and **Single Side Update (Short)** message. The **Single Side Update (Short)** message is used whenever possible, but the **Single Side Update (Long)** message is used whenever the **Price** cannot be represented by a Binary Short Price or the **Quantity** cannot be represented by an unsigned 16-bit integer.

Table 1. Single Side Update (Short)

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB4	Single Side Update (Short) message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Side	12	1	Alphanumeric	B = Bid side S = Ask side
Price	13	2	Binary Short Price	Price (may be a zero or negative price for some instruments).
Quantity	15	2	Binary	Number of contracts on the inside book (a zero value denotes the Price is invalid).
Total Length = 17 bytes				

Table 2. Single Side Update (Long)

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB5	Single Side Update (Long) message.

Field Name	Offset	Length	Type/(Value)	Description
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Side	12	1	Alphanumeric	B = Bid side S = Ask side
Price	13	8	Binary Price	Price (may be a zero or negative price for some instruments).
Quantity	21	4	Binary	Number of contracts on the inside book (a zero value denotes the Price is invalid).
Total Length = 25 bytes				

Two Side Update Message Fields

Two Side Update messages provide an updated price and size for both sides of a **Symbol**. One **Two Side Update** message may reflect one or more updates to the inside book that were processed at the same time, but will only be done so in a way that can be arbitrated between A/B feeds.

Two Side Update messages come in two variants: **Two Side Update (Long)** message and **Two Side Update (Short)** message. The **Two Side Update (Short)** message is used whenever possible, but the **Two Side Update (Long)** message is used whenever the **Price** cannot be represented by a Binary Short Price or the **Quantity** cannot be represented by an unsigned 16-bit integer.

Table 1. Two Side Update (Short)

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB6	Two Side Update (Short) message.
Time Offset	2	4	Binary	Nanosecond offset from Unit Timestamp in this message.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Bid Price	12	2	Binary Short Price	Bid price (may be a zero or negative price for some instruments).
Bid Quantity	14	2	Binary	Number of contracts on the bid side of the inside book (a zero value denotes the Bid Price is invalid).
Ask Price	16	2	Binary Short Price	Ask price (may be a zero or negative price for some instruments).
Ask Quantity	18	2	Binary	Number of contracts on the ask side of the inside book (a zero value denotes the Ask Price is invalid).
Total Length = 20 bytes				

Table 2. Two Side Update (Long)

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB7	Two Side Update (Long) message.
Time Offset	2	4	Binary	Nanosecond offset from Unit Timestamp in this message.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.

Field Name	Offset	Length	Type/(Value)	Description
Bid Price	12	8	Binary Price	Bid price (may be a zero or negative price for some instruments).
Bid Quantity	20	4	Binary	Number of contracts on the bid side of the inside book (a zero value denotes the Bid Price is invalid).
Ask Price	24	8	Binary Price	Ask price (may be a zero or negative price for some instruments).
Ask Quantity	32	4	Binary	Number of contracts on the ask side of the inside book (a zero value denotes the Ask Price is invalid).
Total Length = 36 bytes				

TOP Trade Message Fields

The **TOP Trade** message provides information about executions of orders on the CFE book. **TOP Trade** messages are necessary to calculate CFE execution-based data. **TOP Trade** messages do not alter the book. One or more **Single Side Update** or **Two Side Update** messages will follow a **TOP Trade** message to reflect the updated book (for example, an aggressive order may take out one or more price levels and establish a new level on the opposite side).

Any order may be executed in parts. A complete view of all CFE executions can be built from all **TOP Trade** messages.

The **TOP Trade** message sends the trade price, trade quantity, execution id, and trade condition of a trade as well as the cumulative volume for the business day. A **TOP Trade** message will be sent for each execution, but not every **TOP Trade** message indicates a trade. The **Trade Condition** value of X (Trade Break) is sent whenever an execution on CFE is broken. Trade breaks are rare and only affect applications that rely upon CFE execution-based data. Trade breaks will contain the **Symbol**, **Quantity**, **Price**, and **Execution Id** of the original trade. The **Total Volume** field will be reduced by the number of shares reported in the **Quantity** field.

Table 1. TOP Trade

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB8	TOP Trade message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Quantity	12	4	Binary	Incremental number of contracts executed or corrected (see Trade Condition).
Price	16	8	Binary Price	The execution price of the order.
Execution Id	24	8	Binary	CFE generated day-unique execution identifier of this trade. Execution Id is also referenced in the Trade Break message.
Total Volume	32	4	Binary	Total number of contracts traded on the current business day (may decrease if the Trade Condition field indicates a canceled trade).

Field Name	Offset	Length	Type/(Value)	Description
Trade Condition	36	1	Alphanumeric	(Space)=Normal trade O = Opening trade ¹ S = Spread trade ¹ B = Block trade E = ECRP trade D = Derived ¹ Sent for simple (non-spread) symbols only.
Total Length = 37 bytes				

End of Day Messages

Several different message types are sent after the close to signify the end of a Trading Day.

Settlement Message Fields

Settlement messages are used to provide information concerning indicative, approved, or corrected daily and final settlement prices for CFE products. An indicative daily settlement price (**Issue = I**) is calculated by the system and sent immediately after an instrument closes trading but before the settlement price is approved. An approved settlement price (**Issue = S**) is sent once the CFE Trade Desk approves a settlement price for an instrument. If there is an error in the approved settlement price, then it may be re-issued (**Issue = R**). For symbols that settle each day using VWAP, the system will begin disseminating an intermediate indicative price update (**Issue = i**) at 2:59:35 (following the first interval of the VWAP calculation) that will be sent every five seconds leading up to the receipt of the indicative daily settlement price (**Issue = I**).

Settlement messages will be included in a spin response.

Table 1. Settlement

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xB9	Settlement message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Trade Date	12	4	Binary Date	Trade Date for the settlement.
Settlement Price	16	8	Binary Price	Settlement Price
Issue	24	1	Alphanumeric	i = Periodic Indicative Settlement I = Indicative Settlement S = Initial Settlement R = Re-issued Settlement
Total Length = 25 bytes				

End of Day Summary Message Fields

The **End of Day Summary** message is sent out right after trading ends for a symbol. No more Market Update messages will follow an **End of Day Summary** message for a particular symbol. A value of zero in the **Total Volume** field means that no volume traded on that symbol for the day. The **Total Volume** field reflects all contracts traded during the day. Block, ECRP, and Derived trades are included in the **Total Volume** field, but they are also reported separately to provide more detail.

The **Summary Flags** field provides additional information on how to interpret the **High Price** and **Low Price** fields, especially in instruments that had no volume for the day and/or where 0 is a valid price (e.g. Trade At Settlement products). There are flags that indicate whether or not the **High Price** and **Low Price** fields are valid. If they are not

valid, then there was no High (and/or Low) Price for the day. There are also flags that indicate whether the **High Price** was set by the highest bid and the **Low Price** was set by the lowest offer rather than a trade.

All **End of Day Summary** message values will span the full trading day, including all extended hours trading and all trading segments.

Table 1. End of Day Summary

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xBA	End of Day Summary message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Trade Date	12	4	Binary Date	Trade Date for the message.
Open Interest	16	4	Binary	Prior Trade Date Open Interest for this symbol.
High Price	20	8	Binary Price	The higher of highest bid price and highest trade price for the day. Block and ECRP trades (Trade Condition = B or E) do not update High Price .
Low Price	28	8	Binary Price	The lower of lowest offer price and lowest trade price for the day. Block and ECRP trades (Trade Condition = B or E) do not update Low Price .
Open Price	36	8	Binary Price	The first trade on the day (in any session) will set the Open Price for the day (valid only if Total Volume > 0). Block and ECRP trades (Trade Condition = B or E) do not update Open Price .
Close Price	44	8	Binary Price	The last trade on the day (in any session) will set the Close Price for the day (valid only if Total Volume > 0). Block and ECRP trades (Trade Condition = B or E) do not update Close Price .
Total Volume	52	4	Binary	Total number of contracts traded for the day, including Block, ECRP, and Derived trades.
Block Volume	56	4	Binary	Total number of block contracts traded for the day.
ECRP Volume	60	4	Binary	Total number of contracts traded for the day.
Summary Flags	64	1	Bit Field	Bit 0 = High Price Valid - Set if High Price is a valid value. Bit 1 = High Price is bid- Set if High Price was set by the highest bid (rather than a trade). Bit 2 = Low Price Valid - Set if Low Price is a valid value. Bit 3 = Low Price is offer - Set if Low Price was set by the lowest offer (rather than a trade). Bit 4 = Open/Close Valid - Set if both. Open Price and Close Price fields contain valid values Bit 5-7 = Reserved
Total Length = 65 bytes				

Trading Status Message Fields

The **Trading Status** message is used to indicate the current trading status of a Futures contract. A **Trading Status** message will be sent whenever a security's trading status changes. If a **Trading Status** message has not been received for a symbol, then the **Trading Status** for the symbol should be assumed to be S = Suspended. The following summarizes the Trading Status values in the CFE system:

- S = Suspended. A contract is in a suspended state when the associated product is closed and not accepting orders

- Q = Accepting orders for queuing. Queuing state is used during the Pre-Open for all products. It is also used for spread instruments that may not be tradeable due to Threshold Width
- T = Trading. Used for both Extended and Regular Hours trading
- H = Halt state. This state is used for Supervisory Halts initiated by the Trade Desk. Orders are not being accepted in this state

Table 1. Trading Status

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0x31	Trading Status message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Reserved1	12	2	Alpha	Reserved
Trading Status	14	1	Alpha	S = Suspended Q = Queuing T = Trading H = Halted
Reserved2	15	3	Alphanumeric	Reserved
Total Length = 18 bytes				

Open Interest Message Fields

The **Open Interest** message is sent to communicate a symbol's open interest, usually for the prior trading date. This message will be sent when open interest information is made available to CFE and may be sent multiple times if there are changes to the open interest for a symbol. The open interest is also populated in the **End of Day Summary** message.

Table 1. Open Interest

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0xD3	Open Interest message.
Time Offset	2	4	Binary	Nanosecond offset from last unit timestamp.
Symbol	6	6	Printable ASCII	Six character, base 62 symbol.
Trade Date	12	4	Binary Date	Trade Date for the Open Interest data.
Open Interest	16	4	Binary	Open Interest for this symbol.
Total Length = 20 bytes				

End of Session Message Fields

The **End of Session** message is sent for each unit when the unit shuts down. No more sequenced messages will be delivered for this unit, but heartbeats from the unit may be received.

Table 1. End of Session

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

Gap Request Proxy Messages

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

Login Message Fields

The **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 1. Login

Field	Offset	Length	Value/Type	Description
<i>Length</i>	0	1	Binary	<i>Length</i> of this message including this field.
<i>Message Type</i>	1	1	0x01	Login message.
<i>SessionSubId</i>	2	4	Alphanumeric	<i>SessionSubId</i> supplied by CFE.
<i>Username</i>	6	4	Alphanumeric	<i>Username</i> supplied by CFE.
<i>Filler</i>	10	2	Alphanumeric	(space filled)
<i>Password</i>	12	10	Alphanumeric	<i>Password</i> supplied by CFE.
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 1. Login Response

Field	Offset	Length	Value/Type	Description
<i>Length</i>	0	1	Binary	<i>Length</i> of this message including this field.
<i>Message Type</i>	1	1	0x02	Login Response message.
<i>Status</i>	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 CFE's gap servers.

Table 1. Gap Request

Field	Offset	Length	Value/Type	Description
<i>Length</i>	0	1	Binary	<i>Length</i> of this message including this field.

Field	Offset	Length	Value/Type	Description
Message Type	1	1	0x03	Gap Request message
Unit	2	1	Binary	Unit that the gap is requested for.
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 A = Accepted or reason for failure, will be sent for each **Gap Request** message received by the GRP.

Table 1. 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.
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.

Spin Messages

Login

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

The format of the **Login** message for the Spin Server is identical to that of the GRP described previously in [Login Message Fields](#).

Login Response

The **Login Response** message is sent by the Spin 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.

The format of the **Login Response** message for the Spin Server is identical to that of the GRP described previously in [Login Response Message Fields](#).

Spin Image Available Message Fields

The **Spin Image Available** message is sent once per second and indicates through what sequence number a spin is available.

Table 1. Spin Image Available

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0x80	Spin Image Available message.
Sequence	2	4	Binary	Spin is available which is current through this sequence number.
Total Length = 6 bytes				

Spin Request Message Fields

The **Spin Request** message is used by a user's process to request transmission of a spin of the unit's order book. Refer to [Spin Servers](#) for more complete details regarding **Sequence** specification as well as buffering requirements.

Table 1. Spin Request

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0x81	Spin Request message.
Sequence	2	4	Binary	Sequence number from a Spin Image Available message received by the participant.
Total Length = 6 bytes				

Spin Response Message Fields

The **Spin Response** message is sent in response to a user's **Spin Request** message indicating whether a spin will be sent.

Table 1. Spin Response

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0x82	Spin Response message
Sequence	2	4	Binary	Sequence number from a Spin Image Available message received by the participant.
Order Count	6	4	Binary	Number of Add Order messages which will be contained in this spin.
Status	10	1	Alphanumeric	Accepted or reason for reject*.
Total Length = 11 bytes				
Spin Response - Status Codes				
'A'	Accepted			
'O'	Out of Range (Sequence requested is greater than Sequence available by the next spin)			
'S'	Spin already in progress (only one spin can be running at a time).			

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

Spin Finished Message Fields

The **Spin Finished** message is sent to indicate that all messages for the spin requested have been sent. A **Spin Finished** message is only sent if a **Spin Request** message was not rejected. Upon receipt of a **Spin Finished** message, any buffered multicast messages should be applied to the participant's copy of the book to make it current.

Table 1. Spin Finished

Field Name	Offset	Length	Type/(Value)	Description
Length	0	1	Binary	Length of this message including this field.
Message Type	1	1	0x83	Spin Finished message
Sequence	2	4	Binary	Sequence number from the Spin Request message.
Total Length = 6 bytes				

Spin Server Usage Example

The following diagram shows the exchange of messages over time between a participant and CFE's Multicast TOP feed and Spin Server. Note that while the example may seem to imply **Market Snapshot** messages only would be sent on a Spin, this is not the case. **Trading Status** message may be sent at the beginning of the spin session and **Time** messages may be found mixed between **Market Snapshot** messages according to their timestamps.

At time 1, the participant has no state of the book and desires to become current. The participant caches the received Multicast TOP messages (sequences 310172 and 310173) for later use. Since the participant has no book, they cannot yet be applied.

At time 5, the participant has successfully logged into the Spin Server and has cached another message, sequence 310174.

At time 7, the participant receives a **Spin Image Available** message which indicates that the spin server is capable of giving them a spin of all symbols as of sequence 310169. The participant does not have all messages cached after 310169 (they are missing 310170 and 310171), so this spin is not useful to the participant.

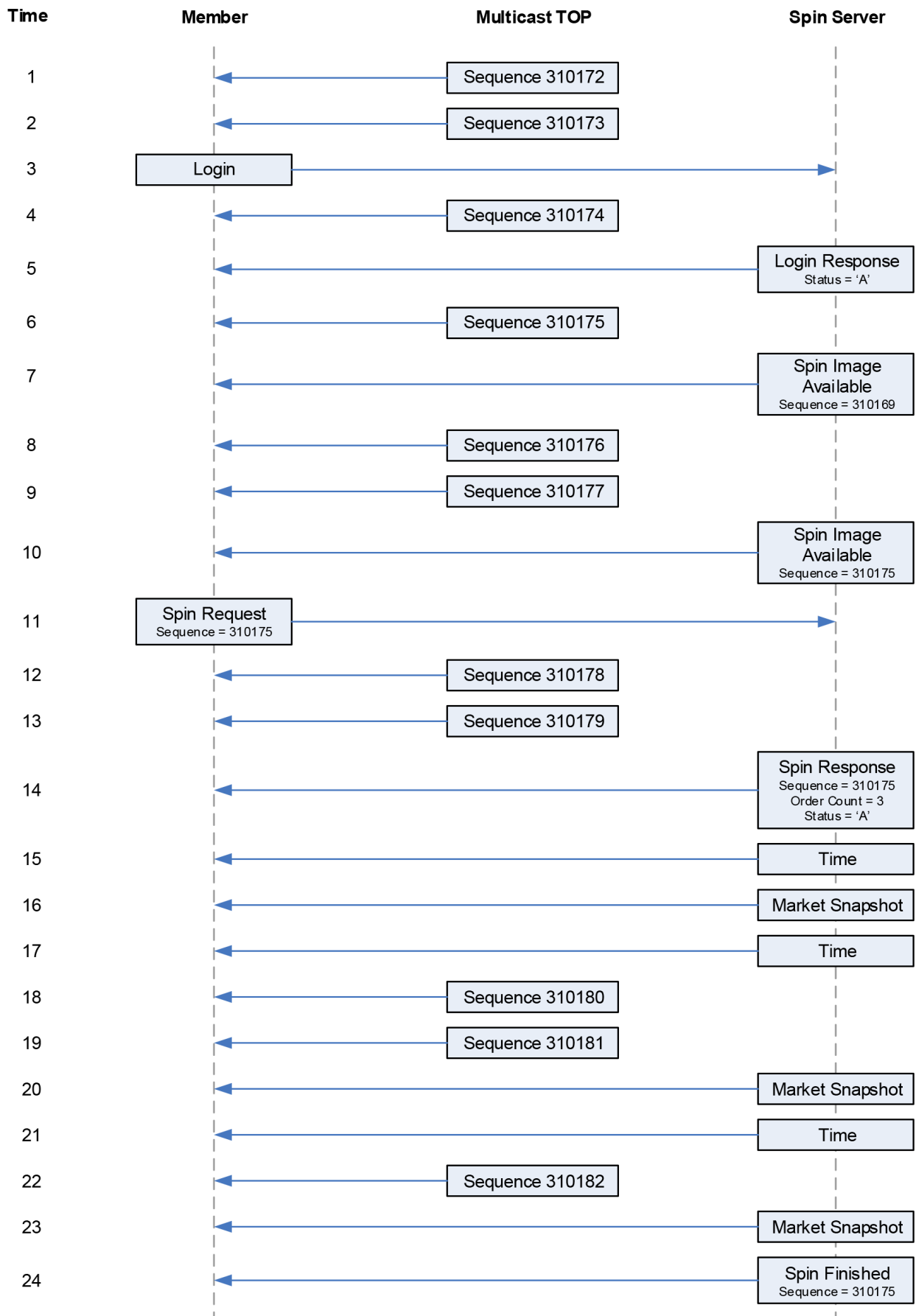
At time 10, the participant receives a **Spin Image Available** message which is useful since it would be a spin of all orders up to and including sequence 310175 and the participant has all messages after 310175 cached.

At time 11, the participant sends a **Spin Request** message for all messages up to and including 310175 and continues to cache Multicast TOP messages received.

At time 14, the Spin Server acknowledges the **Spin Request** message and indicates that three symbols will be sent.

At time 24, the spin server indicates that it has finished sending all open orders. The participant must then apply the cached messages from sequence number 310176 through current.

Note: Spin Servers are available for each unit. Participants may need to employ multiple Spin Servers depending upon their architecture.



Message Types

Gap Request Proxy Messages

0x01	Login
0x02	Login Response
0x03	Gap Request
0x04	Gap Response

Spin Server Messages

0x01	Login
0x02	Login Response
0x80	Spin Image Available
0x81	Spin Request
0x82	Spin Response
0x83	Spin Finished

TOP Messages

0x20	Time
0x2D	End of Session
0x31	Trading Status
0xB1	Time Reference
0xB2	Market Snapshot (Short)
0xB3	Market Snapshot (Long)
0xB4	Single Side Update (Short)
0xB5	Single Side Update (Long)
0xB6	Two Side Update (Short)
0xB7	Two Side Update (Long)
0xB8	TOP Trade
0xB9	Settlement
0xBA	End of Day Summary
0xBB	Futures Instrument Definition
0xBE	Price Limits
0xD3	Open Interest
0xFA	Futures Variance Symbol Mapping

Example Messages

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

Login Message Example

Table 1. Login Message Example

Length	16	22 bytes
Type	01	Login
SessionSubld	30 30 30 31	"0001"
Username	46 49 52 4D	"FIRM"
Filler	20 20	" "
Password	41 42 43 44 30 30 20 20 20 20	"ABCD00"

Login Response Message Example

Table 1. Login Response Message Example

Length	03	3 bytes
Type	02	Login Response
Status	41	Login accepted

Gap Request Message Example

Table 1. Gap Request Message Example

Length	09	9 bytes
Type	03	Gap Request
Unit	01	Unit 1
Sequence	3B 10 00 00	First message: 4155
Count	32 00	50 messages

Gap Response Message Example

Table 1. Gap Response Message Example

Length	08	8 bytes
Type	04	Gap Response
Unit	01	Unit 1
Sequence	3B 10 00 00	First message: 4155
Status	41	Accepted

Spin Image Available Message Example

Table 1. Spin Image Available Message Example

Length	06	6 bytes
Type	80	Spin Image Available

Sequence	3B 10 00 00	Sequence: 4155
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Spin Request Message Example

Table 1. Spin Request Message Example

Length	06	6 bytes
Type	81	Spin Request
Sequence	3B 10 00 00	Sequence: 4155

Spin Response Message Example

Table 1. Spin Response Message Example

Length	0B	11 bytes
Type	82	Spin Request
Sequence	3B 10 00 00	Sequence: 4155
Order Count	42 00 00 00	66 orders
Status	41	Accepted

Spin Finished Message Example

Table 1. Spin Finished Message Example

Length	06	6 bytes
Type	83	Spin Finished
Sequence	3B 10 00 00	Sequence: 4155

Time Message Example

Table 1. Time Message Example

Length	0A	10 bytes
Type	20	Time
Time	98 85 00 00	34,200 seconds = 09:30 AM Central
Epoch Time	F8 27 94 5A	1519659000 = February 26, 2018 9:30:00 AM Central

Unit Clear Message Example

Table 1. Unit Clear Message Example

Length	06	6 bytes
Type	97	Unit Clear
Time Offset	18 D2 06 00	447,000 ns since last Time Message

Time Reference Message Example

Table 1. Time Reference Message Example

Length	12	18 bytes
Type	B1	Time Reference

Midnight Reference	E0 50 92 5A	2018-02-25 00:00:00 Central (1519538400 seconds since the Epoch)
Time	00 E1 00 00	16:00:00
Time Offset	00 00 00 00	Exactly 16:00:00
Trade Date	02 ED 33 01	20180226 February 26, 2018

Market Snapshot (Short) Message Example

Table 1. Market Snapshot (Short) Message Example

Length	25	37 bytes
Type	B2	Market Snapshot (Short)
Time Offset	08 5C 44 25	625,237,000 ns
Symbol	30 31 32 33 34 35	012345
Unit Timestamp	E6 EB 99 5A	2018-03-02 12:27:18 Central (1520036838 seconds since the Epoch)
Bid Price	41 01	\$3.21
Bid Size	BC 02	700 contracts
Ask Price	B0 01	\$4.32
Ask Size	84 03	900 contracts
Last Trade Price	8F 01	\$3.99
Last Trade Size	FE FF	65,534 contracts
Last Trade Condition	20	(space) Normal Trade
Total Volume	32 54 76 98	2,557,891,634 contracts
Trading Status	54	T - Trading
Reserved	31 20 20	Reserved

Market Snapshot (Long) Message Example

Table 1. Market Snapshot (Long) Message Example

Length	2D	61 bytes
Type	B3	Market Snapshot (Long)
Time Offset	08 5C 44 25	625,237,000 ns
Symbol	30 31 32 33 34 35	012345
Unit Timestamp	E6 EB 99 5A	2018-03-02 12:27:18 Central (1520036838 seconds since the Epoch)
Bid Price	9C 82 FF FF FF FF FF FF	\$-3.21
Bid Size	BC 02 00 00	700 contracts
Ask Price	E0 F4 8F 04 00 00 00 00	\$7,654.32
Ask Size	84 03 00 00	900 contracts
Last Trade Price	DC 9B 00 00 00 00 00 00	\$3.99
Last Trade Size	64 00 00 00	100 contracts
Last Trade Condition	20	(space) Normal Trade
Total Volume	78 56 34 12	305,419,896 contracts
Trading Status	54	T - Trading
Reserved	31 20 20	Reserved

Single Side Update (Short) Message Example

Table 1. Single Side Update (Short) Message Example

Length	11	17 bytes
Type	B4	Single Side Update (Short)
Time Offset	30 FA D3 29	701,758,000 ns since last Time Message
Symbol	30 31 32 33 34 35	012345
Side	42	B (Buy)
Price	0C 30	\$1.23
Quantity	64 00	100 contracts

Single Side Update (Short, Negative Price) Message Example

Table 1. Single Side Update (Short, Negative Price) Message Example

Length	11	17 bytes
Type	B4	Single Side Update (Short)
Time Offset	30 FA D3 29	701,758,000 ns since last Time Message
Symbol	30 31 32 33 34 35	012345
Side	42	B (Buy)
Price	85 FF	-\$1.23
Quantity	C8 00	200 contracts

Single Side Update (Long) Message Example

Table 1. Single Side Update (Long) Message Example

Length	1B	27 bytes
Type	B5	Single Side Update (Long)
Time Offset	30 FA D3 29	701,758,000 ns since last Time Message
Symbol	30 31 32 33 34 35	012345
Side	42	B (Buy)
Price	0C 30 00 00 00 00 00 00	\$1.23
Quantity	64 00 00 00	100 contracts

TOP Trade Message Example

Table 1. TOP Trade Message Example

Length	25	37 bytes
Type	B8	Trade
Time Offset	10 84 D4 23	601,130,000 ns since last Time Message
Symbol	36 35 34 33 32 31	654321
Quantity	BC 02 00 00	700 contracts
Price	08 E2 01 00 00 00 00 00	\$12.34
Execution Id	34 2B 46 E0 BB 00 00 00	0AAP09VEC

Total Volume	40 42 0F 00 00 00 00 00	1,000,000 contracts
Trade Condition	20	Normal Trade (space)

TOP Trade (Condition = Trade Break) Message Example

Table 1. TOP Trade (Condition = Trade Break) Message Example

Length	25	37 bytes
Type	B8	Trade
Time Offset	10 84 D4 23	601,130,000 ns since last Time Message
Symbol	36 35 34 33 32 31	654321
Quantity	BC 02 00 00	700 contracts
Price	08 E2 01 00 00 00 00 00	\$12.34
Execution Id	34 2B 46 E0 BB 00 00 00	0AAP09VEC
Total Volume	84 3F 0F 00 00 00 00 00	999,300 contracts
Trade Condition	58	X - Trade Break

Settlement Message Example

Table 1. Settlement Message Example

Length	19	25 bytes
Type	B9	Settlement
Time Offset	60 84 8E 00	9,340,000 ns since last Time Message
Symbol	36 35 34 33 32 31	654321
Reserved	20 20	
Trade Date	03 ED 33 01	20180227 February 27, 2018
Settlement Price	4C F8 06 00 00 00 00 00	\$45.67
Issue	53	S – Initial Settlement

Open Interest Message Example

Table 1. Open Interest Message Example

Length	19	20 bytes
Type	D3	Open Interest
Time Offset	60 84 8E 00	9,340,000 ns since last Time Message
Symbol	36 35 34 33 32 31	654321
Trade Date	A9 3C 34 01	20200617 June 17, 2020
Open Interest	B1 68 DE 3A	987,654,321 contracts

End of Day Summary Message Example

Table 1. End of Day Summary Message Example

Length	41	65 bytes
Type	BA	End of Day Summary
Time Offset	18 D2 06 00	447,000 ns since last Time Message
Symbol	39 38 37 36 35 34	987654

Open Interest	B1 68 DE 3A	987,654,321 contracts
High Price	DC FB 09 00 00 00 00 00	\$65.43
Low Price	08 E2 01 00 00 00 00 00	\$12.34
Open Price	E0 49 08 00 00 00 00 00	\$54.32
Close Price	F8 A9 08 00 00 00 00 00	\$56.78
Total Volume	15 CD 5B 07 00 00 00 00	123,456,789 contracts
Block Volume	88 13 00 00	5,000 Block contracts
ECRP Volume	E8 03 00 00	1,000 ECRP contracts
Summary Flags	15	High Price Valid 0x01
		Low Price Valid 0x04
		Has Open/Close 0x10

Futures Instrument Definition (*Contract Date Different from Expiration Date*) Message Example

Table 1. Futures Instrument Definition (Contract Date Different from Expiration Date) Message Example

Length	2D	45 bytes
Type	BB	Futures Instrument Definition Message
Time Offset	E8 61 BF 23	599,745,000 ns since Last Time Message
Symbol	30 30 30 33 6C 4E	0003IN
Unit Timestamp	75 2D 40 5E	2020-02-09 10:04:05 Central Time (1581264245 seconds since Epoch)
Report Symbol	41 4D 42 33 20 20	AMB3
Futures Flags	00	0
Expiration Date	D4 3D 34 01	20200916 – September 16, 2020
Contract Size	19 00	25
Listing State	41	A - Active
Price Increment	C4 09 00 00 00 00 00 00	\$0.25
Leg Count	00	0 legs
Leg Offset	00	0 – No Legs
Reserved	00	0 – Reserved
Contract Date	A9 3C 34 01	20200617 – June 17, 2020

Futures Instrument Definition (*Contract Date Same as Expiration Date*) Message Example

Table 1. Futures Instrument Definition (Contract Date Same as Expiration Date) Message Example

Length	2D	45 bytes
Type	BB	Futures Instrument Definition Message
Time Offset	80 A3 14 27	655,664,000 ns since Last Time Message
Symbol	30 30 30 33 69 34	0003i4
Unit Timestamp	75 2D 40 5E	2020-02-09 10:04:05 Central Time (1581264245 seconds since Epoch)
Report Symbol	56 58 20 20 20 20	VX

Futures Flags	00	0
Expiration Date	A9 3C 34 01	20200617 – June 17, 2020
Contract Size	E8 03	1000
Listing State	41	A - Active
Price Increment	F4 01 00 00 00 00 00 00	\$0.05
Leg Count	00	0 legs
Leg Offset	00	0 – No Legs
Reserved	00	0 – Reserved
Contract Date	A9 3C 34 01	20200617 – June 17, 2020

Futures Instrument Definition w/ 2 Legs(Contract Date Populated with Zero value) Message Example

Table 1. Futures Instrument Definition w/ 2 Legs (Contract Date Populated with Zero value) Message Example

Length	41	65 bytes
Type	BB	Futures Instrument Definition Message
Time Offset	E8 61 BF 23	599,745,000 ns since Last Time Message
Symbol	30 30 30 33 6C 52	0003IR
Unit Timestamp	75 2D 40 5E	2020-02-09 10:04:05 Central Time (1581264245 seconds since Epoch)
Report Symbol	41 4D 42 33 20 20	AMB3
Futures Flags	00	0
Expiration Date	A9 3C 34 01	20200617 – Wednesday, June 17, 2020
Contract Size	19 00	25
Listing State	41	A - Active
Price Increment	C4 09 00 00 00 00 00 00	\$0.25
Leg Count	02	2 legs
Leg Offset	2D	Legs begin at byte 45
Reserved	00	0 – Reserved
Contract Date	00 00 00 00	0
Leg #1 Ratio	FF FF FF FF	-1 (1 Sell)
Leg #1 Symbol	30 30 30 33 67 75	0003gu
Leg #2 Ratio	01 00 00 00	1 (1 Buy)
Leg #2 Symbol	30 30 30 33 6C 4E	0003IN

Futures Variance Symbol Mapping Message Example

Table 1. Futures Variance Symbol Mapping Message Example

Length	28	40 bytes
Type	FA	Futures Variance Symbol Mapping Message
Time Offset	E8 61 BF 23	599,745,000 ns since Last Time Message
Unit Timestamp	E5 CE 44 66	2024-05-14 10:04:05 CT
Feed Symbol	30 30 30 33 6C 52	0003IR

Futures Symbol	56 41 20 20 20 20 32 34 30 35 31 37	VA 240517
Accrued Day Variance	E0 3E 3F 56 32 87 00 00	148.650265100000
Num Final Returns	0F 01	271
Num Elapsed Returns	0D 01	269

Trading Status Message Example

Table 1. Trading Status Message Example

Length	12	18 bytes
Type	31	Trading Status
Time Offset	18 D2 06 00	447,000 ns since last Time Message
Symbol	39 39 38 38 37 37	998877
Halt Status	54	T = Trading
Reserved	30 20 20	Reserved

Price Limits Message Example

Table 1. Price Limits Message Example

Length	1C	28 bytes
Type	BE	Price Limits
Time Offset	18 D2 06 00	447,000 ns since last Time Message
Symbol	31 32 33 34 35 20	12345
Upper Price Limit	08 E2 01 00 00 00 00 00	\$12.34
Lower Price Limit	8C 81 01 00 00 00 00 00	\$9.87

Sequenced Unit Header with 2 Messages

Table 1. Sequenced Unit Header with 2 Messages

Sequenced Unit Header Message Example		
Hdr Length	3E 00	62 bytes, including header
Hdr Count	02	2 messages to follow
Hdr Unit	01	Unit 1
Hdr Sequence	01 00 00 00	First message has sequence number 1
Message 1: Trade Message Example		
Length	25	37 bytes
Type	B4	Trade
Time Offset	10 84 D4 23	601,130,000 ns since last Time Message
Symbol	36 35 34 33 32 31	654321
Reserved	20 20	
Quantity	BC 02 00 00	700 contracts
Price	08 E2 01 00 00 00 00 00	\$12.34
Execution Id	34 2B 46 E0 BB 00 00 00	0AAP09VEC
	40 42 0F 00 00 00 00 00	1,000,000 contracts
Trade Condition	20	Normal Trade (space)

Message 2: Single Side Update Message Example

Length	11	17 bytes
Type	B4	Single Side Update (Short)
Time Offset	30 FA D3 29	701,758,000 ns since last Time Message
Symbol	36 35 34 33 32 31	654321
Side	42	B (Buy)
Price	0C 30	\$1.23
Quantity	64 00	100 contracts

Multicast Configuration

Production Environment Configuration

Limitations/Configurations

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

Table 1. CFE Multicast TOP Limitations/Configurations

Period/Type	Limit/Setting	Notes
MTU	1500	CFE will send UDP messages up to 1500 bytes. Participants should ensure that their infrastructure is configured accordingly.
WAN-Shaped Throttle	100 Mb/s	The real-time and gap multicast head ends are configured to shape their output to this level to minimize packet loss.
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	1,500 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.

CFE Unit/Product Distribution

The following table describes the CFE symbol distribution across units.

Table 1. CFE Production/Certification Environment - Unit/Product Distribution

Symbol Range	Unit
UX, VX, VXT, VXM, VXMT	1
IBHY, IBIG, IBGO, IBYO, IEMD, MGTN, VA, XBTF	2
FBT, FET, PBT, PET	3
N/A	4

Note - CFE 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.

Multicast Routing Parameters

Table 1. CFE Multicast TOP Routing Parameters - Production

Data Center	Rendezvous Point
Primary Data Center C feed	74.115.128.164

Data Center	Rendezvous Point
Primary Data Center D feed	74.115.128.165
Secondary Data Center E feed	170.137.16.128

Address/Unit Distribution

The following tables describe the unit distribution across the CFE Multicast TOP feeds.

Note - CFE 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.

Table 1. CFE Multicast TOP Address/Unit Distribution - Primary, Production

Primary Datacenter		WAN-Shaped [FCT] 74.115.133.96/29		WAN-Shaped [FDT] 74.115.133.104/29	
Unit	IP Port	Real-time MC	Gap Resp. MC	Real-time MC	Gap Resp. MC
1	30101	224.0.131.134	224.0.131.135	233.130.124.134	233.130.124.135
2	30102				
3	30103				
4	30104				

Table 2. CFE Multicast TOP Address/Unit Distribution - Secondary, Production

Secondary Datacenter		WAN-Shaped [FET] 170.137.16.80/29	
Unit	IP Port	Real-time MC	Gap Resp. MC
1	31101	233.182.199.2	233.182.199.3
2	31102		
3	31103		
4	31104		

Certification Environment Configuration

CFE Unit/Product Distribution

The following table describes the CFE symbol distribution across units.

Table 1. CFE Production/Certification Environment - Unit/Product Distribution

Symbol Range	Unit
UX, VX, VXT, VXM, VXMT	1
IBHY, IBIG, IBGO, IBYO, IEMD, MGTN, VA, XBTF	2
FBT, FET, PBT, PET	3
N/A	4

Note - CFE 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.

Certification Multicast Routing Parameters

Table 1. CFE Multicast TOP Routing Parameters - Certification

Data Center	Rendezvous Point
Primary Data Center feed	74.115.128.130

Address/Unit Distribution

The following tables describe the unit distribution across the certification CFE Multicast TOP feeds.

Note - CFE 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.

Table 1. CFE Multicast TOP Address/Unit Distribution - Certification

Primary Datacenter		WAN-Shaped [Cert] 174.136.160.16/28	
Unit	IP Port	Real-time MC	Gap Resp. MC
1	32101	224.0.74.198	224.0.74.199
2	32102		
3	32103		
4	32104		

Connectivity

Supported Extranet Carriers

The WAN-Shaped feed will be made available to participants through extranet carriers that have completed their multicast implementation and certified with CFE on a per-market basis. CFE has certified a number of carriers defined in the [Cboe Titanium Cboe Futures Exchange Connectivity Manual](#) with respect to redistribution of CFE Multicast data feeds. For more information on receiving Multicast TOP through any of these providers, reach out to the vendor contact noted in the CFE Connectivity Manual under Extranet Providers.

Bandwidth Recommendation

The WAN-shaped feeds require 100 Mbps of bandwidth. CFE will use 90% of these respective bandwidths for Multicast TOP to allow participants to use the same physical connection for order entry if desired.

Support

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

Canned Test Data

Customers are strongly encouraged to capture their own test data from the Certification environment to ensure that their systems can correctly decode the TOP feed and all available message types. To assist firms with their own testing a TOP sample (taken from the Certification environment) is made available at the link below. Cboe does not guarantee that all message types will appear in test data and cautions that canned test data will be updated infrequently and may not fully reflect the current specification.

[CFE TOP Test Data](#) (last updated 1/4/18)

Revision History

Document Version	Date	Description
1.0.0	05/01/17	Initial version.
1.0.1	06/28/17	Updated description for Report Symbol , Leg Offset and Variance Block Offset fields in Futures Instrument Definition message. Updated descriptions of Variance Futures fields in Futures Instrument Definition message. Added Execution Id field to TOP Trade message. TOP Trade messages are no longer aggregated; a separate message is generated for every execution. Added Price Limits message.
1.0.2	07/11/17	Added Rendezvous Points, Source IP addresses, and Multicast IP addresses.
1.0.3	08/08/17	Replaced Binary Long Price with Binary Price. Updated Data Types to include definition of Binary Price.
1.0.4	09/21/17	Renamed Trade Date message to Time Reference. Added Epoch Time field to Time message. Fixed discrepancies between Spec and Example Messages.
1.0.5	09/26/17	Corrected feed reference labels in section 8.
1.0.6	10/17/17	Added clarification on Trading Status messages for Complex Instruments going in and out of Queuing because of Threshold Width. Cboe branding/logo changes.
1.0.7	12/08/17	Removed LegOffset = 93 value as this value is not possible to be sent. Price limits may apply during any trading hours subject to contract specifications.
1.0.8	12/11/17	Updated Top Trade examples to reflect correct message type.
1.0.9	12/29/17	Trading Status messages for Complex instruments transitioning in and out of Queuing on account of Threshold Width no longer suppressed. Removed associated commentary from Trading Status message section. Added "I=Inactive" as possible Listing State . Updated Realized Variance , Discount Factor , Previous ARMVM , and Fed Funds Rate to Signed Binary data type. Corrected the offsets for Leg Ratio and Leg Symbol .
1.0.10	01/10/18	Corrected examples for TOP Trade . Added Canned Test Data section.
1.0.11	01/17/18	Block and ECRP trades (Trade Condition = B or E) do not update High Price or Low Price .
1.0.12	01/25/18	Updated field description of Symbol to remove "padding" language. The Symbol field is always six characters, base 62. Price Limits are included in a spin. Added Feed Hours and System Restart section. Clarified cases where the Unit Clear message would be sent. More specifics added to how End of Day Summary values are determined. If no Trading Status has been received for a Symbol , then the Trading Status is "S=Suspended".
1.0.13	02/01/18	Added links to certification and production symbol mapping files.
1.0.14	02/21/18	Fixed discrepancy with the Secondary Data Center listed as CH4 instead of 400 S La Salle. Updated Trade Condition field values to demonstrate that some values are only sent for simple instruments. Additional clarifications added around daily restart based on customer feedback.
1.0.15	03/01/18	Updated description of High Price and Low Price in End of Day Summary message.

Document Version	Date	Description
1.1.0	03/22/18	The End of Day Summary message will be enhanced and expanded to 65 bytes: Total Volume will be updated to include Block and ECRP volume, Block Volume field will be added, ECRP Volume field will be added, and Bit Fields field will be added. End of Day Summary example was updated.
1.1.1	03/23/18	Updated effective date of End of Day Summary message change from 1.1.0 to be effective 06/03/18.
1.1.2	05/10/18	Clarified the cases when sequenced Futures Instrument Definition messages are sent.
1.1.3	11/08/18	Updated Overview and and Multicast Routing Parameter sections with new Multicast Feed IDs (A to FC, B to FD, E to FE). Added note clarifying simple leg FID messages come before complex leg FID messages sent in Spin responses. Updated multicast feed ids in section 1.3 to follow standard naming convention.
1.1.4	04/08/19	Updated Multicast Routing Parameter Data Center feed names to align with references in unit distribution table.
1.1.5	01/16/20	Clarified definition of Time message. Time messages are only sent when there is a new TOP message in a given second.
1.1.6	02/14/20	Added Contract Date field to Futures Instrument Definition message. Effective trade date 04/27/20.
1.1.7	02/24/20	Variance Offset and Leg Offset values will be set at 45 as a result of the change to add Contract Date . Refer to Futures Instrument Definition message for more details.
1.1.8	04/07/20	Corrected WAN-Shaped feed IDs from "FAT and FBT" to "FCT and FDT" in Feed Connectivity Requirements section.
1.1.9	07/27/20	Updated symbols listed in Unit/Product Distribution tables to include VXT, VXM, and VXMT.
1.1.10	01/21/21	Added new value of I = Indicative Settlement to the Issue field on the Settlement message (effective 03/22/21).
1.2.0	08/17/21	Added new value of i = Periodic Indicative Settlement to the Issue field on the Settlement message (effective 10/17/21). Added new Open Interest message (effective 10/17/21).
1.2.1	10/26/21	Noted CFE will eliminate the 15 minute trading pause for VX , VXM, and AMERIBOR futures products (effective 12/06/21).
1.2.2	11/01/21	Corrected hyperlinks to Production symbol files and Certification symbol files.
1.2.3	12/15/21	Minor formatting updates.
1.2.4	10/09/23	Added new value of 'D=Derived' to Last Trade Condition and Trade Condition fields in the Top Trade and Market Snapshot messages, and updated section 2.14.2 to indicate Derived trades will be included in the Total Volume field (effective 12/11/23).
1.2.5	11/28/23	Updated hyperlinks to symbol mappings in production and certification environments.
1.2.6	12/27/23	Updated description of Trading Status 'Q=Accepting orders for queuing' to indicate the Queuing state is used for all products, with no exceptions.
1.2.7	06/28/24	Updated section 1.8 to include Future Variance Symbol Mapping , added message type Future Variance Symbol Mapping , added new message structure for Futures Instrument Definition (replacing the current message structure), updated Variance Block to Reserved in example messages in section 6.22, 6.23 and 6.24, and added Future Variance Symbol Mapping example message (effective 09/23/24).
1.2.8	07/15/24	Noted the Futures Instrument Definition message contains general futures contract information and is sent for all futures products, including Variance Futures (effective 09/23/24).

Document Version	Date	Description
1.2.9	08/09/24	Noted the Futures Variance Symbol Mapping message may be sent as a sequenced message intraday if a symbol is modified intraday. Clarified the reason for setting the Futures Flags field of the Futures Instrument Definition message to zero.
1.2.10	09/05/24	With the implementation of the new 60 second window for VWAP, the system will begin disseminating an intermediate indicative price update (Issue = i) at 2:59:05 p.m. CT for VX and VXM futures products (effective 09/09/24).
1.2.11	11/04/24	Removed the deprecated Futures Instrument Definition message with sunset date 09/23/24. Removed the "effective 09/23/24" annotation on the updated Futures Instrument Definition message and the new Futures Variance Symbol Mapping message. Added two new Matching Units, plus new port and IP information for Matching Units 2-4 (effective 02/03/25).
1.2.12	01/15/25	Updated Feed Hours and System Restart to indicate the TOP feed will start up on Sunday at approximately 10:30 a.m. CT. Updated with Cboe Titanium branding.
1.2.13	01/27/25	Updated Contract Size description for Futures Instrument Definition Message Fields . Added FBT and FET to Unit 3 Unit/Product Distribution (effective 06/09/25).
1.2.14	04/07/25	Noted in Spin Servers : a Time message will be sent as the last message in a Spin if the last Time message sent on a Spin is older than the last received time from the internal market data producers. Added XBTF to Unit 2 CFE Unit/Product Distribution (effective 04/28/25).
1.2.15	09/09/25	Added PBT and PET to Unit 3 CFE Unit/Product Distribution (effective 12/15/25 TBD 11/10/25).
1.2.16	10/20/25	Updated CFE Unit/Product Distribution to include MGTN on Unit 2 (effective 12/08/25) (effective 11/17/25) .
1.2.17	10/30/25	Updated Spin Servers to include End of Day Summary in list of spin request messages. Updated PBT and PET effective date to 12/15/25 TBD .
1.2.18	11/17/25	Updated PBT and PET effective date to 12/15/25.
1.2.19	11/18/25	Updated MGTN effective date to 12/08/25.
1.2.20	01/05/26	Updated Feed Hours and System Restart to reflect the new time that persisted orders are added back into the order book.
1.2.21	x/x/26	Updated Time description in Time and Time Reference messages.