# BX Options Top of Market

## Market Data Feed / Technical Specifications

Revision 2.2

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Approved

## Document History

| Revision | Published | Author(s) | Summary |
|---|---|---|---|
| 2.2 | 08/30/2024 | | • Converting the SoupBINTCP Protocol option to a replay without support for Live Market Data<br>• Adding the End of Replay Sequence Message only for SoupBINTCP. |
| 2.1 | 01 09 2023 | | • Version updated to 2.1<br>• Clarifying the Data Types: Added “2 byte Price fields are unsigned positive numbers. 4 byte Price fields are signed positive numbers.” |
| 2.0 | 10 07 2020 | | • Quote Condition changed from <space>= regular/autox eligible “X” = not autox eligible to<br><space> = regular quote/autox eligible<br>“X” = Ask side not firm bid side firm<br>“Y” = Bid side not firm, ask side firm<br>Updated the “Trade Report” – “Message Type” From “R” to “T”. |
| 2.0 | 03 10 2019 | | • Timestamp Message type no longer used. ‘Nanoseconds’ field in all messages have been replaced with an 8 byte timestamp field.<br>• Security Open/Close message consolidated into Trade Action Message.<br>• Additional fields added to Directory Message.<br>• Added a 2-byte Internal indicator to all messages.<br>• All book update messages updated to have uniform message header.<br>• Customer and Pro Customer Bid and Ask Size added to messages. |
| 1.20 | 02 11 2017 | | • Updated the Start of Messages (System Event Code “O”) time to ~2:00 am. |
| 1.10 | 30 11 2012 | | • Updated the Start of Messages (System Event Code “O”) time to ~4:00 am.<br>• Updated the End of System Hours (System Event Code “E”) time to ~5:15 pm to more accurately reflect current practice.<br>• Updated the End of Messages (System Event Code “C”) time to ~5:20 pm to more accurately reflect current practice. |
| 1.00 | 10 04 2012 | | • Initial version. |

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# 1. Overview

Nasdaq BX Options Top of Market (BX Top) is a direct data feed product offered by The Nasdaq BX Options Market®, which features the following data elements:

- **Best Bid and Offer Quotations:** The options system will calculate and disseminate its best bid and offer position, with aggregated size, based on displayable order and quote interest in the options market system. For bandwidth efficiency reasons, the feed will display Quotes as two sided if the bid and ask sides change, one sided if only one side changes.
- **Last Sale Data:** The options system will also disseminate trade messages for executions that occur within the options market via this feed. Broken Trades are reported in the event that an options trade transaction is broken on the same business day that it is reported.
- **Administrative messages:** such trading actions and symbol directory messages:
  - Trading action messages are used to inform market participants when an option is halted or released for trading and the current state of the option.
  - Symbol Directory messages provide basic option data.

# 2. Architecture

The feed will be made up of a series of sequenced messages. Each message is variable in length based on the message type and is composed of binary and alphanumeric data. The messages that make up this protocol are typically delivered using a higher level protocol that takes care of sequencing and delivery guarantees.

The options system offers the data feed in two protocol options:

| Protocol Option | Number of Outbound Channels |
|---|---|
| SoupBinTCPv3.00 | Multiple output channels, each channel supporting a subset of securities, the range defined by first letter of underlying |
| MoldUDP64v1.00 | Multiple output channels, each channel supporting a subset of securities, the range defined by first letter of underlying |

The feed is composed of 2 groups of Multicast or Soup channels: the “Q” Group, for Quote related information; and the “T” Group, for Trade related information.

Both the primary (“A feed”) and secondary (“B feed”) will be hosted by servers co-located with the trading system and will have identical performance characteristics. In fact the “A” and “B” feeds are logically identical: Mold or Soup messages will have the same Mold or Soup sequence numbers across all the streams.

Please note that Nasdaq has determined to provide local redundancy in the NY Metro Area (“A” and “B” feeds), while using the Mid-Atlantic Region (“C” feed) for disaster recovery in the event order entry is switched from the NY Metro Area.

A complete set of alternate connection parameters are available for each Multicast Channel and TCP Connection in the event of a failure in any of the primary connections.

The SoupBinTCP channel will be available only for replaying messages. Upon client login, the channel will replay all messages until it is ready to stream live data. Once the replay is complete, it will publish an "End Of Replay Sequence" message with the sequence number that allows the client to resume receiving real-time messages from the Mold channel. The client connection on the replay channel will stay up with just the soup heartbeats. The client can then disconnect and ask for another replay if necessary."

## 3. Data Types

All Alpha or Alphanumeric fields are left justified and padded on the right with spaces.

All Integer fields are unsigned big-endian (network byte order) binary encoded numbers unless otherwise specified. Integers may be 1, 2 or 4 bytes long.

Prices are 2 byte or 4 byte Integer fields. 2 byte Price fields are unsigned positive numbers. 4 byte Price fields are signed positive numbers. When a 4 byte price is converted to a decimal format, prices are in fixed point format with 6 whole number places followed by 4 decimal digits. When a 2 byte price is converted to a decimal format, prices are in fixed point format with 3 whole number places followed by 2 decimal digits.

## 4. Message Formats

This feed supports three basic types of messages:

- System Events including Administrative Messages and market events
- Best bid and offer updates
- Trade reports

Within the system event and administrative types, the options system may support multiple message formats as outlined below.

### 4.1. System Event Messages

The system event message type is used to signal a market or data feed handler event. The format is as follows:

**System Event Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | "S" = System Event Message |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Event Code | 11 | 1 | Alpha | Refer to System Event Codes below |

**System Event Codes**

| Code | Explanation | When (Typically) |
|---|---|---|
| "O" | Start of Messages. This is always the first message sent in any trading day. | After ~2:00am |
| "S" | Start of System Hours. This message indicates that the exchange is open and ready to start accepting orders. | 7:00am |
| "Q" | Start of Opening Process. Thismessageis intended to indicate that the exchange hasstarted itsopening auction process. | 9:30:00am |
| "N" | End of Normal Hours Processing - This message is intended to indicate that the exchange will no longer accept any new orders or changes to existing orders for options that trade during normal trading hours. | 4:00:00pm |
| "L" | End of Late Hours Processing - This message is intended to indicate that the exchange will no longer accept any new orders or changes to existing orders for options that trade during extended hours. | 4:15:00pm |
| "E" | End of System Hours. This message indicates that the exchange system is now closed. | ~5:15pm |
| "C" | End of Messages. This is always the last message sent in any trading day. | ~5:20pm |

This message is transmitted in both the "Q" and "T" groups.

## 4.2. Administrative Messages

### 4.2.1. Derivative Directory Messages

At the start of each trading day, Nasdaq disseminates options symbol directory messages for all active options symbols in the system.

Notes on the Derivative Directory Messages:

- The Derivative Directory Messages are sent once per symbol, typically before the "Start of System Hours" System Event. Should it be necessary, intra-day updates to this message will be sent as they occur. In the case of an intra-day update, for a given Option Id, the canonical information for the option is invariant (will not change). The canonical information consists of Security Symbol, Expiration Year Month and Day, Strike Price and Option Type. Other attributes for the Option may change.
- Firms should note that they will only receive Derivative Directory messages for the symbol range associated with the matching engine serving that connection.
- The Underlying Symbol is in most cases the same as the industry standard ticker underlying. In rare cases, such as a special settlement symbol, the exchange assigns unique underlying symbols.
- If an Option is removed from the system intra-day, a new options directory message will be sent with "Tradable" field set to "N". Any Quotes sent for this removed Option will be rejected. All existing quotes for this option will be purged.
- The Minimum Price Variation (MPV) has the following values:
  - "E" – All prices are in penny increments
  - "S" – Prices below $3.00 are in increments of $0.05, prices above $3.00 are in increments of $0.10
  - "P" – Prices below $3.00 are in increments of $0.01, prices above $3.00 are in increments of $0.05
- The symbol directory message is transmitted in both the "Q" and "T" groups.

**Derivative Directory Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | "R" = Directory Message |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Instrument ID | 11 | 4 | Integer | Option ID assigned daily. Valid for trading day |
| Security Symbol | 15 | 6 | Alphanumeric | Denotes the security symbol. |
| Expiration Year | 21 | 1 | Integer | Last two digits of the year of the option expiration |
| Expiration Month | 22 | 1 | Integer | Expiration Month (1-12) |
| Expiration Date | 23 | 1 | Integer | Day of the Month of expiration (1-31) |
| Explicit Strike Price | 24 | 4 | Integer | Explicit strike price. Refer to Data Types for field processing notes. |
| Option Type | 28 | 1 | Alpha | "C" = Call option<br>"P" = Put option<br>"N"= N/A |
| Underlying Symbol | 29 | 13 | Alphanumeric | Denotes the unique symbol assigned to the underlying security. |
| Closing Type | 42 | 1 | Alphabetic | Denotes which System Event is used to trigger the instrument closing process.<br>"N" = Normal Hours<br>"L" = Late Hours |
| Tradable | 43 | 1 | Alpha | Denotes whether or not this instrument is tradable at the exchange. The allowable values are:<br>"Y" = Instrument is tradable<br>"N" = Instrument is not tradable |

**Derivative Directory Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| MPV | 44 | 1 | Alpha | Minimum Price Variation for instrument. See Notes below for further explanation:<br>"E" = penny Everywhere<br>"S" = Scaled<br>"P" = penny Pilot |
| ISIN | 45 | 12 | Alphanumeric | International Securities Identification Number for instrument<br>Not supported on BX Options. Always set to '0' |
| Tick Size Table ID | 57 | 2 | | Tick Size ID for instrument<br>Not supported on BX Options. Always set to '0' |
| Price notation | 59 | 1 | Alpha | The price notation of the order book.<br>Not supported on BX Options. Always set to '0' |
| Volume notation | 60 | 1 | Alpha | The Volume notation of the order book<br>Not supported on BX Options. Always set to '0' |
| Financial Product | 61 | 2 | Integer | Type of Financial Product<br>Not supported on BX Options. Always set to '0' |
| Market segment Id | 63 | 1 | Alpha | Market identifier<br>Not supported on BX Options. Always set to '0' |
| Trading Currency | 64 | 3 | Alpha | Currency of the trading instrument<br>Not supported on BX Options. Always set to '0' |
| MIC | 67 | 4 | Alpha | Market Identifier Code identifying the Exchange.<br>Not supported on BX Options. Always set to '0' |
| Instrument Long Name | 71 | 16 | Alpha | Instrument long name<br>Not supported on BX Options. Always set to '0' |

### 4.2.2. Trading Action Message

The options system uses this administrative message to indicate the current trading status of an index or equity option within the options market.

The Trading Action message will be used to indicate the current trading state of the instrument as it transitions through the various states during the trading session. It will begin with Pre Open state if it is eligible for trading. The states Opening and Re-Opening indicate that the instrument is undergoing an auction prior to it moving into Continuous Trading state. Buy Side and Sell Side Trading Suspended states are special cases of Continuous Trading. The instrument transitions to Closed state at the end of trading hours. At any point before the Closed state the instrument can enter the Halted state for regulatory or operational reasons.

After the start of system hours, the options system will use the Trading Action message to relay changes in trading status for an individual option. Messages will be sent when an option: is halted, is released for quotation, released for trading, or temporarily suspended for trading on the buy or sell side.

**Trading Action Message**

| Field Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | "H" = Trading Action Message |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Instrument Id | 11 | 4 | Integer | Option ID assigned daily. Valid for trading day |

**Trading Action Message**

| Field Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Current Trading State | 15 | 1 | Alphabetic | Reflects the current trading state for the derivative.The allowable values are:<br>"H" = Halt in effect<br>"B" = Buy Side Trading Suspended –i.e. Buy orders are not executable)<br>"S" = Sell Side Trading Suspended –i.e. Sell orders are not executable)<br>"I" = Pre Open<br>"O" = Opening Auction<br>"R" = Re-Opening<br>"T" = Continuous Trading<br>"X" = Closed |

This message is transmitted in both the "Q" and "T" groups.

## 4.3. Best Bid AND Ask Update – Short Form

The options system will continuously calculate its best bid and offer position for active options contracts on the options market during the trading day. Whenever the best bid and ask position changes on both sides, the options system will send its best bid and ask update via the data feed for the affected security. A change in bid or ask implies a change in price and/or size. The quote will reflect the highest price displayable in the options system for buy orders/quotes and the lowest price displayable in the options system for sell orders/quotes.

If only one side of the quote changes, Best Bid OR Ask Update message will be sent for bandwidth efficiency reasons.

The Quote Condition applies to both the bid and ask sides.

There are two forms of the Best Bid AND Ask Update, the Short Form has Prices and Sizes in 2 byte Integer fields. Note that 2 byte Prices are in pennies and does not imply a loss of precision in the price.

**Best Bid AND Ask Update – Short Form Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | "q" = Best bid AND ask update |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Instrument ID | 11 | 4 | Integer | Option ID assigned daily. Valid for trading day |
| Quote Condition | 15 | 1 | Alpha | <space> = regular quote/autox eligible<br>"X" = Ask side not firm bid side firm<br>"Y" = Bid side not firm, ask side firm |
| Bid Market Order Size | 16 | 2 | Integer | Number of market order contracts on the bid side |
| Bid Price | 18 | 2 | Integer | Best bid price in fixed point format with 3 whole number places followed by 2 decimal digits |
| Bid Size | 20 | 2 | Integer | Aggregated number of contracts on the bid side being displayed in the options market at the current time. |
| Bid Cust Size | 22 | 2 | Integer | Customer quantity on the bid side.<br>Not supported on BX Options. Always set to '0'<br>Not supported on BX Options. Always set to '0' |
| Ask Market Order Size | 26 | 2 | Integer | Number of market order contracts on the ask side |
| Ask Price | 28 | 2 | Integer | Best ask price in fixed point format with 3 whole number places followed by 2 decimal digits |

**Best Bid AND Ask Update – Short Form Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Ask Size | 30 | 2 | Integer | Aggregated number of contracts on the ask side being displayed in the options market at the current time. |
| Ask Cust Size | 32 | 2 | Integer | Customer quantity on the ask side.<br>Not supported on BX Options. Always set to '0' |
| Ask ProCust Size | 34 | 2 | Integer | Customer professional quantity on the ask side. |

Not supported on BX Options. Always set to '0'

## 4.4. Best Bid AND Ask Update – Long Form

This message is the same as the Best Bid AND Ask Update Message – Short Form described above except that Prices and Sizes are 4 byte Integers, the price having 4 implied decimal places.

**Best Bid AND Ask Update – Long Form Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | "Q" = Best bid AND ask update |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Instrument ID | 11 | 4 | Integer | Option ID assigned daily. Valid for trading day |
| Quote Condition | 15 | 1 | Alpha | <space> = regular quote/autox eligible<br>"X" = Ask side not firm bid side firm<br>"Y" = Bid side not firm, ask side firm |
| Bid Market Order Size | 16 | 4 | Integer | Number of market order contracts on the bid side |
| Bid Price | 20 | 4 | Integer | Best bid price in fixed point format with 6 whole number places followed by 4 decimal digits. |
| Bid Size | 24 | 4 | Integer | Aggregated number of contracts on the bid side being displayed in the options market at the current time. |
| Bid Cust Size | 28 | 4 | Integer | Customer quantity on the bid side.<br>Not supported on BX Options. Always set to '0' |
| Bid ProCust Size | 32 | 4 | Integer | Customer professional quantity on the bid side.<br>Not supported on BX Options. Always set to '0' |
| Ask Market Order Size | 36 | 4 | Integer | Number of market order contracts on the ask side |
| Ask Price | 40 | 4 | Integer | Best ask price in fixed point format with 6 whole number places followed by 4 decimal digits. |
| Ask Size | 44 | 4 | Integer | Aggregated number of contracts on the ask side being displayed in the options market at the current time. |
| Ask Cust Size | 48 | 4 | Integer | Customer quantity on the ask side.<br>Not supported on BX Options. Always set to '0' |
| Ask ProCust Size | 52 | 4 | Integer | Customer professional quantity on the ask side.<br>Not supported on BX Options. Always set to '0' |

This message is transmitted in the "Q" group only.

## 4.5. Best Bid OR Ask Update – Short Form

The options system will continuously calculate its best bid and offer position for active options contracts on the options market during the trading day. Whenever the best bid or ask position changes on one side but not the other side, the options system will send its best bid or ask update via this feed for the affected security. A change in bid or ask implies a change in price and/or size. The quote will reflect the highest price displayable in the options system for buy orders/quotes and the lowest price displayable in the options system for sell orders/quotes.

For the bid or ask update received, the data feed recipient firm should adjust the quotation bid or ask side only for the market side indicated in the message. Implicitly the opposite side has the same price and size as previously displayed.

If both bid and ask change as one update, the Best Bid AND Ask Update message will be sent, displaying both sides of the quote simultaneously.

The Quote Condition applies to both the bid and ask sides.

There are two forms of the Best Bid OR Ask Update, the Short Form has Price and Size in 2 byte Integer fields. Note that 2 byte Price is in pennies and does not imply a loss of precision in the price.

**Best Bid OR Ask Update – Short Form Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | Best bid OR ask update: “b” = Quote update bid side “a” = Quote update ask side |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Instrument ID | 11 | 4 | Integer | Option ID assigned daily. Valid for trading day |
| Quote Condition | 15 | 1 | Alpha | <space> = regular quote/autox eligible<br>“X” = Ask side not firm bid side firm<br>“Y” = Bid side not firm, ask side firm |
| Market Order Size | 16 | 2 | Integer | Number of market order contracts on the bid or ask side |
| Price | 18 | 2 | Integer | Best bid or ask price in fixed point format with 3 whole number places followed by 2 decimal digits |
| Size | 20 | 2 | Integer | Aggregated number of contracts on the bid or ask side being displayed in the options market at the current time. |
| Cust Size | 22 | 2 | Integer | Customer quantity on the bid or ask side.<br>Not supported on BX Options. Always set to ‘0’ |
| ProCust Size | 24 | 2 | Integer | Customer professional quantity on the bid or ask side.<br>Not supported on BX Options. Always set to ‘0’ |

This message is transmitted in the “Q” group only.

## 4.6. Best Bid OR Ask Update – Long Form

This message is the same as the Best Bid OR Ask Update Message – Short Form described above except that Prices and Sizes are 4 byte Integers, the price having 4 implied decimal places.

**Best Bid OR Ask Update – Long Form Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | Best bid OR ask update: “B” = Quote update bid side “A” = Quote update ask side |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Instrument ID | 11 | 4 | Integer | Option ID assigned daily. Valid for trading day |

**Best Bid OR Ask Update – Long Form Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Quote Condition | 15 | 1 | Alpha | <space> = regular quote/autox eligible<br>"X" = Ask side not firm bid side firm<br>"Y" = Bid side not firm, ask side firm |
| Market Order Size | 16 | 4 | Integer | Number of market order contracts on the bid or ask side |
| Price | 20 | 4 | Integer | Best bid or ask price in fixed point format with 6 whole number places followed by 4 decimal digits, the side determined by Message Type. |
| Size | 24 | 4 | Integer | Aggregated number of contracts on the bid or ask side being displayed in the options market at the current time. |
| Cust Size | 28 | 4 | Integer | Customer quantity on the bid or ask side.<br>Not supported on BX Options. Always set to '0' |
| ProCust Size | 32 | 4 | Integer | Customer professional quantity on the bid or ask side.<br>Not supported on BX Options. Always set to '0' |

This message is transmitted in the "Q" group only.

## 4.7. Trade Report

The Trade Report message will be used to relay execution system transactions that are reported during the current business day. The options system only reports one-side of a trade execution on the feed and other data feed products.

Trade Report messages should be included in time-and-sales displays as well as volume and other market statistics.

**Trade report**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | "T" = Trade Report |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Instrument ID | 11 | 4 | Integer | Option ID assigned daily. Valid for trading day |
| Cross ID | 15 | 4 | Integer | Indicates the internal control number (cross id) associated with the given options trade transaction. |
| Trade Condition | 19 | 1 | Alpha | The Trade Condition is the same as defined in the OPRA specification (OPRA terminology is either "Last Sale" or "Transaction"): https://www.opraplan.com/document- library<br>Always refer to the www.opraplan.com website to ensure the possible Trade Conditions sent out by this feed, which are consistent with the Trade Conditions defined by OPRA. |
| Price | 20 | 4 | Integer | Reflects the transaction (premium) price on the execution. |
| Volume | 24 | 4 | Integer | Current number of contracts traded for an option in one trade. |

This message is transmitted in the "T" group only.

### 4.8. Broken Trade Report

The following message is used in the event that an options trade transaction is broken on the same business day that it is reported.

**Broken Trade Report**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | “X” = Broken Trade Report |
| Tracking Number | 1 | 2 | Integer | Internal system tracking number |
| Timestamp | 3 | 8 | Integer | Nanoseconds since midnight |
| Instrument ID | 11 | 4 | Integer | Option ID assigned daily. Valid for trading day |
| Original Cross ID | 15 | 4 | Integer | Indicates the original internal control number (cross id) associated with the given trade transaction in the options market system. |
| Original Price | 19 | 4 | Integer | Reported Premium Price of an option contract in the original trade report message on this feed. |
| Original Volume | 23 | 4 | Integer | Reported number of contracts in the original trade report message on this feed.<br>This message is transmitted in the “T” group only. |

### 4.9. End of Replay Sequence Message (Only for SoupBINTCP)

The End of replay Sequence message reflects the sequence number at the time replay of existing messages is complete.

The firms can then use this sequence number to resume on the real time Mold channel.

**End of Replay Sequence Message**

| Name | Offset | Length | Value | Notes |
|---|---|---|---|---|
| Message Type | 0 | 1 | Alpha | "M" = End of Replay Sequence Message |
| Sequence Number | 1 | 20 | Alpha Numeric | Sequence number once the replay is complete. |

Use this sequence number to resume on the real time Mold channel.

Note: This field is ASCII representation of the sequence number.

## 5. Support

- For general product support for Nasdaq data feeds, please contact Clientsuccess@nasdaq.com.