ISE & GEMX Order Feed Specification

Version 1.0.3. January 9, 2023

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1. Overview

The Nasdaq GEMX Order Feed is a direct data feed product in the Nasdaq ISE (ISE) and Nasdaq GEMX (GEMX) systems offered by Nasdaq® that features the following:

- Notifies participants of imbalances on opening and reopening (resumption from halt) periodically before the events.
- Advises participants that a new Order is resting on the book.
- Announces that a new auction order is in the market. For public (exposed) auctions, auction responses are also disclosed.
- Administrative and market event messages including:
  - Options Directory messages to be disseminated to relay basic option symbol and contract information for those securities traded on the options market.
  - Security Open Message to be disseminated for each security as soon as the opening auction process is completed to inform recipients that the option symbol denoted in the message is available for auto execution within the options market system.
  - Trading action messages to inform market participants when a specific security is halted or released for trading on the options market.

NOTE: This feed cannot be used to build the order book.

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 a Multicast and Soup channel.

Please note that Nasdaq provides local redundancy in the NY Metro Area (local “A” and “B” feeds), as well as the remote Chicago Region (“C” and “D” feeds). The secondary “C” and “D” feeds are available for general use; however please note that performance characteristics will be reduced due to the remote location of these feeds.

Both the local primary (“A feed”) and local secondary (“B feed”) will be hosted by servers co-located with the local trading system and will have identical performance characteristics. The remote primary (“C feed”) and remote secondary (“D feed”) will be hosted by servers co-located with the remote trading system and will have identical (but reduced) performance characteristics. The messages in each of the “A”, “B”, “C” and “D”feeds are identical: Mold or Soup messages will have the same Mold or Soup sequence numbers across all of the streams.

In the event of disaster recovery, the “C” and “D” feeds should be used as primary feeds when order entry is switched from the NY Metro Area to the Chicago Region.

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, 4 or 6 bytes long.

Prices are 2 , 4 or 8 byte Integer fields. 2 byte Price fields are unsigned positive numbers. 4 and 8 byte Price fields are signed numbers. When an 8 byte price is converted to a decimal format, prices are in fixed point format with 12 whole number places followed by 8 decimal digits. 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.

Time is expressed as a 6 byte Integer, representing the number of nanoseconds past midnight of the current day.

4. Message Formats

This feed supports five basic types of messages:

- System Events
- Administrative Data and Market Events
- Imbalances before opening and reopening
- Announcements of new resting orders in the book
- Announcements of auctions

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

4.1. System Event Message

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
Timestamp	1	6	Integer	The time, expressed as the number of nanoseconds after midnight.
Event Code	7	1	Alpha	Refer to System Event Codes below
Current Year	8	2	Integer	The current calendar year (example: 2016).
Current Month	10	1	Integer	The current calendar month, with values 1 to 12 inclusive, January=1, etc.
Current Day	11	1	Integer	The current calendar day, with values 1 to 31 inclusive.
Version	12	1	Integer	Version of this interface. Currently set to 1.
Sub-version	13	1	Integer	Sub-version of this interface. Currently set to 0.

System Event Codes

Code	Explanation	When (typically)
"O"	Start of Messages. This is always the first message sent in any trading day.	After ~ 12:00am
"Q"	Start of Opening Process. This message is intended to indicate that the options system has started its opening auction process.	9:30:00am
"L"	Start of Late Hours Closing Process. This message is intended to indicate that the options system will no longer generate new executions for options that trade during extended hours	4:15:00pm
"E"	End of Messages. This is always the last message sent in any trading day.	~5:15pm
"C"	End of System Hours. This message indicates that the options system is now closed.	~5:20pm
"W"	End of WCO Early closing. This message is intended to indicate that the exchange will no longer accept any new orders or changes to existing Orders on last trading date of WCO options.	12:00 Noon

4.2. Option Directory Message

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

Option Directory Message

Name	Offset	Length	Value	Notes
Message Type	0	1	Alpha	"D" = Directory Message
Timestamp	1	6	Integer	The time, expressed as the number of nanoseconds after midnight.
Option ID	7	4	Integer	Option ID for this option, assigned daily, valid for trading day.
Security Symbol	11	6	Alphanumeric	Denotes the option root symbol (security symbol)
Expiration Year	17	1	Integer	Last two digits of the year of the option expiration
Expiration Month	18	1	Integer	Expiration Month of the option (1-12)
Expiration Day	19	1	Integer	Day of the Month of expiration (1-31)
Strike Price	20	8	Integer	Explicit strike price in fixed point format with 12 whole number places followed by 8 decimal digits.
Option Type	28	1	Alpha	"C" = Call option "P" = Put option
Source	29	1	Integer	Identifies the source of the option, valid for the trading day.
Underlying Symbol	30	13	Alpha	Denotes the unique symbol assigned to the underlying security within the Exchange System.
Trading Type	43	1	Alpha	Indicates what kind of option this is: "E" = Equity "I" = Index "F" = ETF "C" = Currency
Contract Size	44	2	Integer	Underlying deliverable size
Option Closing Type	46	1	Alpha	Denotes which System Event is used to determine when trading ceases in this symbol. "N" = Normal Hours "L" = Late Hours
Tradable	47	1	Alpha	Denotes whether or not this option is tradable at the exchange: "Y" = Option is tradable "N" = Option is not tradable

Option Directory Message

Name	Offset	Length	Value	Notes
MPV	48	1	Alpha	Minimum Price Variation for this option: "E" = penny Everywhere "S" = Scaled "P" = penny Pilot
Closing Only	49	1	Alpha	Closing position of the option: "Y" = Option is Closing Position Only. Only Market Maker origin "N" = Option is not Closing Position Only

Options Directory Notes:

1. The options 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.
2. Firm should note that they will only receive Option Directory messages for the symbol range associated with the matching engine serving that connection.
3. 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.
4. This is a sequenced message and therefore can be replayed upon re-connection.
5. If an Option is removed from the system intra-day, a new options directory message will be sent with "Tradable" field set to "N".
6. The Minimum Price Variation (MPV) has the following values:
    a. "E" – All prices are in penny increments
    b. "S" – Prices below $3.00 are in increments of $0.05, prices above $3.00 are in increments of $0.10
    c. "P" – Prices below $3.00 are in increments of $0.01, prices above $3.00 are in increments of $0.05

4.3. 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.

Prior to the start of system hours, the options system will send out a Trading Action message. The options system will send out a Trading Action message with the "T" (Trading Resumption) for all options contracts that are eligible for trading at the start of the options market system hours. If a security is absent from the pre-opening Trading Action spin, firms should assume that the security is being treated as halted in the options platform at the start of the system hours. Securities may be halted in the options system 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 security. Messages will be sent when an option is halted or is released for trading

Trading Action Message

Name	Offset	Length	Value	Notes
Message Type	0	1	Alpha	"H" = Trading Action
Timestamp	1	6	Integer	The time, expressed as the number of nanoseconds after midnight.
Option ID	7	4	Integer	Integer ID of the option, as defined in the Options Directory Message.
Current Trading State	11	1	Alpha	Reflects the current trading state for the options security in the options market. The allowable values are: "H" = Halt in effect

4.4. Security Open/Closed Message

The options system uses this administrative message to indicate when an option has completed the opening process and is now available for auto execution or when the option has closed and is no longer available for auto execution.

The system disseminates the Security Open/Closed Message for each option as soon as the opening is completed. Upon receipt of the message with "Open State" = "Y", the recipient is advised that the option denoted in the message is now available for auto execution within the options system. Upon receipt of the message with "Open State" = "N", the recipient is advised that the option is no longer eligible for auto-execution within the options system.

Security Open/Closed Message

Name	Offset	Length	Value	Notes
Message Type	0	1	Alpha	"O" = Security Open/Closed
Timestamp	1	6	Integer	The time, expressed as the number of nanoseconds after midnight.
Option ID	7	4	Integer	Integer ID of the option, as defined in the Options Directory Message.
Open State	11	1	Alpha	Reflects the current eligibility for auto execution of the options security in the options market. The allowable values are: Y = Open for auto execution

Note: Recipients should continue to process the Trading Action message in order to determine if a contract is in a Halt state for the day. A security open message should not override the Trading action message indicating if an index or equity option is halted.

Recipients should use both messages in tandem to indicate if the issue is halted and/or or open for auto execution.

4.5. Opening Imbalance Message

Nasdaq disseminates Opening Imbalance information at regular intervals in the time leading up to the Nasdaq Opening Auction events. For the Nasdaq Opening Auction, Nasdaq will begin the dissemination of Opening Imbalance messages for a put or call option prior to the start of the opening process event and also prior to the halt resumption (reopening) process event.

Opening Imbalance Message

Message Type	0	1	Alpha	"N" = Opening Imbalance
Timestamp	1	6	Integer	The time, expressed as the number of nanoseconds after midnight.
Option ID	7	4	Integer	Integer ID of the option, as defined in the Options Directory message

Opening Imbalance Message

Message Type	0	1	Alpha	"N" = Opening Imbalance
Paired Contracts	11	4	Integer	The total number of contracts that are eligible to be matched at the Current Reference Price.
Imbalance Direction	15	1	Alpha	Indicates the market side of the imbalance: "B" = buy imbalance "S" = sell imbalance
Imbalance Price	16	4	Integer	The imbalance price in fixed point format with 6 whole number places followed by 4 decimal digits.
Imbalance Volume	20	4	Integer	The imbalance volume.

4.6. Order on Book Message

An Order on Book message is generated for all the following situations whenever an order free from any display restrictions is reported by the matching engine. In all such cases the order size to be displayed is as reported by the matching engine:

- New – Whenever a new order is entered, including GTC orders from the previous day
- Change/Partial Fill – Whenever the order is changed or partially filled and if the order continues to be free of display restrictions

Some fields, at the discretion of the originator of the Order, may be hidden. Possible hidden fields Possible hidden fields are: Side, Price, Size, Owner ID, Giveup and CMTA.

Please note that the Order on Book message is not generated whenever the order is cancelled or completely filled.

Order on Book Message

Name	Offset	Length	Value	Notes
Message Type	0	1	Alpha	"B" = Order on Book
Option ID	7	4	Integer	Integer ID of the option, as defined in the Options Directory Message.
Order Type	11	1	Alpha	'M' = Market 'L' = Limit
Side	12	1	Alpha	'B' = Bid 'A' = Offer (Ask) '<blank>' if hidden
Size	17	4	Integer	Size of the order (zero if hidden)
Order Capacity	22	1	Alpha	'C' = Customer 'D' = Customer Professional 'F' = Firm 'B'= Broker/Dealer - Customer 'K' = Broker/Dealer- Firm 'E' = Proprietary 'N' = Away Market Maker 'M' = Market Maker
Owner ID	23	6	Alpha	Spaces when not set
Giveup	29	6	Alpha	Spaces when not set
CMTA	35	6	Alpha	Spaces when not set

4.7. Auction Message

This message is used to announce auctions. The start of auction is announced, followed by possible updates on the auction, and announcing the end of the auction.

Some fields, at the discretion of the originator of the Order, may be hidden. Possible hidden fields are: Side, Price, Size, Owner ID, Giveup and CMTA.

For the end of auction announcement most of the fields will be blanked or zeroed out. Refer to the message definition for more details.

Auction Message

Name	Offset	Length	Value	Notes
Message Type	0	1	Alpha	"A" = Auction
Option ID	7	4	Integer	Integer ID of the option, as defined in the Options Directory Message.
Auction ID	11	4	Integer	Integer which uniquely identifies the auction.
Order Type	15	1	Alpha	'M' = Market 'L' = Limit
Side	16	1	Alpha	'B' = Bid 'A' = Offer (Ask) '<blank>' if hidden
Price	17	4	Integer	Price in fixed point format with 6 whole number places followed by 4 decimal digits. For market orders, the price is zero. Hidden prices are set to zero
Size	21	4	Integer	Size (zero if hidden)
Exec Flag	25	1	Alpha	'N' = None 'A' = AON
Order Capacity	26	1	Alpha	'C' = Customer 'D' = Customer Professional 'F' = Firm 'B'= Broker/Dealer - Customer 'K' = Broker/Dealer- Firm 'E' = Proprietary 'N' = Away Market Maker 'M' = Market Maker
Owner ID	27	6	Alpha	Spaces when not set
Giveup	33	6	Alpha	Spaces when not set
CMTA	39	6	Alpha	Spaces when not set
Auction Event	45	1	Alpha	'S' = Start 'U' = Auction Update 'E' = End of Auction
Auction Type	46	1		'B' = Block 'F' = Flash 'C' = Facilitation 'S' = Solicitation 'P' = PIM
Number of Responses	47	1	Integer	Number of auction Responses. Next two fields repeat that number of times. Allowable values for this field are 0 or 1.

Auction Message

Name		Offset	Length	Value	Notes
Repeating Fields	Response Price		4	Integer	Best price of the auction response in fixed point format with 6 whole number places followed by 4 decimal digits. The response, if shown (zero if not shown) is the best response on the contra side.
	Response Size		4	Integer	Best size of the auction response (zero if not shown).

This message is used to announce auctions. The start of auction is announced, followed by possible updates on the auction, and announcing the end of the auction.

5. Support

- For general product support for Nasdaq data feeds, please contact Nasdaq Market Data at clientsuccess@nasdaq.com.
- For technical support for Nasdaq data feeds, please contact Nasdaq Systems Engineering at devsupport@nasdaq.com.

Appendix A – Sample Messages

Each message defined in this protocol has an example to clarify how the message is parsed. Some points to consider:

- The encapsulating protocol defines the message length, in bytes. This can be used as an aid to parsing the messages;
- The first byte of the message is always message type. Once the type of the message is known, the rest of the message can be parsed from the definitions of the messages.

Example 1 – System Event Message

At 9:30:00.123456789 am, the system sends a System Event message which announces a Start of Opening Process event for date April 23, 2017. The version of this interface is 1.0.

System Event Message

Name	Offset	Value	Hex Value
Message Type	0	"S"	53
Timestamp	1	9:30:00.123456789	1F 1A D6 35 BD 15
Event Code	7	"Q"	51
Current Year	8	2017	07 E1
Current Month	10	4	04
Current Day	11	23	17
Version	12	1	01
Sub-Version	13	0	00

Network byte stream (in hex):

- 53 1F 1A D6 35 BD 15 51 07 E1 04 17 01 00

Example 2 – Options Directory Message

At 6:30:00.234567891 am, the system sends an Options Directory message describing a tradable option having ID 85393 with the following properties: security symbol "OIH1", equity option, expiration date 1/20/2017, strike price $29.10000000, type call option, underlying symbol "OIH", contract size 100, Option is Closing Position Only, normal closing hours, "Scaled" MPV, trading on the exchange on source 2.

Options Directory Message

Name	Offset	Value	Hex Value
Message Type	0	"D"	44
Timestamp	1	6:30:00.234567891	15 48 4A AB 48 D3
Option Id	7	85393	00 01 4D 91
Security Symbol	11	"OIH1"	4F 49 48 31 20 20
Expiration Year	17	2017	11
Expiration Month	18	1	01
Expiration Day	19	20	14
Strike Price	20	29.10000000	00 00 00 00 AD 73 13 80
Option Type	28	Call	43
Source	29	2	02
Underlying Symbol	30	"OIH"	4F 49 48 20 20 20 20 20 20 20 20 20 20

Options Directory Message

Name	Offset	Value	Hex Value
Trading Type	43	“E”	45
Contract Size	44	100	00 64
Option Closing Type	46	“N”	4E
Tradable	47	“Y”	59
MPV	48	“S”	53
Closing Only	49	“Y”	59

Network byte stream (in hex):

- 44 15 48 4A AB 48 D3 00 01 4D 91 4F 49 48 31 20 20 11 01 14 00 00 00 00 AD 73 13 80 43 02 4F 49 48 20 20 20 20 20 20 20 20 20 20 45 00 64 4E 59 53 59

Example 3 – Trading Action Message

At 1:51:45.234567891 pm, the system sends a Trading Action message indicating that option with id 85393 has been halted.

Trading Action Message

Name	Offset	Value	Hex Value
Message Type	0	“H”	48
Timestamp	1	13:51:45.234567891	2D 63 77 C7 62 D3
Option Id	7	85393	00 01 4D 91
Current Trading State	11	“H”	48

Network byte stream (in hex):

- 48 2D 63 77 C7 62 D3 00 01 4D 91 48

Example 4 – Security Open/Closed Message

At 9:30:00.345678912 am, the system sends a Security Open/Closed message indicating that option with id 85393 is open for auto execution.

Security Open/Closed Message

Name	Offset	Value	Hex Value
Message Type	0	“”	4F
Timestamp	1	9:30:00.345678912	1F 1A E3 74 94 40
Option Id	7	85393	00 01 4D 91
Open State	11	“Y”	59

Network byte stream (in hex):

- 4F 1F 1A E3 74 94 40 00 01 4D 91 59

Example 5 – Opening Imbalance Message

At 9:28:35.987654321 am, the system sends an Opening Imbalance message indicating that option with id 85393 has 35 paired contracts with imbalance on the buy side with imbalance price of $1.0000 and imbalance volume of 10 contracts.

Opening Imbalance Message

Name	Offset	Value	Hex Value
Message Type	0	“N”	4E
Timestamp	1	9:28:35.987654321	1F 07 3F 53 46 B1
Option Id	7	85393	00 01 4D 91
Paired Contracts	11	35	00 00 00 23
ImbalanceDirection	15	“B”	42
Imbalance Price	16	1.0000	00 00 27 10
Imbalance Volume	20	10	00 00 00 0A

Network byte stream (in hex):

- 4E 1F 07 3F 53 46 B1 00 01 4D 91 00 00 00 23 42 00 00 27 10 00 00 00 0A

Example 6 – Order on Book Message

At 2:24:38.123123123 pm, the system sends .an Order on Book message indicating that a customer limit order priced at $1.5300 with 58 contracts has been entered into the system. No owner, giveup or CMTA is displayed for this order.

Order on Book Message

Name	Offset	Value	Hex Value
Message Type	0	“B”	42
Timestamp	1	14:24:38.123123123	2F 2E D1 19 B1 B3
Option Id	7	85393	00 01 4D 91
Order Type	11	“L”	4C
Side	12	“A” (Ask, Offer)	41
Price	13	1.5300	00 00 3B C4
Size	17	58	00 00 00 3A
Exec Flag	21	“N”	4E
Order Capacity	22	“C”	43
Owner ID	23	“<spaces>”	20 20 20 20 20 20
Giveup	29	“<spaces>”	20 20 20 20 20 20
CMTA	35	“<spaces>”	20 20 20 20 20 20

Network byte stream (in hex):

- 42 2F 2E D1 19 B1 B3 00 01 4C 91 4D 41 00 00 3B C4 00 00 00 3A 4E 43 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20

Example 7 – Auction Message

At 12:25:43.321321321 pm, the system sends an Auction message for an option with option ID 85393 and auction ID 11584697 with the following attributes: for a customer limit order, bid side at price $1.2700, size 10 contracts, no owner, giveup or CMTA specified. It is an update to a Facilitation auction and has 1 response , with a price of $1.2800, size 2.

Auction Message

Name	Offset	Value	Hex Value
Message Type	0	"A"	41
Timestamp	1	12:25:43.321321321	28 B1 9D C5 FF 69
Option Id	7	85393	00 01 4D 91
Auction Id	11	11584697	00 B0 C4 B9
Order Type	15	"L"	4C
Side	16	"B" (Bid)	42
Price	17	1.2700	00 00 31 9C
Size	21	10	00 00 00 0A
Exec Flag	25	"N"	4E
Order Capacity	26	"C"	43
Owner ID	27	"<spaces>"	20 20 20 20 20 20
Giveup	33	"<spaces>"	20 20 20 20 20 20
CMTA	39	"<spaces>"	20 20 20 20 20 20
Auction Event	45	"U"	55
Auction Type	46	"F"	46
Number of Responses	47	1	01
Response Price	48	1.2800	00 00 31 9D
Response Size	52	2	00 00 00 02

Network byte stream (in hex):

- 41 28 B1 9D C5 FF 69 00 01 4D 91 00 B0 C4 B9 4C 42 00 00 31 9C 00 00 00 0A 4E 43 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 55 46 01 00 00 31 9D 00 00 00 02

Appendix B – Document Revision Control Log

September 13, 2016: ISE Gemini/ISE/ISE Mercury Order Feed - Version 1.00

- Initial specification.

November 18, 2016: ISE Gemini/ISE/ISE Mercury Order Feed - Version 1.01

- Fixed Trading Type enumeration in Option Directory Message
- Response Size and Price of Auction message is the best response
- Added to description of price field for Order and Trade messages

December 12, 2016: ISE Gemini/ISE/ISE Mercury Order Feed - Version 1.01

- Added text regarding hidden fields in Order on Book Message
- Added text regarding hidden fields in Auction Notification Message. Also added text with description of zeroed or blanked fields on the end of auction
- Adjusted order capacity enumerations in Order on Book and Auction Messages

January 13, 2017: ISE Gemini/ISE/ISE Mercury Order Feed - Version 1.01

- Adjusted Start of Currency Opening Process enumeration from "W" to "F"
- Clarifying intra-day removal of option impact on option directory message

April 19, 2017: GEMX/ISE/ MRX Order Feed - Version 1.01

- Removing FX Opening System Event Enumeration as FX products will open at 9:30 with other options

April 26, 2017: GEMX/ISE/ MRX Order Feed - Version 1.01

- Adding order capacity enumeration "F" for Firm to Order on Book and Auction messages

May 30, 2017: GEMX/ISE/ MRX Order Feed - Version 1.01

- Adding system event enumeration "W" for early close on expiration day of WCO (FX) options

June 13, 2017: GEMX/ISE/ MRX Order Feed - Version 1.01

- Adjusting system event enumeration "O" Start of Messages to 12:30 AM

December 17, 2019: GEMX/ISE/ MRX Order Feed - Version 1.02

- Updated the Start of Messages (System Event Code "O") time to ~2:00 am.

November 3, 2022: GEMX/ISE Order Feed - Version 1.02

- Removed any reference to Nasdaq MRX (MRX)

January 9, 2023: Nasdaq ISE/Nasdaq GEMX Trade Feed – Version 1.0.3

- Version updated to 1.0.3
- Clarifying the Data Types: Added "2 byte Price fields are unsigned positive numbers. 4 and 8 byte Price fields are signed numbers."

June 2, 2023: Nasdaq ISE/GEMX Depth of Market Feed - Version 1.03

- Start of Messages("O") event start time changed from "After ~2am" to "After ~12am"