NASDAQ ITCH to Trade Options
Version 1.0.2

1. Overview

NASDAQ ITCH to Trade Options (ITTO) is a direct data feed product offered by The NASDAQ Option Market®, which features the following data elements:

o **Order level data with attribution:** For NASDAQ Option System, NASDAQ will provide its full order depth using the standard ITTO format. ITTO uses a series of messages of order messages to track the life of a customer order[1]. ITTO message formats will support NASDAQ Option System market participant attribution.

o **Trade messages:** To ensure that customers have complete information about the NASDAQ order book, ITTO will support a trade message to reflect a match of a non-displayable order in the NASDAQ Option system. ITTO also supports a trade message to reflect NASDAQ auction transactions.

o **Net Order Imbalance Data:** In the minutes leading up to the NASDAQ Option Opening and Closing Auctions, NASDAQ disseminates the indicative clearing price and net order imbalance in the NASDAQ Option System. Because the calculation includes non-displayable as well as displayable order types, the Net Order Imbalance Indicator (NOII) is the best indicator of the NASDAQ Option opening and closing prices available to the public.

o **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.
  • Symbol Directory messages provide basic option data
  • Option Opening messages provide a option opening time

2. Architecture

The ITTO 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 non-control ASCII bytes. The messages that make up the ITTO protocol are typically delivered using a higher level protocol that takes care of sequencing and delivery guarantees. ITTO 1.0 is an outbound market data feed only. The ITTO protocol does not support order entry.

NASDAQ plans to offer the ITTO data feed in three protocol options:

Protocol Option	Number of Outbound Channels
SoupTCP	Single outbound channel for all securities
Compressed via SoupTCP	Single outbound channel for all securities
MoldUDP	Single outbound channel for all securities

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[1] ITTO is an outbound market data feed only.   The protocol does <u>not</u> support order entry. For information on NASDAQ order entry protocols, please refer to the Trading Services section of the NASDAQ Trader website.

3. Data Types

All numeric fields are represented in ASCII coded digits and are right-justified. Padding spaces appear on the left as necessary.

Prices are given in decimal format with 6 whole number places followed by 4 decimal digits. The whole number portion is padded on the left with spaces; the decimal portion is padded on the right with zeros. The decimal point is implied by position; it does not appear inside the price field.

All alpha fields are left-justified. Padding spaces appear on the right as necessary.

4. Message Formats

The ITTO feed is composed of a series of messages that describe orders added to, removed from, and executed on the NASDAQ Options Market as well as disseminate Auction and Option Symbol Directory information.

4.1. Time Messages

Timestamp reflects the NASDAQ system time at which the outbound message was generated. NASDAQ states time as the number of milliseconds past midnight. The time zone is U.S. Eastern Time.

For bandwidth efficiency reasons, NASDAQ will use separate time stamp messages for the ITTO product. The messages will be sequenced so that data feed recipients can apply the time stamps properly. The time stamp is broken into two separate messages: seconds and milliseconds. Please note that the timestamp for new seconds will always be immediately followed by a time stamp for new milliseconds.

4.1.1. Seconds Message

This message is sent every second for which at least one ITTO message is being generated.

SECONDS MESSAGE				
Name	**Offset**	**Length**	**Value**	**Notes**
Message Type	0	1	"T"	"T" Seconds Message
Second	1	5	Numeric	Number of seconds since midnight

4.1.2. Milliseconds Message

This message is sent every millisecond for which at least one ITTO message is being generated.

MILLISECONDS MESSAGE				
Name	**Offset**	**Length**	**Value**	**Notes**
Message Type	0	1	"M"	"M" Milliseconds Message
Millisecond	1	3	Numeric	Number of milliseconds since midnight

4.2. 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	"S"	System Event Message
Event Code	1	1	Alpha	Refer to System Event Codes below

SYSTEM EVENT CODES	
Code	**Explanation**
"O"	*Start of Messages.* This is always the first message sent in any trading day.
"S"	*Start of System Hours.* This message indicates that NASDAQ is open and ready to start accepting orders.
"Q"	*Start of Opening Process.* This message is intended to indicate that NASDAQ has started its opening auction process.
"X"	*Clear NOII - Opening Auction Data.* This message signals that firms may clear NOII cache for the regular Opening Auction.
"N"	*Start of Normal Hours Closing Process* This message is intended to indicate that NASDAQ will no longer accept any new orders or changes to existing orders for options participating in the normal hours close process.
"L"	*Start of Late Hours Closing Process* - This message is intended to indicate that NASDAQ will no longer accept any new orders or changes to existing orders for options participating in the late hours close process.
"E"	*End of System Hours.* This message indicates that NASDAQ options system is now closed.
"C"	*End of Messages.* This is always the last message sent in any trading day.

4.3. Administrative Data

4.3.1. Option Directory Message

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

OPTIONS DIRECTORY				
Name	**Offset**	**Length**	**Value**	**Notes**
Message Type	0	1	"R"	Options Directory Message
Option Symbol	1	7	Alphabetic	Denotes the options symbol used by NASDAQ for a particular instrument. Under the current symbology model, NASDAQ uses the same symbol as OPRA for its outbound data feed.
Options Closing Type	8	1	Alphabetic	Denotes which System Event is used to trigger the option closing process. "N" = Normal Hours "L" = Late Hours
Option Type	9	1	Alphabetic	Denotes the type of option "P" = Put "C" = Call
Expiration Year	10	4	Numeric	Denotes the year that the put or call option is set to expire.
Expiration Month	14	2	Numeric	Denotes the month that the put or call option is set to expire.
Expiration Day	16	2	Numeric	Denotes the day of the month when the put or call option is set to expire.
Explicit Strike Price	18	14	Numeric	Denotes the Explicit Strike Price associated with the put or call option. The price format is $$$$$$dddddddd.
Underlying Symbol	32	6	Alphanumeric	Denotes the unique symbol assigned to the underlying security within NASDAQ Single Book Execution System.

4.3.2. Options Trading Action Message

NASDAQ uses this administrative message to indicate the current trading status of an index or equity option within the NASDAQ Options Market.

Prior to the start of system hours, NASDAQ will send out a Trading Action spin. In the spin, NASDAQ will send out an Option Trading Action message with the "T" (Trading Resumption) for all options contracts that are eligible for trading at the start of the NASDAQ Options Market system hours. If an option is absent from the pre-opening Trading Action spin, firms should assume that the option is being treated as halted in the NASDAQ Options platform at the start of the system hours. Please note that options may be halted in the NASDAQ system for regulatory or operational reasons.

After the start of system hours, NASDAQ 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, or is released for trading.

Trading Action Message				
Name	**Offset**	**Length**	**Value**	**Notes**
Message Type	0	1	"H"	Options Trading Action Message
Option Symbol	1	7	Alphabetic	Denotes the options symbol used by NASDAQ for a particular instrument.
Current Trading State	8	1	Alphabetic	Reflects the current trading state for the options security in the NASDAQ Options Market. The allowable values are: H = Halt in effect T = Trading on NASDAQ

4.3.3. Security Open Message:

NASDAQ plans to disseminate the Security Open Message for each option as soon as the opening / closing auction process is completed. Upon receipt of the open state message, firms should be advised that the option denoted in the message is now available for auto execution within the NASDAQ Options Market System. Upon receipt of the closed state message, firms should be advised that the option is no longer eligible for auto-execution within the NASDAQ Options Market System.

Security Open Message				
Name	**Offset**	**Length**	**Value**	**Notes**
Message Type	0	1	"O"	Open Message
Option Symbol	1	7	Alphabetic	NASDAQ-assigned indicator for issue for which the order message is being generated.
Open State	8	1	Alphabetic	Reflects the current eligibility for auto execution of the options security in the NASDAQ Options Market. The allowable values are: Y = Open for auto execution N = Closed for auto execution

Please note that recipients should continue to process the Trading Action Spin 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.

4.4. *Add Order Message*

An Add Order Message indicates that a new order has been accepted by the NASDAQ Option system and was added to the displayable book. The message includes a day-unique Order Reference Number used by NASDAQ to track the order.

NASDAQ will support two variations of the Add Order message format:

4.4.1. Add Order Message – No MPID Attribution

ADD ORDER MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"A"	Add Order Message
Order Reference Number	1	9	Numeric	Numeric The unique reference number assigned to the new order. The order reference number is Increasing, but not necessarily sequential.
Market Side	10	1	Alpha	The type of order being added. "B" = Buy "S" = Sell
Contracts	11	6	Numeric	The total number of contracts associated with the order being added to the book.
Option Symbol	17	7	Alphabetic	Denotes the options symbol used by NASDAQ for a particular instrument.
Price	24	10	Numeric	The display price of the new order.

4.4.2. Add Order Message –MPID Attribution

ADD ORDER MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"F"	Add Order Message
Order Reference Number	1	9	Numeric	Numeric The unique reference number assigned to the new order. The order reference number is Increasing, but not necessarily sequential.
Market Side	10	1	Alpha	The type of order being added. "B" = Buy "S" = Sell
Contracts	11	6	Numeric	The total number of contracts associated with the order being added to the book.
Option Symbol	17	7	Alphabetic	Denotes the options symbol used by NASDAQ for a particular instrument.
Price	24	10	Numeric	The display price of the new order.
Attribution	34	4	Alphabetic	NASDAQ market participant identifier associated with the entered order.

4.5. *Modify Order Message*

Modify Order messages always include the Order Reference Number of the Add Order to which the update applies. To determine the current display contracts for an order, ITTO subscribers must deduct the number of contracts stated in the Modify message from the original number of contracts stated in the Add Order message with the same reference number. NASDAQ may send multiple Modify Order messages for the same order reference number and the effects are cumulative. When the number of display contracts for an order reaches zero, the order is dead and should be removed from the book.

4.5.1. Order Executed Message

This message is sent whenever an order on the book is executed in whole or in part. It is possible to receive several Order Executed Messages for the same order if that order is executed in several parts. The multiple Order Executed Messages on the same order are cumulative. By combining the executions received separately via two types of Order Executed Messages and Trade Messages, it is possible to build a complete view of all non-auction executions that happen on NASDAQ. Auction execution information is available in one bulk print via the Auction Trade Message.

ORDER EXECUTED MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"E"	Order Executed Message
Order Reference Number	1	9	Numeric	The order reference number associated with the executed order.
Executed Contracts	10	6	Numeric	The number of contracts executed.
Match Number	16	9	Numeric	The NASDAQ generated day-unique Match Number of this execution. The match number is also referenced in the Trade Break Message.

4.5.2. Order Executed with Price Message

This message is sent whenever an incoming order is executed against the book in whole or in part at a price different from the initial display price. Since the execution price is different than the display price of the original Add Order, NASDAQ includes a price field within this execution message. It is possible to receive multiple Order Executed and Order Executed with Price messages for the same order if that order is executed in several parts. The multiple Order Executed messages on the same order are cumulative. These executions may be marked as non-printable. If the execution is marked as non-printed, it means that the contracts will be included into a later bulk print (e.g., in the case of auction executions). If a firm is looking to use the ITTO data in time-and-sales displays or volume calculations, NASDAQ recommends that firms ignore messages marked as non-printable to prevent double counting.

ORDER EXECUTED WITH PRICE MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"C"	Order Executed Message
Order Reference Number	1	9	Numeric	The order reference number associated with the executed order.
Executed Contracts	10	6	Numeric	The number of contracts executed.
Match Number	16	9	Numeric	The NASDAQ generated day-unique

				Match Number of this execution. The match number is also referenced in the Trade Break Message.
Printable	25	1	Alphabetic	Indicates if the execution should be reflected on time and sale displays and volume calculations. "N" = non-printable "Y" = printable
Execution Price	26	10	Numeric	The price at which the order execution occurred. Refer to Data Types for field processing notes.

4.5.3. Order Cancel Message

This message is sent whenever an order on the book is modified as a result of a partial cancellation.

ORDER CANCEL MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"X"	Order Cancel Message
Order Reference Number	1	9	Numeric	The order reference number associated with the executed order.
Cancelled Contracts	10	6	Numeric	The number of contracts to be removed from the display size of the order as the result of a cancellation.

4.5.4. Order Delete Message

This message is sent whenever an order on the book is being cancelled. All remaining contracts are no longer accessible so the order should be removed from the book.

ORDER DELETE MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"D"	Order Delete Message
Order Reference Number	1	9	Numeric	The order reference number associated with the executed order.

4.6. Options Trade Messages

4.6.1. Options Trade (Non-Auction)

This Options Trade Message is designed to provide execution details for normal match events involving non-displayable order types. (Note: There is a separate message for NASDAQ Option auction events.)

Since no Add Order Message is generated when a non-displayed order is initially received, NASDAQ cannot use the Modify Order message for all matches. NASDAQ therefore developed this message to indicate when a match occurs between non-displayable order types. This message is transmitted each time a non-displayable order is executed in whole or in part. It is possible to receive multiple messages for the same order if that order is executed in several parts. Trade Messages for the same order are cumulative. These messages should be included in NASDAQ time-and-sales displays as well as volume and other market statistics. Since Trade Messages do not affect the book, however, they may be ignored by firms just looking to build and track the NASDAQ Option System display.

Options Trade (Non-Auction)				
Name	**Offset**	**Length**	**Value**	**Notes**
Message Type	0	1	"P"	Trade Message Identifier
Order Reference Number	1	9	Numeric	The order reference number associated with the executed order.
Buy/Sell Indicator	10	1	Alpha	The type of non-display order on the book being matched. "B" =buy order "S" =sell order
Contracts	11	6	Numeric	The number of Contracts being matched in this execution.
Option Symbol	17	7	Alpha	Denotes the options symbol used by NASDAQ for a particular instrument associated with the match execution.
Price	24	10	Numeric	The match price of the order. Refer to Data Types for field processing notes.
Match Number	34	9	Numeric	The NASDAQ generated session-unique Match Number for this trade. The Match Number is referenced in the Trade Break Message.

4.6.2.   Options Auction Trade

Options Auction Trade message is sent for every option when a auction in that option is completed. The message indicates the bulk volume associated with the auction event.

To avoid double counting of auction volume, firms should not include transactions marked as nonprintable in time-and-sales displays or market statistic calculations.

Option auction execution information is only available in this bulk print. It is possible to build a complete list of non-auction executions on NASDAQ by combining the executions received separately via Printable Order Executed Messages and Printable Trade Messages.

Options Cross Trade				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"Q"	Auction Trade Message
Contracts	1	9	Numeric	The number of contracts matched in the NASDAQ Auction.
Option Symbol	10	7	Alpha	Denotes the options symbol used by NASDAQ for a particular instrument associated with the trade message.
Cross Price	17	10	Numeric	The price at which the auction occurred. Refer to Data Types for field processing notes.
Match Number	27	9	Numeric	The NASDAQ generated day-unique Match Number of this execution.
Cross Type	36	1	Alpha	The NASDAQ auction session for which the message is being generated. "O" = NASDAQ Opening Auction. "C" = NASDAQ Closing Auction.

4.6.3.   Broken Trade/Order Execution Message

The Broken Trade Message is sent whenever an execution on NASDAQ is broken. An execution may be broken if it is found to be "clearly erroneous" pursuant to NASDAQ's Clearly Erroneous Policy. A trade break is final; once a trade is broken, it cannot be reinstated.

Firms that use the ITTO feed to create time-and-sales displays or calculate market statistics should be prepared to process the broken trade message. If a firm is only using the ITTO feed to build a book, however, it may ignore these messages as they have no impact on the current book.

BROKEN TRADE/ORDER EXECUTED MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"B"	Broken Trade/Order Executed Message
Match Number	1	9	Numeric	The NASDAQ Match Number of the execution that was broken. This refers to a Match Number from a previously transmitted Order Executed Message, Order Executed With Price Message, or Trade Message.

4.7. Net Order Imbalance Indicator (NOII)

NASDAQ disseminates NOII data at 5-second intervals in the minutes leading up to the NASDAQ Auction events.

- o For the NASDAQ Opening Auction, NASDAQ will begin the dissemination of NOII messages for a put or a call option two minutes prior to the start of opening process event.
- o For the NASDAQ Closing Auction, NASDAQ will begin the dissemination of NOII messages for a put or a call option ten minutes prior to the start of the associated closing process event.

NOII MESSAGE				
Name	**Offset**	**Length**	**Value**	**Notes**
Message Type	0	1	"I"	NOII Message
Paired Contracts	1	9	Numeric	The total number of contracts that are eligible to be matched at the Current Reference Price.
Imbalance Contracts	10	9	Numeric	The number of contracts not paired at the Current Reference Price.
Imbalance Direction	19	1	Alphabetic	Indicates the market side of the imbalance "B" = buy imbalance "S" = sell imbalance "N" = no imbalance "O" = insufficient orders to calculate
Option Symbol	20	7	Alphabetic	Denotes the options symbol used by NASDAQ for a particular instrument.
Far Price	27	10	Numeric/ Price	A hypothetical auction-clearing price for auction orders only. Refer to Appendix D for processing notes.
Near Price	37	10	Numeric/ Price	A hypothetical auction-clearing price for auction orders as well as continuous orders.
Current Reference Price	47	10	Numeric/ Price	Indicates price at which the NOII contracts are being calculated.
Cross Type	57	1	Alphabetic	Denotes the type of NASDAQ auction for which the NOII message is being generated "O" = Open Cross "C" = Close Cross
Price Variation Indicator	58	1	Alphanumeric	This field indicates the absolute value of the percentage of deviation of the Near Indicative Clearing Price to the nearest Current Reference Price. "L" = Less than 1% "1" = 1 to 1.99% "2" = 2 to 2.99% "3" = 3 to 3.99% "4" = 4 to 4.99% "5" = 5 to 5.99% "6" = 6 to 6.99% "7" = 7 to 7.99% "8" = 8 to 8.99% "9" = 9 to 9.99%

NOII MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
				"A" = 10 to 19.99% "B" = 20 to 29.99% "C" = 30% or greater Space = Cannot be calculated

5. Support

o   For general product support for NASDAQ data feeds, please contact NASDAQ Market Data Distribution at 301.978.5307 or mktdatasvc@nasdaq.com.

o   For technical support for NASDAQ data feeds, please contact NASDAQ Systems Engineering at devsupport@nasdaq.com.

Appendix A

Documentation Revision Control Log

December 27, 2007: Options ITTO 1.0

NASDAQ released the initial Options ITTO specification document to the public.

August 24, 2009: Options ITTO 1.0.1

NASDAQ corrected the hyperlinks in the architecture section

October 22, 2009: Options ITTO 1.0.2

NASDAQ Corrected the location of the symbol field within the NOII message type