Genium INET ITCH® 2.0

Protocol Specification

Revision 2.12

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1 Overview

Genium INET ITCH is a direct data feed product. The ITCH feed displays all public orders and trades that occur on the auto-matched market(s). ITCH features the following data elements:

- o **Order level data (MBO) with attribution:** The system will provide its full order depth using the standard ITCH format. ITCH uses a series of order messages to track the life of a customer order, including order executions.[1] The ITCH message formats supports market participant attribution if used by the marketplace.

- o **Trade messages:** ITCH supports a trade message to reflect a match of a non-displayable order in the system.

- o **Reference Data**:

    - o Order book Directory message provide basic security data such as the ISIN code and Financial Product.

    - o Tick Size Table Entry messages to convey Tick Sizes for order books.

- o **Event controls**, such as the states of the different order books.

    - o Order book State message to inform receivers of state changes.

NOTE: ITCH provides an order book view and auto-matched trades.

- Do not assume that the mechanisms of the matching logic can be derived from observing the ITCH feed.
- ITCH cannot be used to manage private orders.
- ITCH does not provide privately negotiated trades reported to the marketplace.

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[1] ITCH is an outbound market data feed only.   The ITCH protocol does <u>not</u> support order entry.

2 Architecture

The ITCH feed is made up of a series of sequenced messages. Each message is variable in length based on the message type. The messages will be binary encoded using SoupBinTCP or MoldUDP64. The messages that make up the ITCH protocol are typically delivered using a higher level protocol that takes care of sequencing and delivery guarantees.

The Genium INET ITCH data feed is offered in two protocol options:

Protocol Option	Number of Outbound Channels
SoupBinTCP	**Not currently used.** SoupBinTCP is a lightweight point-to-point protocol, built on top of TCP/IP sockets that allow delivery of a set of sequenced messages from a server to a client in real-time. SoupBinTCP guarantees that the client receives each message generated by the server in sequence, even across underlying TCP/IP socket connection failures. The sequence numbers are implicit, meaning that the client maintains a counter that is increased every time a message is received. At reconnect after a connection loss, the client submits the last seen sequence number in its Logon message, and the server resends every message starting from that sequence number.
MoldUDP64	MoldUDP64 is a light-weight networking protocol built on top of UDP that provides a mechanism for listeners to detect and re-request missed packets. Unlike SoupBinTCP, each message is explicitly sequence numbered. If a packet loss is detected by the client, it can re-request that packet from the MoldUDP64 gateway, and it will be resent as a UDP unicast to that client.

3 Data Types

All Numeric fields are composed of binary encoded numbers.

All alpha fields are left justified and padded on the right with spaces.
The Alpha fields are composed of non-control ISO 8859-1 (Latin-1) encoded bytes.

DATA TYPES		
Type	*Size*	*Notes*
Numeric	1, 2, 4, 8 bytes	Unsigned big-endian binary encoded numbers. **NOTE:** The transport layer, SoupBinTCP or MoldUDP64, uses big-endian for its numeric values.
Alpha	variable	Left justified and padded on the right with spaces.
Price	4 bytes	Prices are signed integer fields. Number of decimals is specified in the Order book Directory message. **NOTE:** A Price field with bit 31 set (the highest bit, MIN_INT) while all other bits are zero (decimal -2147483648) means that no price was available. This value also represents a market order in the Add Order messages.
Date	4 bytes	Four byte integer value derived from the **Numeric** data type. The decoded value represents a Date in YYYYMMDD-format.

4 Message Formats

The ITCH feed is composed of a series of messages that describe orders added to, removed from, and executed on the Genium INET Trading system. It also contains messages for basic reference data of the order books as well as state changes and halts.

4.1 Time Messages

For bandwidth efficiency reasons, NASDAQ will separate the ITCH timestamps into two pieces:

Timestamp portion	Message Type	Notes
Seconds	Standalone message.	Unix time (number of seconds since 1970-01-01 00:00:00 UTC) **NOTE:** A Timestamp – Second message will be disseminated for every second for which there is at least one payload message.
Nanoseconds	Field within individual messages.	Reflects the number of nanoseconds since the most recent Timestamp-Seconds message that the payload message was generated.

4.1.1 Seconds Message

This message is sent every second for which at least one ITCH message is being generated. The message contains the number of seconds since the start of 1970-01-01 00:00:00 UTC, also called Unix Time.

TIMESTAMP – SECONDS MESSAGE				
Name	Offset	Length	Value	Notes
Message Type	0	1	"T"	Seconds Message.
Second	1	4	Numeric	Unix time (number of seconds since 1970-01-01 00:00:00 UTC)

4.2   Reference Data Messages

4.2.1   Order book Directory

At the start of each trading day, Order book directory messages are disseminated for all active securities, including halted securities, in the Genium INET Trading system.

NOTE: Intra-day transmissions of this message may occur when new order books are added to the system. Updates to existing order books may also be represented by intra-day Order book Directory messages.

ORDER BOOK DIRECTORY				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"R"	Order book Directory Message
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Order book ID	5	4	Numeric	Denotes the primary identifier of an order book. **NOTE:** Expired Order book IDs may be reused for new instruments.
Symbol	9	32	Alpha	Security short name.
Long Name	41	32	Alpha	Human-readable long name of security.
ISIN	73	12	Alpha	ISIN code identifying security.
Financial Product	85	1	Numeric	Values: 1 = Option 2 = Forward 3 = Future 4 = FRA 5 = Cash 6 = Payment 7 = Exchange Rate 8 = Interest Rate Swap 9 = REPO 10 = Synthetic Box Leg/Reference 11 = Combination 12 = Guarantee 13 = OTC General 14 = Equity Warrant 15 = Security Lending
Trading Currency	86	3	Alpha	Trading currency.
Number of decimals in Price	89	2	Numeric	This value defines the number of decimals used in price for this order book. **NOTE:** A value of 256 means that the instrument is traded in fractions (each fraction is 1/256).
Number of decimals in Nominal Value	91	2	Numeric	This value defines the number of decimals in Nominal Value.
Odd Lot Size	93	4	Numeric	Indicates the number of securities that represent an odd lot for the order book. **NOTE:** A value of 0 indicates that this lot type is undefined for the order book.

Round Lot Size	97	4	Numeric	Indicates the quantity that represent a round lot for the issue
Block Lot Size	101	4	Numeric	Indicates the number of securities that represent an block lot for the order book. **NOTE:** A value of 0 indicates that this lot type is undefined for the order book.
Nominal Value	105	8	Numeric	Nominal value.
Number of Legs	113	1	Numeric	Number of legs. **NOTE:** Only applicable for combination instruments.
Underlying Order book ID	114	4	Numeric	Order book ID of underlying instrument. **NOTE:** Only applicable for derivative instruments except for combinations.
Strike Price	118	4	Price	**NOTE:** Only applicable for derivative instruments.
Expiration Date	122	4	Date	Date of expiration. **NOTE:** Only applicable for derivative instruments.
Number of decimals in Strike Price	126	2	Numeric	This value defines the number of decimals used in Strike Price for this order book. **NOTE:** Only applicable for derivative instruments.
Put or Call	128	1	Numeric	Option type. Values: 1 = Call 2 = Put **NOTE:** A value of 0 indicates that Put or Call is undefined for the order book.
Market ID	129	2	Numeric	Market ID

4.2.2 Combination Order book Leg

This message provides a mapping between a combination order book and one of the combination leg order books.
A Combination instrument (standard or Tailor-Made) is a synthetic instrument consisting of two or more real instruments. In Genium INET combination instruments are set up as regular order books where orders can be placed.
The Combination instrument and each of the leg instruments are represented by Order book Directory messages in ITCH. The Combination Order book Leg message represents a mapping between a combination order book and one of its leg order books. For each combination order book, one Combination Order book Leg message will be generated per leg the combination consists of.

NOTE: Intra-day transmissions of this message may occur when new combination order books are added to the system. This is typically the case for tailor-made combinations. Updates to existing combination order books may also be represented by intra-day Order book Directory messages.

COMBINATION ORDER BOOK LEG				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"M"	Combination Order book Leg Message
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Combination Order book ID	5	4	Numeric	Denotes the primary identifier of an order book. **NOTE:** Expired Order book IDs may be

				reused for new instruments.
Leg Order book ID	9	4	Numeric	Order book ID of Leg instrument
Leg Side	13	1	Alpha	Values: B = As Defined C = Opposite
Leg Ratio	14	4	Numeric	

4.2.3   Tick Size Table Entry

This message contains information on a tick size for a price range. Together, all Tick Size messages with the same Order book ID form a complete Tick Size Table. Each Order book has a set of Tick Size Table Entries to define its tick size table.
NOTE: The number of decimals in prices are given by the Order book Directory message for this Order book.

TICK SIZE TABLE ENTRY				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"L"	Tick Size Message
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Order book ID	5	4	Numeric	The order book this entry belongs to.
Tick Size	9	8	Price	Tick Size for the give price range
Price From	17	4	Price	Start of price range for this entry.
Price To	21	4	Price	End of price range for this entry. Zero (0) means infinity.

4.3   Event and State Change Messages

4.3.1   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	"S"	System Event Message.
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Event Code	5	1	Alpha	See System Event Codes below.

The system supports the following event codes on a daily basis.

SYSTEM EVENT CODES – DAILY	
Code	*Explanation*
"O"	**Start of Messages. Outside of time stamp messages, the start of day message is the first message sent in any trading day.**
"C"	**End of Messages. This is always the last message sent in any trading day.**

4.3.2   Order book State Message

The Order book state message relays information on state changes.

ORDER BOOK STATE MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"O"	Order book State Message.
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Order book ID	5	4	Numeric	Order book identifier.
State Name	9	20	Alpha	Name of Order book State

4.4   Market by Order Messages

NOTE: Order IDs are only unique per order book and side. When modifying or deleting orders, be careful to only update the order with the correct side and order book, since the same Order ID may be present in multiple order books and/or sides.

4.4.1   Add Order Messages

An Add Order Message indicates that a new order has been accepted by the Genium INET Trading system and was added to the displayable book. The message includes an Order ID that *is unique per Order book and side* used by the Genium INET Trading to track the order.

Genium INET ITCH will support two variations of the Add Order message format.

NOTE: Refer to the Data types chapter for a description of how market orders are represented.

4.4.1.1 Add Order – No MPID Attribution

This message will be generated for unattributed orders in the Genium INET Trading system.

ADD ORDER MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"A"	Add Order Message.
Timestamp –	1	4	Numeric	Nanoseconds portion of the

Name	Offset	Length	Value	Notes
Nanoseconds				timestamp.
Order ID	5	8	Numeric	The identifier assigned to the new order. Note that the number is *only* unique per Order book and side.
Order book ID	13	4	Numeric	Order book identifier.
Side	17	1	Alpha	The type of order being added. "B" = buy order. "S" = sell order.
Order book Position	18	4	Numeric	Rank within order book. See Appendix A for details.
Quantity	22	8	Numeric	The visible quantity of the order. **NOTE:** Orders with an undisclosed quantity will have this field set to 0.
Price	30	4	Price	The display price of the new order. Refer to Data Types for field processing notes.
Order Attributes	34	2	Numeric	Additional order attributes. Values: 0 = Not applicable 1 = Force 2 = Short Sell 4 = Market Bid 8 = Price Stabilization 16 = Override Crossing 32 = Undisclosed 1024 = Fill-and-kill immediately 2048 = Firm color disabled 4096 = Convert to aggressive (if locked market) 8192 = Bait/implied order 16384 = Quote **NOTE:** Applicable types may be defined by the marketplace. **NOTE 2:** This field is a bit map. Multiple values may be set simultaneously.
Lot Type	36	1	Numeric	Lot Type. Values: 0 = Undefined 1 = Odd Lot 2 = Round Lot 3 = Block Lot 4 = All or None Lot

4.4.1.2 Add Order – MPID Attribution

This message will be generated for attributed orders and quotations entered into the Genium INET Trading system.

ADD ORDER – MPID ATTRIBUTION MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"F"	Add Order Message.
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.

Order ID	5	8	Numeric	The unique identifier assigned to the new order. Note that the number is *only* unique per Order book and side.
Order book ID	13	4	Numeric	
Side	17	1	Alpha	The type of order being added. Values: "B" = buy order. "S" = sell order.
Order book Position	18	4	Numeric	Rank within order book. See Appendix A for details.
Quantity	22	8	Numeric	The visible quantity of the order. **NOTE:** Orders with an undisclosed quantity will have this field set to 0.
Price	30	4	Price	The display price of the new order. Refer to Data Types for field processing notes.
Order Attributes	34	2	Numeric	Additional order attributes. Values: 0 = Not applicable 1 = Force 2 = Short Sell 4 = Market Bid 8 = Price Stabilization 16 = Override Crossing 32 = Undisclosed 1024 = Fill-and-kill immediately 2048 = Firm color disabled 4096 = Convert to aggressive (if locked market) 8192 = Bait/implied order 16384 = Quote **NOTE:** Applicable types may be defined by the marketplace. **NOTE 2:** This field is a bit map. Multiple values may be set simultaneously.
Lot Type	36	1	Numeric	Lot Type. Values: 0 = Undefined 1 = Odd Lot 2 = Round Lot 3 = Block Lot 4 = All or None Lot
Participant ID	37	7	Alpha	Market participant identifier associated with the entered order.

4.4.2   Modify Order Messages

Modify Order messages always include the Order ID, Order book ID and Side of the Add Order to which the update applies.

4.4.2.1 Order Executed Message

This message is sent whenever an order on the book is executed in whole or in part.

If the incoming order causing the match cannot be fully filled, the remainder will be placed in the book after the match has occurred.

To determine the currently displayed quantity for an order, ITCH subscribers must deduct the quantity stated in the Order Executed message from the original quantity stated in the Add Order message with the same Order ID. When the displayed quantity for an order reaches zero, the order is dead and should be removed from the book.

It is possible to receive several Order Executed Messages for the same order if that order is executed in several parts. Multiple Order Executed Messages on the same order are cumulative.

ORDER EXECUTED MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"E"	Order Executed Message.
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Order ID	5	8	Numeric	The order id associated with the executed order.
Order book ID	13	4	Numeric	
Side	17	1	Alpha	The type of order being added. Values: "B" = buy order. "S" = sell order.
Executed Quantity	18	8	Numeric	The quantity being executed.
Match ID	26	8	Numeric	Assigned by the system to each match executed.
Combo Group ID	34	4	Numeric	Used to group combo and leg executions together.
Participant ID, owner	38	7	Alpha	**NOTE:** Will be set to blank (space) for anonymous markets.
Participant ID, counterparty	45	7	Alpha	**NOTE:** Will be set to blank (space) for anonymous markets.

4.4.2.2 Order Executed with Price Message

This message is sent in the relatively rare event that an order on the book is executed in whole or in part with a price different than the initial display price.

If the incoming order causing the match cannot be fully filled, the remainder will be placed in the book after the match has occurred.

To determine the currently displayed quantity for an order, ITCH subscribers must deduct the quantity stated in the Order Executed message from the original quantity stated in the Add Order message with the same Order ID. When the displayed quantity for an order reaches zero, the order is dead and should be removed from the book.

It is possible to receive several Order Executed Messages for the same order if that order is executed in several parts. Multiple Order Executed Messages on the same order are cumulative.

The executions may be marked as non-printable. If a participant is looking to use the ITCH data in trade tickers or volume calculations, NASDAQ recommends that participants ignore messages marked as non-printable to prevent double counting.

NOTE: Combination orders on the book that execute will always be represented by this message.

NOTE 2: Combination orders that execute will have the Printable flag set to "N". The trades that occur in the legs of the combination will be printable. This avoids double counting of the combination order and its leg trades. Leg trades will be published with the Trade message.

ORDER EXECUTED WITH PRICE MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"C"	Order Executed Message.
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Order ID	5	8	Numeric	The order id associated with the executed order.
Order book ID	13	4	Numeric	
Side	17	1	Alpha	The type of order being added. Values: "B" = buy order. "S" = sell order.
Executed Quantity	18	8	Numeric	The quantity being executed.
Match ID	26	8	Numeric	Assigned by the system to each match executed.
Combo Group ID	34	4	Numeric	Used to group combo and leg executions together.
Participant ID, owner	38	7	Alpha	**NOTE:** Will be set to blank (space) for anonymous markets.
Participant ID, counterparty	45	7	Alpha	**NOTE:** Will be set to blank (space) for anonymous markets.
Trade Price	52	4	Price	
Occurred at Cross	56	1	Alpha	Values: "Y" = Yes, trade occurred at the cross "N" = No, trade occurred at continuous market
Printable	57	1	Alpha	Indicates if the trade should be included in trade tickers and volume calculations. Values: "N" = non-printable "Y" = printable

4.4.2.3 Order Replace Message

Please note that the Order Replace Message is currently not used but is included in the ITCH specification for future reference. A replace of an existing order will be represented by an Order Delete Message followed by an Order Add Message but the original order ID will remain.

This message is sent whenever an existing order on the book has been modified. This will be the case when an order is modified through an alter action. Note that a re-quote of an existing quote will be represented by an Order Delete followed by an Order Add.

Note that the Quantity field contains the new visible quantity for the order.

The Side, Order book ID, and attribution (if any) remain the same as the original order. Attribution is not part of the Order Replace message.

ORDER REPLACE MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"U"	Order Replace Message.
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Order ID	5	8	Numeric	The original order identifier of the order being replaced. Note that the Order ID is only unique per order book and side. **NOTE:** The Order ID does not change when the order is replaced.
Order book ID	13	4	Numeric	
Side	17	1	Alpha	The type of order being added. Values: "B" = buy order. "S" = sell order.
New Order book Position	18	4	Numeric	New Rank within order book. See Appendix A for details.
Quantity	22	8	Numeric	The new visible quantity of the order.
Price	30	4	Price	The new Price of the order.
Order Attributes	34	2	Numeric	Additional order attributes. Values: 0 = Not applicable 1 = Force 2 = Short Sell 4 = Market Bid 8 = Price Stabilization 16 = Override Crossing 32 = Undisclosed 1024 = Fill-and-kill immediately 2048 = Firm color disabled 4096 = Convert to aggressive (if locked market) 8192 = Bait/implied order 16384 = Quote **NOTE:** Applicable types may be defined by the marketplace. **NOTE 2:** This field is a bit map.

				Multiple values may be set simultaneously.

4.4.2.4 Order Delete Message

This message is sent whenever an order on the book is being deleted. There will be no remaining quantity, so the order should be removed from the book.

Please note that normally no Order Delete message is sent when an order is *completely filled*. The receiver needs to keep track of the remaining quantity on all orders by recalculating the remaining quantity on each Order Executed message received. Orders must be removed from the book when remaining quantity reaches 0.

NOTE: Order Deletes *are* sent when an order with an undisclosed quantity is fully filled.

NOTE 2: Order Deletes are sent out when orders are suspended due to connection loss.

NOTE 3: Order Deletes will be sent out for all existing orders prior to an auction where market by order dissemination is disabled. The owners of these orders must not interpret this as order cancellations. Use the private order flow to determine the state of your orders.

ORDER DELETE MESSAGE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"D"	Order Delete Message.
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Order ID	5	8	Numeric	The ID of the order being deleted. NOTE: The Order ID is only unique per order book and side.
Order book ID	13	4	Numeric	The Order book ID.
Side	17	1	Alpha	The type of order being added. Values: "B" = buy order. "S" = sell order.

4.5 Trade Messages

4.5.1 Trade Message

The Trade Message is designed to provide execution details for normal match events involving non-displayable order types. This message is also used to publish individual cross trades.

Since no Add Order Message is generated when a non-displayed order is initially received, the Order Executed message cannot be used for all matches. The Trade Message is used to report a match for a non-displayable order in the book.

It is possible to receive multiple Trade Messages for the same order if that order is executed in several parts. Trade Messages for the same order are cumulative.

Trade Messages should be included in trade tickers as well as volume and other market statistics. Since Trade Messages do not affect the displayed book,

however, they may be ignored by participants just looking to build and track the
order book view.

Name	Offset	Length	Value	Notes
TRADE MESSAGE				
Message Type	0	1	"P"	Trade Message Identifier
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Match ID	5	8	Numeric	Assigned by the system to each match executed.
Combo Group ID	13	4	Numeric	Used to group combo and leg executions together.
Side	17	1	Alpha	The type of non-display order on the book being matched. "B" =buy order "S" =sell order **NOTE:** Will be set to blank (space) for anonymous markets.
Quantity	18	8	Numeric	The quantity being matched in this execution.
Order book ID	26	4	Numeric	
Trade Price	30	4	Price	
Participant ID, owner	34	7	Alpha	**NOTE:** Will be set to blank (spaces) for anonymous markets.
Participant ID, counterparty	41	7	Alpha	**NOTE:** Will be set to blank (spaces) for anonymous markets.
Printable	48	1	Alpha	Indicates if the trade should be included in trade tickers and volume calculations. Values: "N" = non-printable "Y" = printable
Occurred at Cross	49	1	Alpha	Values: "Y" = Yes, trade occurred at the cross "N" = No, trade occurred at continuous market

4.6   Auction Messages

Markets by order dissemination may be disabled during auctions by configuration.
In such cases, every existing order will be removed from the book by an Order
Delete message immediately prior to the auction.
NOTE: The owners of these orders must not interpret this as order cancellations.
Use the private order flow to determine the state of your orders.

4.6.1   Equilibrium Price Update

This message is used if/when auctions occur. The message provides the changes in
equilibrium price.
NOTE: If any Price field has bit 31 set (the highest bit, MIN_INT) while all other bits
are zero (decimal -2147483648), this means that no price is available.

EQUILIBRIUM PRICE UPDATE				
Name	*Offset*	*Length*	*Value*	*Notes*
Message Type	0	1	"Z"	Equilibrium Price Update Message
Timestamp – Nanoseconds	1	4	Numeric	Nanoseconds portion of the timestamp.
Order book ID	5	4	Numeric	Order book ID
Available Bid Quantity at Equilibrium Price	9	8	Numeric	Quantity at equilibrium price on the bid side
Available Ask Quantity at Equilibrium Price	17	8	Numeric	Quantity at equilibrium price on the ask side
Equilibrium Price	25	4	Price	Equilibrium Price
Reserved	29	4		Not currently in use
Reserved	33	4		Not currently in use
Reserved	37	8		Not currently in use
Reserved	45	8		Not currently in use

5 Revision History

Date	Revision	Change Description
January 5, 2012	2.00	Initial version. Copy of Genium INET ITCH v. 0.30.
		Added note that SoupBinTCP transport currently not in use.
		Removed Workup Information message.
		Replaced Combination Order book Directory message with Combination Order book Leg message to allow for variable number of legs.
		Changed size of Tick Size field to 4 bytes.
		Added Number of Legs field to Order book Directory.
		Added Order book Trading Action message to convey halt information.
		Replaced 12 byte Match ID with 8 byte Match ID and Combo ID.
		Updated appendix on combination order book trades to reflect new Match ID and Combo ID.
		Added Derivative Order book Directory message.
March 1, 2012	2.01	Removed Order book Trading Action message.
		Removed specialized derivative Order book Directory message.
		Added note on prices not available in the Equilibrium Price message.
May 22, 2012	2.02	Added Put or call field to Order book Directory message.
		Renamed Combo ID to Combo Group ID.
June 5, 2012	2.03	Added note on how market orders are represented.
September 18, 2012	2.04	Introduced Date data type.
		Changed data type of the Expiration Date field to Date.

December 21, 2012	2.05	Added Order Attribute 'Quote'.
February 26, 2013	2.06	Renamed Financial Product value Standard Combination to Combination. Clarified how quantities are represented in Modify Order messages.
April 9, 2013	2.07	Reverted size of Tick Size field back to 8 Bytes.
July 2, 2013	2.08	Removed note saying that multiple Order Deletes can be received for an order.
February 6, 2014	2.09	Removal of Best Bid/Ask Price/Quantity in Auction Message
February 5, 2015	2.10	Added that Underlying Order book ID is not applicable for combinations
March 11, 2015	2.11	Minor corrections
April 9, 2015	2.12	Added Market ID to Order book directory message and added information regarding that Order Replace message is not currently used.

Appendix A, How to build an order book viewer

The information needed to build an order book view from the ITCH message flow is contained in the Add Order Messages (see section 4.4.1) and the Modify Order Messages (see section 4.4.2). The messages are:

- Add Order – No MPID Attribution

- Add Order – MPID Attribution

- Order Executed

- Order Executed with Price

- Order Replace

- Order Delete

The two flavors of the Add Order messages have the same meaning; an order is added to the book. Orders shall be ranked by:

- Order book Position. 1 denotes the highest ranked order. For an Order Replace, the order must be removed from its previous position and inserted at New Order book Position. An order inserted at an existing position shifts the order on that position down (and all orders below as well. A deleted or fully filled order causes existing orders below it to shift their position up one step to fill the "void".

The Order Executed (with Price) message signals a partial or full fill. The order quantity must be reduced by the quantity of the Order Executed message.

The Order Replace message signals that the order has been modified. The current rank may or may not be lost in the process Order book Position will show the new rank within the book.

The Order Delete message tells the recipient to remove the order referenced.

Appendix B, How to build a Trade Ticker

The Trade Ticker is based on the following messages:

- Order Executed

- Order Executed with Price

- Trade

Note that Trades and Order Executed with Price messages marked as non-printable shall be excluded to avoid double booking of trades.

NOTE: Reported trades are not included in ITCH.

6 Appendix C, Trades in Combination Order books

When a Combination order is executed, trades also occur in all legs of the combination. To learn about the Combination instrument and its constituents, query the Combination Order book Leg messages (chapter 4.2.2).

- Communication of Combo vs. Combo Executions

    o Order Executed with Price message for the Combination Order book (chapter 4.4.2.2), with the Printable flag set to N (to avoid double counting)

    o Trade messages in the constituent Order books (chapter 4.5.1)

- Communication of Combo vs. Outright Executions

    o Order Executed, and/or Order Executed with Price messages for the constituent Order books

    o Trade message in the Combination Order book, with the Printable flag set to N (to avoid double counting)

- The Combination Order book execution and the constituent Order book executions will have different Match IDs, but the same Combo Group ID.

NOTE: The Combo Group ID field should not be assumed to be unique over time.