

NASDAQ OMX BX TotalView-ITCH 4.0

For BX Listing Market & BX Trading Venue

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NASDAQ OMX BX TotalView-ITCH 4.0

Note: This version of the BX TotalView-ITCH service is designed to support symbols up to six characters only.

As noted in [Data Technical News #2010-3](#), NASDAQ OMX is releasing new versions of the BX TotalView-ITCH service to support expanded symbol fields. Given NYSE's announced plans to move to longer ticker symbols, NASDAQ OMX is requiring that direct data feed subscribers migrate to the new BX TotalView-ITCH (Version 4.1) data formats between April 2010 and December 2010.

While NASDAQ OMX plans to support this version of the BX TotalView-ITCH data formats through December 2010, the feed will carry data only for those securities with a ticker symbol (inclusive of suffixes) of six characters or less. This feed will be discontinued at the close of business on December 31, 2010.

1 Overview

1.1 Product Description

NASDAQ OMX BX TotalView-ITCH ("BX TotalView-ITCH") is a direct data feed product offered by NASDAQ OMX BX.

BX TotalView features the following data elements that support trading on the BX exchange in all exchange-listed equities securities:

- **Order level data with attribution:** The BX TotalView-ITCH 4.0 data feed provides its full order depth using the standard ITCH format. ITCH uses a series of messages of order messages to track the life of a customer order.¹ As an added feature, the message formats will support market participant attribution. BX TotalView-ITCH 4.0 carries order level data for all U.S. exchange-listed equities.
- **Trade messages:** To ensure that customers have complete information about BX market order flow, NASDAQ OMX BX TotalView-ITCH 4.0 supports a trade message to reflect a match of a non-displayable order in the BX system.
- **Administrative messages**, such trading actions and symbol directory messages:
 - Trading action messages are used to inform market participants when a security is halted or released for trading.
 - Symbol Directory messages provide basic security data such as the market tier and Financial Status Indicator.
 - Market participant position message carries the Primary Market Maker status, Market Participant status and Market Maker mode fields used by some firms to comply with market regulations.
- **Event controls**, such as start of day, end of day and emergency market halt/resume.

¹ NASDAQ OMX BX TOTALVIEW-ITCH is an outbound market data feed only. The ITCH protocol does not support order entry. For information on NASDAQ OMX BX order entry protocols, please refer to the Trading Services section of the NASDAQ OMX Trader website.

1.2 Upcoming Product Enhancements

NASDAQ OMX has recently filed with the U.S. Securities and Exchange Commission (SEC) to establish listing standards for the BX exchange. NASDAQ OMX will begin accepting listing applications for the new BX market, pending SEC approval.

All new values and enhanced functionality to support the BX Listing Market is highlighted in blue to assist subscribing customers in identifying the changes.

With the introduction of the BX Listing Market, NASDAQ OMX will enhance the BX trading system to support an opening and closing cross process. In addition, NASDAQ OMX will introduce the following enhancements to the BX TotalView-ITCH 4.0 data feed product:

- **Symbol Directory messages:** NASDAQ OMX will add a new Market Category Code of “B” to clearly identify securities listed on the BX Listing Market.
- **Net Order Imbalance Indicator (NOII) messages:** In the minutes leading up to the new opening and closing crosses, BX TotalView-ITCH will disseminate the indicative clearing price and net order imbalance for BX-listed securities only. Because the calculation includes non-displayable as well as displayable order types in the BX market system, the Net Order Imbalance Indicator (NOII) is the best predictor of the BX opening and closing prices available to the public for BX-listed securities.
- **Cross Trade messages:** The BX TotalView-ITCH data feed will also support a separate Cross Trade message format to clearly denote the price and volume executed during the opening and closing cross process in the BX system for BX-listed securities only.

2 Architecture

The NASDAQ BX TotalView-ITCH 4.0 feed is made up of a series of sequenced messages. Each message is variable in length based on the message type. The messages that make up the NASDAQ BX TotalView-ITCH 4.0 protocol are typically delivered using a higher level protocol that takes care of sequencing and delivery guarantees.

This data feed will be offered in three protocol options:

- [SoupBINTCP](#)
- [Compressed](#) via SoupTCP
- [MoldUDP64](#)

3 Data Types

All integer fields are unsigned big-endian (network byte order) binary encoded numbers.

All alpha fields are left justified and padded on the right with spaces.

Prices are integer fields. When converted to a decimal format, prices are in fixed point format with 6 whole number places followed by 4 decimal digits. The maximum price in NASDAQ BX TotalView-ITCH 4.0 is 200,000.0000 (decimal, 77359400 hex).

4 Message Formats

The BX TotalView-ITCH 4.0 feed is composed of a series of messages that describe orders added to, removed from, and executed on NASDAQ OMX BX as well as disseminate Cross and Stock Directory information.

4.1 Time Stamp – Seconds

For bandwidth efficiency reasons, NASDAQ OMX BX will separate the BX TotalView-ITCH 4.0 timestamp into two pieces:

| Timestamp Portion | Message Type | Notes |
|--------------------------|---|---|
| Seconds | Standalone message on BX TotalView-ITCH 4.0 feed | Reflects the number of seconds past midnight that the Timestamp message was generated. Note: A Timestamp – Second message will be disseminated for every second for which there is at least one payload message. |
| Nanoseconds | Field within individual message formats on BX TotalView-ITCH 4.0 feed | Reflects the number of nanoseconds since the most recent Timestamp-Seconds message that the payload message was generated. |

For the standalone Timestamp – Seconds message, the message format will be as follows:

| TIMESTAMP - SECONDS MESSAGE | | | | |
|------------------------------------|---------------|---------------|--------------|-----------------------------------|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "T" | Seconds Message. |
| Second | 1 | 4 | Integer | Number of seconds 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. |
| Timestamp | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Event Code | 5 | 1 | Alpha | See System Event Codes below. |

NASDAQ OMX BX supports the following event codes on a daily basis on the BX TotalView-ITCH 4.0 data feed.

| SYSTEM EVENT CODES – DAILY | |
|-----------------------------------|--|
| Code | Explanation |
| "O" | <i>Start of Messages.</i> Outside of time stamp messages, the start of day message is the first message sent in any trading day. |
| "S" | <i>Start of System hours.</i> This message indicates that NASDAQ OMX BX is open and ready to start accepting orders. |
| "Q" | <i>Start of Market hours.</i> This message is intended to indicate that Market Hours orders are available for execution. |
| "M" | <i>End of Market hours.</i> This message is intended to indicate that Market Hours orders are no longer available for execution. |
| "E" | <i>End of System hours.</i> It indicates that NASDAQ OMX BX is now closed |

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| | and will not accept any new orders today. It is still possible to receive Broken Trade messages and Order Delete messages after the End of Day. |
| "C" | <i>End of Messages.</i> This is always the last message sent in any trading day. |

In the event of an emergency market condition (EMC), NASDAQ OMX BX will also support the following event codes on BX TotalView-ITCH 4.0.

| SYSTEM EVENT CODES – AS NEEDED | |
|--------------------------------|---|
| Code | Explanation |
| "A" | <i>Emergency Market Condition – Halt:</i> This message is sent to inform NASDAQ OMX BX market participants that the EMC is in effect. No trading is allowed during the EMC. |
| "R" | <i>Emergency Market Condition – Quote Only Period:</i> This message is sent to inform NASDAQ OMX BX market participants that the EMC quotation only period is in effect. |
| "B" | <i>Emergency Market Condition – Resumption:</i> This message is sent to inform NASDAQ OMX BX market participants that EMC is no longer in effect. |

4.3 Stock Related Messages

4.3.1 Stock Directory

At the start of each trading day, NASDAQ OMX BX disseminates stock directory messages for all active symbols in the system.

Market data redistributors should process this message to populate the Financial Status Indicator (required display field) and the Market Category (recommended display field) for BX-listed and NASDAQ-listed issues.

| STOCK DIRECTORY | | | | |
|----------------------------|--------|--------|---------|--|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "R" | Stock Directory Message |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Stock | 5 | 6 | Alpha | Denotes the security symbol for the issue in the feed. |
| Market Category | 11 | 1 | Alpha | Indicates Listing market or listing market tier for the issue "T" = CQS (NYSE, Amex or regional exchange) "Q" = NASDAQ Global Select Market SM "G" = NASDAQ Global Market SM "S" = NASDAQ Capital Market® "B" = BX Listing Market |
| Financial Status Indicator | 12 | 1 | Alpha | For NASDAQ-listed or BX-listed issues, this field indicates when a firm is not in compliance with NASDAQ or BX continued listing requirements. "D" = Deficient "E" = Delinquent "Q" = Bankrupt "S" = Suspended "G" = Deficient and Bankrupt |

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|-----------------|----|---|---------|--|
| | | | | <p>“H” = Deficient and Delinquent “J” = Delinquent and Bankrupt “K” = Deficient, Delinquent and Bankrupt</p> <p>Space = Company is in compliance, if NASDAQ-listed or BX-listed issue</p> <p>For CQS issues, this field will also be space-filled. Redistributors should refer to SIAC feeds for code if needed.</p> |
| Round Lot Size | 13 | 4 | Integer | Indicates the number of shares that represent a round lot for the issue |
| Round Lots Only | 17 | 1 | Alpha | <p>Indicates if NASDAQ or BX system limits order entry for issue</p> <p>“Y” = only round lots are accepted in this stock “N” = odd/mixed lots are allowed</p> |

4.3.2 Stock Trading Action

NASDAQ OMX BX uses this administrative message to indicate the current trading status of a security to the trading community.

Prior to the start of system hours, NASDAQ OMX BX will send out a Trading Action spin. In the spin, NASDAQ OMX BX will send out a Stock Trading Action message with the “T” (Trading Resumption) for all NASDAQ- and other exchange-listed securities that are eligible for trading at the start of the 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 NASDAQ OMX BX platform at the start of the system hours. Please note that securities may be halted in the NASDAQ OMX BX system for regulatory or operational reasons.

After the start of system hours, NASDAQ OMX BX will use the Trading Action message to relay changes in trading status for an individual security. Messages will be sent when a stock is halted, is released for quotation, or is released for trading.

| STOCK TRADING ACTION | | | | |
|-------------------------|--------|--------|---------|--|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | “H” | Stock Trading Action Message. |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Stock | 5 | 6 | Alpha | Stock symbol right padded with spaces. |
| Trading State | 11 | 1 | Alpha | <p>“H” = Halted / Paused “V” = Halted or paused on NASDAQ only “Q” = Quotation only period “T” = Trading on NASDAQ or NASDAQ OMX BX</p> |
| Reserved | 12 | 1 | Alpha | Reserved. |
| Reason | 13 | 4 | Alpha | Trading Action reason. For the list of reason codes, please refer to Appendix C. |

4.3.3 Market Participant Position

At the start of each trading day, NASDAQ OMX BX disseminates a spin of market participant position messages. The message provides the Primary Market Maker status, Market Maker mode and Market Participant state for each NASDAQ OMX BX market participant firm registered in an issue. Market participant firms may use these fields to comply with certain marketplace rules.

Throughout the day, NASDAQ OMX BX will send out this message only if NASDAQ Operations changes the status of a market participant firm in an issue.

| MARKET PARTICIPANT POSITION | | | | |
|-----------------------------|--------|--------|--------------|--|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "L" | Market Participant Position message |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| MPID | 5 | 4 | Alphabetic | Denotes the market participant identifier for which the position message is being generated |
| Stock | 9 | 6 | Alphanumeric | Denotes the security symbol for which the position is being generated |
| Primary Market Maker | 15 | 1 | Alphanumeric | Indicates if the market participant firm qualifies as a Primary Market Maker in accordance with NASDAQ OMX BX marketplace rules "Y" = primary market maker "N" = non-primary market maker |
| Market Maker Mode | 16 | 1 | Alphanumeric | Indicates the quoting participant's registration status in relation to SEC Rules 101 and 104 of Regulation M "N" = normal "P" = passive "S" = syndicate "R" = pre-syndicate "L" = penalty |
| Market Participant State | 17 | 1 | Alphanumeric | Indicates the market participant's current registration status in the issue "A" = Active "E" = Excused/Withdrawn "W" = Withdrawn "S" = Suspended "D" = Deleted |

4.4 Add Order Message

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

NASDAQ OMX BX will support two variations of the Add Order message format.

4.4.1 Add Order – No MPID Attribution

This message will be generated for unattributed orders in the NASDAQ OMX BX system.

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| ADD ORDER MESSAGE | | | | |
|--------------------------|---------------|---------------|--------------|--|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "A" | Add Order – No MPID Attribution Message. |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Order Reference Number | 5 | 8 | Integer | The unique reference number assigned to the new order. The order reference number is increasing, but not necessarily sequential. |
| Buy/Sell Indicator | 13 | 1 | Alpha | The type of order being added. "B" = buy order. "S" = sell order. |
| Shares | 14 | 4 | Integer | The total number of shares associated with the order being added to the book. |
| Stock | 18 | 6 | Alpha | The security symbol for which the order is being added. |
| Price | 24 | 4 | Integer | The display price of the new order. Refer to Data Types for field processing notes. |

4.4.2 Add Order with MPID Attribution

This message will be generated for attributed orders and quotations entered into the NASDAQ OMX BX system.

| ADD ORDER – MPID ATTRIBUTION MESSAGE | | | | |
|---|---------------|---------------|--------------|--|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "F" | Add Order with MPID Attribution Message. |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Order Reference Number | 5 | 8 | Integer | The unique reference number assigned to the new order. The order reference number is increasing, but not necessarily sequential. |
| Buy/Sell Indicator | 13 | 1 | Alpha | The type of order being added. "B" = buy order. "S" = sell order. |
| Shares | 14 | 4 | Integer | The total number of shares associated with the order being added to the book. |
| Stock | 18 | 6 | Alpha | The security symbol for which the order is being added. |
| Price | 24 | 4 | Integer | The display price of the new order. Refer to Data Types for field processing notes. |
| Attribution | 28 | 4 | Alpha | NASDAQ OMX BX market participant identifier associated with the entered order. |

4.5 Modify Order Messages

Modify Order messages always include the Order Reference Number of the Add Order to which the update applies. To determine the current display shares for an order, BX TotalView-ITCH 4.0 subscribers must deduct the number of shares stated in the Modify message from the original number

of shares stated in the Add Order message with the same reference number. NASDAQ OMX BX may send multiple Modify Order messages for the same order reference number and the effects are cumulative. When the number of display shares 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 reference number if that order is executed in several parts. The multiple Order Executed Messages on the same order are cumulative.

By combining the executions from both types of Order Executed Messages and the Trade Message, it is possible to build a complete view of all non-cross executions that happen on NASDAQ OMX BX. Cross execution information is available in one bulk print per symbol via the Cross Trade Message.

| ORDER EXECUTED MESSAGE | | | | |
|-------------------------|--------|--------|---------|---|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "E" | Order Executed Message. |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Order Reference Number | 5 | 8 | Integer | The order reference number associated with the executed order. |
| Executed Shares | 13 | 4 | Integer | The number of shares executed. |
| Match Number | 17 | 8 | Integer | The BX 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 order on the book is executed 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 OMX BX 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 shares will be included into a later bulk print (e.g., in the case of cross executions). If a firm is looking to use the data in time-and-sales displays or volume calculations, NASDAQ OMX BX 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. |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Order Reference Number | 5 | 8 | Integer | The reference number of the order that was executed. |

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| Executed Shares | 13 | 4 | Integer | The number of shares executed. |
| Match Number | 17 | 8 | Integer | The NASDAQ OMX BX generated day-unique Match Number of this execution. The match number is also referenced in the Trade Break Message. |
| Printable | 25 | 1 | Alpha | Indicates if the execution should be reflected on time and sale displays and volume calculations. "N" = non-printable "Y" = printable |
| Execution Price | 26 | 4 | Integer | 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. |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Order Reference Number | 5 | 8 | Integer | The reference number of the order being reduced. |
| Canceled Shares | 13 | 4 | Integer | The number of shares being 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 shares are no longer accessible so the order must be removed from the book.

| ORDER DELETE MESSAGE | | | | |
|-------------------------|--------|--------|---------|---|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "D" | Order Delete Message. |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Order Reference Number | 5 | 8 | Integer | The reference number of the order being canceled. |

4.5.5 Order Replace Message

This message is sent whenever an order on the book has been cancel-replaced. All remaining shares from the original order are no longer accessible, and must be removed. The new order details are provided for the replacement, along with a new order reference number which will be used henceforth. The side, stock, and attribution (if any) remain the same as the original order, so they are not given in this message.

| ORDER REPLACE MESSAGE | | | | |
|---------------------------------|---------------|---------------|--------------|--|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "U" | Order Replace Message |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Original Order Reference Number | 5 | 8 | Integer | The original reference number of the order being replaced. |
| New Order Reference Number | 13 | 8 | Integer | The new reference number for this order. Note that new reference numbers mean new time priority, so this order belongs below other orders at the same price in priority. |
| Shares | 21 | 4 | Integer | The new total displayed quantity. |
| Price | 25 | 4 | Integer | The new display price for the order. Refer to Data Types for field processing notes. |

4.6 Trade Messages

4.6.1 Trade Message (Non-Cross)

The Trade Message is designed to provide execution details for normal match events involving non-displayable order types. (Note: There is a separate message for cross events.)

Since no Add Order Message is generated when a non-displayed order is initially received, the system cannot use the Order Executed messages for all matches. Therefore this message indicates when a match occurs between non-displayable order types. A Trade Message is transmitted each time a non-displayable order is executed in whole or in part. 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 NASDAQ OMX BX 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 OMX BX display.

| TRADE MESSAGE (NON-CROSS) | | | | |
|----------------------------------|---------------|---------------|--------------|---|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "P" | Trade Message |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Order Reference Number | 5 | 8 | Integer | The unique reference number assigned to the order on the book being executed. |

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| | | | | Effective December 6, 2010, NASDAQ OMX will populate the Order Reference Number field within the Trade (Non-Cross) message as zero. For the binary versions of the TotalView-ITCH data feeds, the field will be null-filled bytes (which encodes sequence of zero). |
| Buy/Sell Indicator | 13 | 1 | Alpha | The type of non-display order on the book being matched. "B" =buy order "S" =sell order |
| Shares | 14 | 4 | Integer | The number of shares being matched in this execution. |
| Stock | 18 | 6 | Alpha | The security symbol associated with the match execution. |
| Price | 24 | 4 | Integer | The match price of the order. Refer to Data Types for field processing notes. |
| Match Number | 28 | 8 | Integer | The NASDAQ OMX BX generated session-unique Match Number for this trade. The Match Number is referenced in the Trade Break Message. |

4.6.2 Cross Trade Message

The Cross Trade message is only applicable for eligible BX-listed securities and indicates that BX has completed its cross process for a specific BX-listed security. BX sends out a Cross Trade message for all active BX-listed issues in the system following the Opening, Closing and EMC cross events. Firms may use the Cross Trade message to determine when the cross for each BX-listed security has been completed. (Note: For the halted securities, firms should use the Trading Action message to determine when an issue has been released for trading.)

For most BX-listed securities, the Cross Trade message will indicate the bulk volume associated with the cross event. If the order interest is insufficient to conduct a cross in a particular issue, however, the Cross Trade message may show the shares as zero.

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

| CROSS TRADE MESSAGE | | | | |
|-------------------------|--------|--------|---------|--|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | "Q" | Cross Trade Message |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Shares | 5 | 8 | Integer | The number of shares matched in the BX Cross. |
| Stock | 13 | 6 | Alpha | The BX-listed security symbol associated with the cross trade message. |
| Cross Price | 19 | 4 | Integer | The price at which the cross occurred. Refer to Data Types for field processing notes. |
| Match Number | 23 | 8 | Integer | The BX generated day-unique Match Number of this execution. |
| Cross Type | 31 | 1 | Alpha | The BX cross session for which the message is being generated. |

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| | | | | <p>“O” = BX Opening Cross. “C” = BX Closing Cross. “H” = Cross for IPO and halted securities. “I” = BX Cross Network: Intraday Cross and Post-Close Cross</p> |
|--|--|--|--|--|

4.6.3 Broken Trade / Order Execution Message

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

Firms that use the BX TotalView-ITCH 4.0 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 BX TotalView-ITCH feed to build a book, however, it may ignore these messages as they have no impact on the current book.

| BROKEN TRADE MESSAGE | | | | |
|-------------------------|--------|--------|---------|---|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | “B” | Broken Trade Message. |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Match Number | 5 | 8 | Integer | The NASDAQ OMX BX 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) Message

NASDAQ OMX BX disseminates NOII data at 5-second intervals in the minutes leading up to the BX Opening Cross and BX Closing Cross.

- For the BX Opening Cross, NOII messages will be disseminated during the two minutes leading up to the start of market hours.
- For the BX IPO and Halt Crosses, NOII messages will be disseminated during the quote only period. The first NOII message will be disseminated approximately five seconds after the Stock Trading Action message with the “B” action value is disseminated.
- For the BX Closing Cross, NOII messages will be disseminated during the ten minutes leading up to the end of market hours.

Please note that BX generates this message only for those BX-listed securities that are eligible for the BX Opening and Closing Crosses.

| NOII MESSAGE | | | | |
|-------------------------|--------|--------|---------|---|
| Name | Offset | Length | Value | Notes |
| Message Type | 0 | 1 | “I” | NOII Message |
| Timestamp - Nanoseconds | 1 | 4 | Integer | Nanoseconds portion of the timestamp. |
| Paired Shares | 5 | 8 | Integer | The total number of shares that are eligible to |

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| | | | | be matched at the Current Reference Price. |
| Imbalance Shares | 13 | 8 | Integer | The number of shares not paired at the Current Reference Price. |
| Imbalance Direction | 21 | 1 | Alpha | The market side of the order imbalance. "B" = buy imbalance "S" = sell imbalance "N" = no imbalance "O" = Insufficient orders to calculate |
| Stock | 22 | 6 | Alpha | The BX-listed security symbol for which the NOII message is being generated |
| Far Price | 28 | 4 | Integer | A hypothetical auction-clearing price for cross orders only. Refer to Data Types for field processing notes. |
| Near Price | 32 | 4 | Integer | A hypothetical auction-clearing price for cross orders as well as continuous orders. Refer to Data Types for field processing notes. |
| Current Reference Price | 36 | 4 | Integer | The price at which the NOII shares are being calculated. Refer to Data Types for field processing notes. |
| Cross Type | 40 | 1 | Alpha | The type of BX cross for which the NOII message is being generated. These messages are only applicable for BX-listed securities. "O" = BX Opening Cross "C" = BX Closing Cross "H" = Cross for IPO and halted BX-listed securities |
| Price Variation Indicator | 41 | 1 | Alpha | 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% "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 OMX BX data feeds, please contact NASDAQ OMX Global Data Products at +1 301 978 5307 or dataprodcts@nasdaqomx.com.

NASDAQ OMX BX TOTALVIEW-ITCH 4.0
INTERFACE SPECIFICATION

- For technical support for NASDAQ OMX BX data feeds, please contact NASDAQ OMX Systems Engineering at devsupport@nasdaqomx.com.

Appendix A

Documentation Revision Control Log

October 6, 2010: NASDAQ TotalView-ITCH Version 4.10

NASDAQ OMX added a note to Trade (Non-Cross) message format stating that the Order Reference Number would be zero for all transactions as of December 6, 2010.

July 2, 2010: BX TotalView-ITCH Version 4.0

NASDAQ OMX added a new Trading State code value of "V" to the Stock Trading Action message to denote a NASDAQ Volatility Guard trading pause.

May 25, 2010: BX TotalView-ITCH Version 4.00

NASDAQ OMX added two new Trading Action Reason code values (T5 and T7) for single security trading pause situations.

September 21, 2009: BX TotalView-ITCH 4.0, Version 1.0 (BX-listed securities)

Updated document to reflect the messaging changes associated with the BX Listing Market initiative. This document included the following modifications from the earlier version of BX TotalView-ITCH 4.0 feed:

- Symbol Directory: Addition of new "B" market category code to identify securities listed on the BX Listing Market.
- Format changes associated with BX opening, closing, IPO and halt crosses for eligible BX-listed securities only.
 - Net Order Imbalance Indicator (NOII): Indicative price information to be disseminated in minutes leading up to the BX Opening, Closing, IPO and Halt crosses for BX-listed securities.
 - Cross Trades: New trade message format to be disseminated at the conclusion of the BX Opening, Closing, IPO and Halt crosses for BX-listed securities.

November 13, 2008: NASDAQ OMX BX TotalView-ITCH Version 4.0, Version 1.0

Final release of the initial specification document, 1.0. This document included the following format modifications from earlier versions of the BX ITCH feed.

- Numeric fields modified to support binary integers
- Time stamp granularity changed to nanoseconds past midnight
- Added Order Replace message

Appendix B

Stock Symbol Convention

For bandwidth efficiency reasons, NASDAQ OMX BX supports a 6-byte symbol field on its proprietary order, quotation and trade data feed products.

For most classes of securities, this field length is sufficient to support the exchange-assigned symbol. For NYSE- and Amex-listed securities with subordinate issue types, however, NASDAQ may modify the trading symbol to fit the allotted field size on the data feeds. For the current symbol convention matrix, please refer to the [Ticker Symbol Conversion for CQS Securities page](#) on the NASDAQ OMX Trader website.

For NASDAQ-listed and BX-listed issues, NASDAQ currently and BX will restrict its symbol length to a maximum of 5 characters. For common stock issuances, NASDAQ and BX will assign a symbol of 1 to 4 characters in length. For subordinate securities, NASDAQ and BX will assign a 5 character symbol for which the last character relays information about the issue class or issue type. For the current list of fifth character symbol suffixes, please refer to [Current List of Fifth Character Symbol Suffixes for NASDAQ-listed Issues](#) on the NASDAQ OMX Trader website.

Appendix C

Trading Action – Reason Codes

For NASDAQ-listed issues, NASDAQ acts as the primary market and has the authority to institute a trading halt in an issue due to news dissemination or regulatory reasons.

For BX-listed issues, NASDAQ OMX BX acts as the primary market and has the authority to institute a trading halt in an issue due to news dissemination or regulatory reasons.

For CQS issues, NASDAQ and BX abide by any regulatory trading halts instituted by the primary or listing market as appropriate.

For all issue types, NASDAQ and/or BX may also halt trading for operational reasons.

NASDAQ and/or BX will send out a trading action message to inform its market participants when the trading status of an issue changes. For informational purposes, NASDAQ and BX also attempt to provide the reason for each trading action update. For bandwidth efficiency reasons, NASDAQ and BX use a 4-byte code for the reason on its outbound data feeds.

| REASON CODES FOR TRADING HALT ACTIONS | |
|---------------------------------------|---|
| Code | Value |
| T1 | Halt News Pending |
| T2 | Halt News Disseminated |
| T5 | Single Security Trading Pause In Affect |
| T6 | Regulatory Halt — Extraordinary Market Activity |
| T8 | Halt ETF |
| T12 | Trading Halted; For Information Requested by Listing Market |
| H4 | Halt Non-Compliance |
| H9 | Halt Filings Not Current |
| H10 | Halt SEC Trading Suspension |
| H11 | Halt Regulatory Concern |
| O1 | Operations Halt; Contact Market Operations |
| IPO1 | IPO Issue Not Yet Trading |
| M1 | Corporate Action |
| M2 | Quotation Not Available |
| Space | Reason Not Available |

| REASON CODES FOR QUOTATION/TRADING RESUMPTION ACTIONS | |
|---|---|
| Code | Value |
| T3 | News and Resumption Times |
| T7 | Single Security Trading Pause / Quotation Only Period |
| R4 | Qualifications Issues Reviewed/Resolved; Quotations/Trading to Resume |
| R9 | Filing Requirements Satisfied/Resolved; Quotations/Trading To Resume |
| C3 | Issuer News Not Forthcoming; Quotations/Trading To Resume |
| C4 | Qualifications Halt ended; Maintenance Requirements Met; Resume |
| C9 | Qualifications Halt Concluded; Filings Met; Quotes/Trades To Resume |
| C11 | Trade Halt Concluded By Other Regulatory Auth.; Quotes/Trades Resume |
| R1 | New Issue Available |
| R2 | Issue Available |
| IPOQ | IPO Security Released for Quotation (NASDAQ and BX Securities Only) |
| IPOE | IPO Security — Positioning Window Extension (NASDAQ and BX Securities Only) |
| Space | Reason Not Available |