Nairobi Securities Exchange (NSE)

Equity Trading System Market Data Feed (MITCH-UDP) Specification Document

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1 DOCUMENT CONTROL

1.1 Table of Contents

1.2 Document Information

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1.3 Revision History

Date	Version	Sections	Description
24 Nov 2020	1.22	**7.9.27** 4.4.1	Indicated that TOB message will be used in NSE MITCH gateway.
06 June 2016	1.21	7.9.17	Added a new field to denote the type of the action trade being disseminated in the recovery trade message.
29 April 2016	1.20	7.7.3 7.8.5 7.9.3 7.9.4 7.9.5 7.9.6 7.9.9 7.9.12 7.9.13 7.9.14 7.9.16 7.9.17 7.9.18 7.9.19 7.9.20 7.9.21 7.9.22 7.9.23 7.9.25 7.9.26 7.9.27	The length of the Symbol field is increased from 6 to 12 in the Snapshot Request Message, Snapshot Complete Message, Symbol Directory Message, Symbol Status Message, Add Order Message, Add Attributed Order Message, Order Book Clear Message, Trade Message, Auction Trade Message, Off Book Trade Message, Recovery Trade Message, Trade Correction Message, Auction Info Message, Statistics Message, Extended Statistics Message, Consolidated Statistics Message, Index Message, AON Info Message, Update Price Point Message, Delete Price Point Message and Top of Book Message.
		7.9.3	Data type of the 'Issued Quantity' field in the Symbol Directory message updated.
		7.5.2	Added the Trade Correction message to the list of application messages.
		4.5.5 7.9.16 7.9.17	Updated to include trade corrections. Added the new message Trade Correction Updated Action Type enumeration to support Trade Correction.
04 Mar 2016	1.19	4.1.1	Update to the behaviour in Opening Auction Call session and Closing Auction Call session based on the parameter 'Bulk Trade Publish Mode'.
		4.5	Update to the behaviour in publishing Time and Sales based on the parameter 'Bulk Trade Publish Mode'.
		4.5.2	Update to the behaviour in publishing Trades during Auction sessions based on the parameter 'Bulk Trade Publish Mode'.
		7.9.10	Update to the data types of certain fields in the Order Executed message along with field offsets.

		7.9.11	Update to the data types of certain fields in the Order Executed With Price/Size message.
		7.9.12	Update to the data types of certain fields in the Trade message.
		7.9.13	Update to the data types of certain fields in the Auction Trade message.
		7.9.14	Update to the data types of certain fields in the Off-Book Trade message.
		7.9.16	Update to the field offset in the Recovery Trade message including data types of certain fields.
		7.9.19	Update to the data types of certain fields in the Extended Statistics message.
		7.9.22	Update to the field offset values in the Index message.
24 Feb 2016	1.18	7.8.4	A note added to the message 'Snapshot Response'.
		7.9.3 7.9.19 7.9.20	Changes introduced and incorporated to the relevant messages (Symbol Directory, Consolidated Statistics Message and Extended Statistics Message)
01 Dec 2015	1.17	7.9.22	Introduced the new field 'Perctg Diff From Closing' and new enums 'Indicative, High, Low' for Update Type.
05 Nov 2015	1.16	7.9.10, 7.9.14, 7.9.16	Added LastOptPx, Volatility, Underlying Reference Price fields to mentioned messages.
			Added Notional Exposure and Notional Exposure to the mentioned message.

		4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.5,5.5, 6.1.2.1	Updated the spec points for clarity as updated based on the changes on the Millennium Exchange Market Data Feed (MITCH – UDP)
06 Oct 2015	1.15	-	Explus version in the 'Document Information' is updated as 1.13 to reflect the compactible system version.
18 Mar 2015	1.14	7.9.5 7.9.8	Enum value for the meaning (T+3) is updated to '4' in the field EXP Settlement Cycle.
11 Feb 2015	1.13	6.1.2.4 6.1.2.7 6.1.2.	Sequence number of Snapshot Complete message is synchronized with Real-Time channel.
19 Nov 2014	1.12	7.9.21	Added a new enumeration called 'Instrument Type' to the field 'Statistics Type'.
04 Sep 2014	1.11	11.1.111.2.1	Updated tables for composition of Order ID and Trade ID.
		4.5.5	Updated behaviour upon trade cancellation.
		4.2.4	Updated with the details of quote modification
9 Jul 2014	1.10	7.9.10	Updated the 'Order Executed' message
		7.9.11	Updated the 'Order Executed With Price/Size' message
		7.9.12	Updated the 'Trade' message
		7.9.16	Updated the 'Update Price Point' message
		7.9.25	Updated the 'Recovery Trade' message
		7.9.26	Updated the 'Delete Price Point' message
		0	Updated the 'Top of Book' message
19 Nov 2013	1.09	4.5.2	Addressed the behaviour of having Add Order messages for replenishments of iceberg orders, after the order execution at Auction Trade.
		6.1.2.5	Order Book Snapshots for Bulletin Board orders book is supported.

		7.4	Eight decimal places are supported for Long Price data type.
		11.2.1	Separator is not stamped as a part of the Order ID or Trade ID.
		All	Corrected the typo errors
17 Sep 2013	1.08	7.7.3, 7.8.5, 7.9.3, 7.9.9, 7.9.12, 7.9.16, 7.9.20	Updated the name respective to the Bit 6 in the SubBook field.
		7.9.4	Addition of new statuses for the field Trading Status to support the Auctions order book
		7.9.5	Addition of new fields to the Add Order message to support the Auctions order book
		7.9.8	Addition of new fields to the Order Modified message to support the Auctions order book
		All	Typo corrected
15 Jul 2013	1.07	4.3, 4.4	Added points for Order Book, Price Depth and Top of Book
		7.9.25, 7.9.26	Added two new messages as Update Price Point and Delete Price Point to the Order Book Management
		0	Added the new message Top of Book to the Order Book Management
		7.9.19	Theoretical Price was introduced as a possible value for Open Close Indicator.
		7.5.2	Added the records Update Price Point message, Delete Price Point message and Top of Book. Changed description of Extended Statistics section
		7.7.3, 7.8.3	Top of Book enumeration for Snapshot Type is added to Snapshot Request message.
		7.8.5	Top of Book enumeration for Snapshot Type is added to Snapshot Complete message
		7.9.9	A new field Book Type is added to Order Book Clear message
		7.8.5	Updated the Trading Status of the Snapshot Complete message.
		7.9.3	A new field Corporate Action added to Symbol Directory Message
		6.1.1.1, 6.1.2.1	The rejection upon logging in by an already logged in user will not receive any message at the rejection.

		4.2, 4.2.1.1	Footnote added to delete if MD feed is not configured for order depth Footnote added to delete section if Market orders are not disseminated
03 Apr 13	1.06	3.1 3.3 6.1.2	All instruments are sent via the snapshot channel in an instrument download
		4.2.2	Updated scenarios in which Order deleted message is used
		4.2.4	Updated scenarios in which Order modified message is used
		4.2.4 4.2.5	Paragraphs on Messaging due to Iceberg orders removed
		4.6	Indicative auction information section updated
		11.2.2	Multiplied decimal values corrected in base 62 conversion table
26 Feb 13	1.05	4.2.5, 7.5.2	Added the messaging model for Block Trade order book.
28 Sep 12	1.04	3.3, 6.1.2	Recovery of missed announcements via Snapshot channel introduced.

		4.7.	Statistics consist of extended statistics.
		7.7.3	The Last Trade Time field of Snapshot Request message changed as Recover From Time.
		7.7.3 7.8.5	Applicable bit values added to field “sub book” - BulletinBoard, Default Auction, All or None
		7.7.3 7.8.4 7.8.5	Enum News (5) added to Snapshot Type field of Snapshot Request, Snapshot Response and Snapshot Complete messages to support recovery of announcements.
		7	Include Wording to Support Addition of New Messages and Fields
			Extended Statistics message added
		7.4	New data type Long Price to support Extended Statistics message
		7.8.5 7.9.4	Enum added to Trading Status for ‘Order Entry’ session, Auction Initiation, Start of Counter Offers, End of Counter Offers and Intraday Auction Call
		7.9.3	Sub Book field introduced to message; Footnote deleted
		7.9.19	Sub Book field introduced to message
		7.9.4	Bulletin Board, All or None and Default Auction enums included to Sub Book field; ‘On-Book’ renamed as ‘Regular’; Enum added to Trading Status for ‘Order Entry’ session

			Bit allocated for 'Bulletin Board' in Flags field
		7.9.12, 7.9.16/19	Sub book types added- All or None and Default Auction
		7.9.13, 7.9.16, 7.9.17	Auction Type type added- Intra-Day Auction
29 Mar 12	1.03	4.7.3, 6.1.2.6, 7.5.2, 7.7.3, 7.8.5, 7.9.4, 7.9.12, 7.9.23	Added updates to the document on the functionality of the All or None (AON) auction order book. This includes details on the statistics, recovery and general changes to the messages affected. The message AON Info was also added.
		6.1.2.6, 7.8.5	The field Snapshot Type was updated with the enum BookLevel Statistics
		7.9.5, 7.9.6, 7.9.9	The Sub Book field was updated as order submission or deletion cannot be carried out for the Off Book order book.
		7.9.21	The length of the Turnover field was updated
11 Jan 12	1.02	-	Added/Corrected hyperlinks.
		7.5.2	Consolidated Statistics message type changed to 0x64.
		7.9.20	Corrected field length of Turnover.
27 Dec 11	1.01	-	Added support for odd lot, block trades and early settlement order books.
		4.7.3, 7.9.22	Added support for indices.
		7.4	Introduced long price data type.
		0, 7.9.21	Extended Statistics and Consolidated Statistics messages added.
		8	Renamed segments.
20 Dec 11	1.00	-	Initial draft.

1.4 Definitions, Acronyms and Abbreviations

Client A recipient connected to the Snapshot or Replay channel of the market data feed.

Iceberg An order which has a displayed quantity that is less than its remaining quantity. **Order**

Off-Book Trade A privately negotiated trade that is reported to *NSE*.

Pre-Auction	The trading session immediately prior to an auction (i.e. opening, closing, etc.). During this session orders are accumulated for execution in the auction and information on the indicative auction price and associated imbalance is disseminated at a regular interval.
Recipient	A subscriber to the Real-Time channel of the market data feed.
Reserve Order	A fully hidden order which has no displayed quantity.
Server	The market data interface of *NSE*.
Sub Book	An instrument may be traded across multiple separate and distinct sub books (e.g. regular, odd lot, etc.).
Trade Reporting	The reporting of an off-book trade.
VWAP	Volume weighted average price.

2 OVERVIEW

The market data feed is a stream of fixed width binary messages which provides the following real-time information for each instrument traded on *NSE*[1]

(i) Order depth for the entire order book. The feed provides information on the side, price and displayed quantity of each order in the order book.

(ii) Price and volume for each executed on-book trade.

(iii) Price, volume, trade type, date and time of each confirmed off-book trade.

(iv) Indicative auction price and the associated trade volume and imbalance.

(v) Statistics (e.g. high/low, volume, VWAP, etc.).

(vi) Trading status.

(vii) News

Each instrument is traded on a series of separate and independent sub books (e.g. regular, odd lot, etc.). The above information is disseminated per instrument and sub book combination. An update transmitted on the feed includes an indication of the instrument and sub book to which it relates.

In addition, the feed includes market and sector statistics as well as the value of each index computed by *NSE*. It also provides participants with the active instrument list and disseminates market announcements.

2.1 Hours of Operation

The feed will operate from *<Start Time>* to *<End Time>* each trading day.

2.2 Support

<Insert support information for recipients (e.g. contact details and hours of operation for the support desk)>

[1] Insert name of market here and press Ctrl A and then F9 to update all other reference to the market.

3 SYSTEM ARCHITECTURE

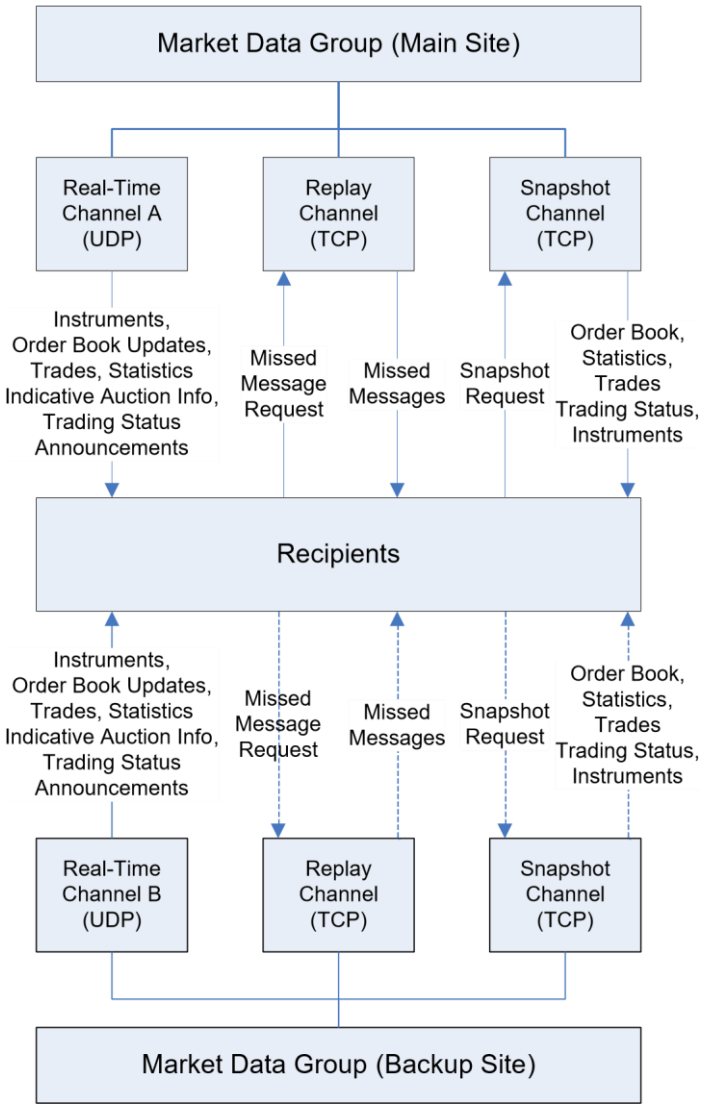
The feed is load balanced by market data group.

While each group will contain multiple instruments, each instrument is assigned to just one market data group. Although the group an instrument is assigned to may change from day to day, it will not change within a day. Market data for all sub books (e.g. regular, odd lot, etc.) for a particular instrument are transmitted from the same market data group.

Each market data group includes a multicast Real-Time channel for the dissemination of market data.

Two TCP recovery channels are available per market data group: Replay and Snapshot.

While a recipient may connect to the Replay channel to recover from a small data loss, it should use the Snapshot channel after a large data loss (i.e. late joiner or major outage).



3.1 Real-Time Channel

The Real-Time channel is the primary means of disseminating market data. Real-time updates to instruments and all market data supported by the feed are available on this multicast channel.

The list of instruments[2] in the market data group is broadcast at the start of the trading day. The details of instruments created during trading hours as well as updates of the trading status of instruments are also disseminated.

Real-time updates to order books, indicative auction information and statistics are published along with the details of each trade. Statistics (i.e. previous close, opening price and closing price) for each instrument and announcements are also disseminated on this channel.

Each application message includes a sequence number which is incremented by one for every message disseminated on the Real-Time channel within a particular market data group. The sequence numbers of each is reset to 1 at the start of each day.

The server will send a Heart beat message to exercise the communication line during periods of inactivity. A Heartbeat will be sent every <2> seconds when the Real-Time channel is inactive.

Recipients have access to two identically sequenced Real-Time feeds: one from the main site (Feed A) and one from the backup site (Feed B). Recipients may process both feeds and

[2] Based on the Exchange configuration the list may contain all instruments or only the active instruments in the market data group

arbitrate between them to minimise the probability of a data loss. However, those co-located at the main site should consider the additional latency of Feed B.

3.2 Replay Channel

The TCP Replay channel permits recipients to request the retransmission of a limited number of messages already published on the Real-Time channel. This channel may be used by recipients to recover from a small data loss.

The Replay channel supports the retransmission of the last *<10,000>*[3] messages published on the Real-Time channel. The channel does not support the retransmission of messages published on the Snapshot channel or from previous trading days.

While a Replay channel is available from the backup site, it will only be activated in the unlikely event of an outage at the main site.

3.3 Snapshot Channel

The TCP Snapshot channel permits recipients to request a snapshot of the order book and statistics for any instrument in the market data group as well as the current trading status. In addition, it enables recipients to request the retransmission of the trades published during the last *<10>*[4] minutes on the Real-Time channel. Furthermore it is possible to request the retransmission of the last *<10,000>*[5] market announcements that were published by the system. It also enables recipients to download the list of instruments in the market data group. This channel may be used by recipients to recover from a large-scale data loss.

Snapshots of index values, market statistics and sector statistics are not available.

While a Snapshot channel is available from the backup site, it will only be activated in the unlikely event of an outage at the main site.

[3] Insert size of replay cache here and press Ctrl A and then F9 to update all other references to it.
[4] Insert duration of trade cache here and press Ctrl A and then F9 to update all other references to it.
[5] Insert size of the announcement cache here and press Ctrl A and then press F9 to update all other references to it

4 SERVICE DESCRIPTION

4.1 Overview of a Trading Day

4.1.1 Trading on the Order Book

The regular day for on-book trading will consist of seven scheduled sessions: Pre-Trading, Opening Auction Call, Regular Trading, Closing Auction Call, Closing Price Publication, Closing Price Cross and Post-Close. The start time for each of these sessions may vary from one set of instruments to another. A Symbol Status message, with a Book Type of "1", will be published on the Real-Time channel to indicate when a particular session has commenced for an instrument. An overview of the trading day is given below.

Time	Session	Description
08:40:00	Market Open	The market data feed begins. Recipients should aim to join the feed at this time. <*Two*> minutes after the market opens, a System Event message will be published with the Event Code "O". Outside the Time message, this will be the first application message for the day. A Symbol Directory message will then be published for each instrument. No new orders, cancel requests and modification requests will be accepted until the Pre-Open session. A Symbol Status message will not be broadcast at Market Open.
08:45:00	Pre-Trading	Participants may not submit, cancel or modify orders during this session. Market operations may cancel or modify orders. The details of GTD/GTC orders carried over from the previous trading day will be disseminated at the start of this session. Order book updates will be disseminated.
09:00:00	Opening Auction Call	The trading day begins. New orders, cancel requests and order modification requests will be accepted during this session. Details of the order book will be published. Indicative opening information will be disseminated via the Auction Info message. The opening auction will take place at the end of this session. Orders in the order book will be executed in a volume maximizing auction. The trades executed in the opening auction will, for each instrument, be reported based on the 'Bulk Trade Publish Mode' parameter as follows; **If the Bulk Trade Publish mode is set to 'Bulk and Supplementary Trade Only';** A single bulk print via Auction Trade and supplementary trades via Order Executed With Price/Size messages would be published.
09:31:00	Regular Trading	Continuous trading begins. Order book updates and trades for each instrument will be disseminated real-time.

Time	Session	Description
15:00:00	Closing Price Publication	The closing price of each instrument will be published. Participants may not submit, cancel or modify orders during this session.
15:05:00	Post-Close	While cancel requests will be accepted, no new orders and modification requests may be submitted during this session. Order book updates will be disseminated. At the end of this session a Symbol Status message will be broadcast for each tradable instrument with the Trading Status "x".
15:25:00	Market Close	The end of the trading day. A Symbol Status message will be broadcast for each tradable instrument with the Trading Status "c". While no order book updates or trades will take place, previously reported trades may be cancelled.
17:00:00	End of Day	The market data feed will stop at this time. A System Event message will be published with the Event Code "C". This will be the last application message for the day. All open TCP/IP connections to the Snapshot or Replay channels will be disconnected by the server. Clients will be unable to login to these channels after this time.

4.1.2 Trade Reporting

NSE Does NOT support reporting of off-book trades.

4.1.3 List of Instruments

A Symbol Directory message will be broadcast for each active, inactive and suspended instruments on the Real-Time channel at market start. This will be subsequent to the System Event message indicating Start of Day.

Depending on the MITCH Gateway process configuration in SysGuard, Symbol Directory message will be broadcasted for inactive instruments in the Real Time channel. If MITCH Gateway process configuration PUBLISH_INACTIVE_INSTRUMENTS is set to YES, Symbol

Directory messages will be broadcasted for inactive instruments and if this is set to NO, Symbol Directory messages for inactive instruments will not be broadcasted.

4.1.4 Trading Status

Symbol Status message will disseminate the status changes of instruments in the exchange real time. Symbol Status message will also indicate whether the status changes take place in the normal order book, bulletin book, negotiations order book or off book.

4.1.5 Trading Halt

An instrument may be halted during the day.

An instrument could be halted manually by market supervision. Trading of an instrument being manually halted could be resumed via a re-opening auction call for on book trading and to any desired off book trading session (e.g. Start Trade Reporting) for trade reporting.

The Symbol Status message will be published to indicate when a particular instrument is halted manually. The Symbol Status message will be published with Halt (H) as the Trading Status. The reason for the halt and whether it applies to on-book trading or trade reporting will be specified in the Halt Reason and Book Type fields respectively.

When trading is resumed a Symbol Status message will be published with the status indicating Re-Opening (e) or Start Trade Reporting (T) for on book trading and trade reporting respectively with the relevant Book Type.

An instrument could also be halted automatically as a result of a circuit breaker breach. Trading of such an instrument could be resumed by moving to regular trading.

The Symbol Status message will be published to indicate when a particular instrument is halted automatically. The Symbol Status message will be published with Halt (H) as the Trading Status. The reason for the halt will be specified in the Halt Reason field. The end time of the halt will be specified in the New End Time field.

When trading is resumed a Symbol Status message will be published with the status indicating Regular (Continuous) Trading (T).

When an instrument is halted clients will not be able to submit new orders or amend open orders of the halted instrument. However open orders can be cancelled. A trading halt will not be carried forward to the next trading day.

NSE may institute two types of trading halts for an instrument: a temporary halt that will not carry over to the next day or a longer term halt that spans across trading days (e.g. regulatory halt).

4.1.5.1 Temporary Halt

A Symbol Status message with the Trading Status “H” will be published if an instrument is temporarily halted, due to the trigger of an Outer Circuit Breaker or imposed manually by Market Operations. The reason for the halt and whether it applies to a particular sub book (E.g. regular, odd lot, etc.) or trade reporting will be specified in the Halt Reason and Book

Type fields respectively. If trading is later resumed a Symbol Status message, with the appropriate Trading Status (e.g. regular trading) and Book Type, will be published. A temporary halt will not be carried forward to the next trading day.

4.1.5.2 Longer Term Halt

A Symbol Directory message, with a Status of “H”, will be published if an instrument is halted across multiple days. A Symbol Status, with the Trading Status “H”, will also be published for each Book Type associated with the instrument (i.e. on-book, off-book, etc.).

If, at the start of a trading day, an instrument is still in a halted state it will be included in the

Symbol Directory messages published by the server. A Symbol Status, with a Status of “H”, will also be published for each associated Book Type at the start of the first scheduled session (i.e. Pre-Trading).

A Symbol Directory message, with a space in the Status field, will be published if the halt is lifted during trading hours. Separate Symbol Status messages will also be published if onbook trading and/or trade reporting is resumed for the instrument.

4.1.6 Pause

A Symbol Status message with the Trading Status “l” (lowercase of “L”) will be published if on-book trading for an instrument is paused during the day. A Symbol Status message, with the appropriate Trading Status (e.g. re-opening auction call) will be published if trading is later resumed. A pause will not be carried forward to the next trading day.

4.1.7 Re-Opening Auction Call

A Symbol Status message, with a Trading Status “e”, will be published if an instrument is moved to the Re-Opening Auction Call during the day, due to the trigger of an Outer Circuit Breaker or imposed manually by Market Operations. The duration an order book is scheduled to be in the Re-Opening Auction Call depends on the manner in which it was moved to this session. A Symbol Status message, with the appropriate status (e.g. Regular Trading) will be published if trading is later resumed. A Re-Opening Auction Call will not be carried forward to the next trading day.

4.1.8 Instrument Suspension

An instrument may be suspended during or outside trading hours. The suspension may be lifted later in the day or it may be carried forward to subsequent trading days. The Symbol Directory message will be published, with a Status of “S”, if an instrument is suspended during trading hours. A suspension applies to both on-book trading and trade reporting.

If, at the start of a trading day, an instrument is still in a suspended state it will be included in the Symbol Directory messages published by the server but not the Symbol Status messages. If the suspension is lifted during the trading day recipients will receive a Symbol Directory message with a space in the Status field. Separate Symbol Status messages will also be published if on-book trading and/or trade reporting is enabled for the instrument.

4.1.9 Market Close

For active, inactive and suspended instruments Symbol Status messages will be disseminated at the market close.

4.1.10 Intra-Day Trading Session Updates

4.1.10.1 Extension of a Pre-Auction Session

A Pre-Auction session may be extended due to a market order imbalance or if the current auction price is significantly different from the last sale. In such a case, a Symbol Status message will be broadcast with the value “3” or “4” in the field Session Change Reason. This message will also include the new time at which the auction will take place.

4.1.10.2 Adjustment by Market Operations

NSE may extend or shorten a particular trading session. In such a case, a Symbol Status message will be broadcast with the value “1” or “2” in the field Session Change Reason. The message will indicate whether the change applies to a particular sub book (e.g. regular, odd lot, etc.) or trade reporting and the new time at which the session will end.

4.1.11 New Instruments

New instruments may be created during the trading day. In such a case, the server will publish a Symbol Directory message to notify recipients of the details of the new instrument (symbol, segment, underlying, expiration date, etc.). Separate Symbol Status messages will also be published if on-book trading and/or trade reporting is enabled for the instrument.

4.2 Order Book Management (Order Depth)[6]

The market data feed provides recipients with the entire order depth for each suborder book(regular, odd lot, early settlement etc.). It provides the side, price and displayed quantity of each and every active order.

4.2.1 Adding an Order

An Add Order message will be sent each time a new visible anonymous order is added to the order book. The message includes the side, price and displayed quantity of the order.

The messagealso includes an identifier of the order which will be referenced on all future updates (e.g. executed, deleted, modified, etc.) for the order. This Order ID will be tagged in the corresponding execution reports sent via the FIX Trading Gateway, Drop Copy Gateway (i.e. SecondaryOrderID (198)) and Native Trading Gateway (SecondaryOrderID field). As this binary identifier is derived from the ASCII Order ID assigned to the order by the matching system, recipients will be able to identify their own orders while ensuring anonymity. Instructions for the conversion of Order IDs on the market data feed to those assigned by the matching system are specified in Section11.1. Order IDs are unique across instruments and days.

4.2.1.1 Market Orders[7]

The displayed quantity of each market order is disseminated during a Pre-Auction session via the Add Order message. Such a message will include a price of zero and an indication that the order is a market order via the Flags field.

4.2.1.2 Attributed Orders[8]

The Add Attributed Order message will be used in the case of an attributed order. The identity of the firm that submitted the order will be included in the message.

4.2.2 Quotes

Quote message will be handled as two separate buy and sell orders. Buy side of the quote is added to the order book before sell side. Once a Quote is added, an Add Order message for the buy side will be sent which will be followed by an Add Order message for the sell side.

4.2.3 Deleting an Order

An Order Deleted message will be used to notify recipients if a displayed order is cancelled or expired. It is also used in scenarios when an existing order in the book is modified in such a way that the order executes with the passive side. If the order has any remaining quantity after the execution, it is added back to the order book via the Add Order message or the Add Attributed Order message (in the case of an attributed order).The identifier of the order will be included in the message.

4.2.4 Modifying an Order

An Order Modified message will be sent if the display quantity of an order or its price is changed and is added back to the order book without an execution or if an order loses time priority. The message will include the applicable display quantity and price as well as an indication of whether the order has retained or lost its time priority. A modification will not result in the order being assigned a new Order ID. Order Modified message will be used when a quote is modified by the user.

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[6] Delete this section if the market data feed is not configured for order depth.
[7] Delete this section if market orders are not disseminated.
[8]Delete this section if attributed orders are not supported.

4.2.5 Executions

An Order Executed message will be sent whenever a displayed order is fully or partially filled at its displayed price. On receipt of this message recipients should deduct the quantity specified in the field Executed Quantity from the quantity displayed for the order in the order book. The Order Executed message does not contain an explicit price. The execution price will be the limit price of the order as indicated in the last Add Order, Add Attributed Order or Order Modified message sent for it.

An Order Executed With Price/Size message will be sent if a displayed order is fully or partially filled at a price different from its displayed price (e.g. during an auction).The message contains an explicit execution price and an instruction as to whether or not the trade should update time and sales and statistics displays.

At Continuous trading, if the partial execution of an iceberg order results replenishment, instead of an Order Executed with Price/Size message two other messages will be disseminated by the system. They are an Order Executed message and an Add Order message. The Order Executed message will notify the trade and the subsequent Add Order messages notify the replenished new visible quantity.

Following an auction, an Order Executed with Price/Size message will be disseminated to notify iceberg order executions with the Display Quantity set to zero (0) if the peak has been fully filled. An Add Order message will be disseminate after uncrossing to notify the iceberg replenishment.

As an order may be filled in multiple executions, recipients may receive several Order Executed and Order Executed With Price/Size messages for a particular order. The effect of each message is cumulative. When the displayed quantity of an order reaches zero it should be removed from the order book.

4.3 Order Book Management (Price Depth)[8]

The market data feed provides recipients with a view of the order book, where all orders are aggregated at each price level, for *<five>* price levels. The feed provides the aggregate displayed quantity and the number of represented orders at each price level.

4.3.1 Update Price Point

The Update Price Point message will be used to communicate the addition of a new price point or a size update to an already published price point. The Price Level of the Update Price Point message will communicate the position of the price point. System will not communicate a separate message to change the Price Levels below a newly added price point. If there is an existing price point with the same Price Level, then the clients are expected to “push down” the other price points below the specified Price Level.

4.3.2 Delete Price Point

The Delete Price Point message will be used to communicate the removal of a price point in. The Price Level of the Delete Price Point message will communicate the position of the price point. System will not communicate a separate message to change the Price Levels below a removed price point. If there are existing price points below the removed Price Level, then the clients are expected to “push up” the other price points below the specified Price Level.

4.4 Order Book Management (Top of Book)[9]

4.4.1 Top of Book

The Top of Book message will be used to communicate the best bid and the best offer prices and sizes of an order book in Top of Book service. Separate Top of Book messages are used

to communicate best bid details and best offer details. The Action field of the message will denote if the top of book of the specified side should be updated or deleted. If the Action field is set to Update(1), then the clients should repaint their top of book picture of the specified side with the information provided in the message. This could mean that a new price is present or that the limit or market visible quantity at top of book has changed. If for a given side there are no visible market and limit order quantities, then the Top of Book message will be published with an Action of Delete(2).

Note: In NSE, the Top of Book message will be published in a separate gateway instance. NSE to provide the required connectivity details to required parties.

4.5 Time and Sales

Recipients may build time and sales and statistics displays by combining the execution information received via the Order Executed, Order Executed With Price/Size, Trade, Auction Trade and Off-Book Trade messages published by the server.

In the event of a call auction uncrossing, when the system is configured to publish the bulk trade as well as the supplementary trades, then a single bulk print via Auction Trade and supplementary trades via Order Executed With Price/Size messages would be published. The supplementary trades via Order Executed With Price/Size needs to be used to publish the time and sales.

Each of the above messages will include an identifier of the trade which will be referenced if a trade is ever cancelled. As this binary identifier is derived from the ASCII Trade ID assigned to the trade by the post trade system, recipients will be able to identify their own trades. Instructions for the conversion of Trade IDs on the market data feed to those assigned by the post trade system are specified in Section11.2. The Trade IDs used for a particular type of trade (i.e. on-book or off-book) are unique across instruments and days. However, an onbook trade and an off-book trade may include the same Trade ID.

4.5.1 Execution of Hidden Quantity

The Trade message is sent whenever the non-displayed portion of an iceberg order or a reserve order is fully or partially filled during regular trading. An Order Executed or Order Executed With Price/Size message will not be sent in such a scenario.

If both the displayed and non-displayed quantity of an iceberg order is filled by an incoming order, the server will transmit two messages: an Order Executed message for the displayed portion and a Trade message for the non-displayed portion. Both messages may contain the same Trade ID.

4.5.2 Auctions

The system can be configured to either publish only the bulk trade pertaining to the auction uncrossing or the bulk trade together with the supplementary trades.

In the event of a call auction uncrossing, when the system is configured to publish the bulk trade and the supplementary trades the following behaviour should be expected by the recipients.

Each displayed order executed in the auction will be updated via an Order Executed With Price/Size message irrespective of whether or not it was executed at its displayed price. The Printable field of each such message will be “Y” to indicate to recipients that they should update time and sales and statistics displays.

The executions that take place during an auction will be reported as a single bulk print via the Auction Trade message. This message will include details of the type of auction (i.e. opening, closing, etc.), the auction price and the total volume executed. This message should be ignored by the recipients in order to avoid double counting of statistics and should not be used to update time and sales displays.

When executions are over, separate Add Order messages are disseminated to denote replenishments of iceberg orders. Further a single Extended Statistics message would be published when all the auction executions are over.

4.5.3 Closing Price Cross

Each execution that takes place during the closing price cross will be reported via an Order Executed With Price/Size or Trade message.

A displayed order executed during the closing price cross will be updated via an Order Executed With Price/Size message irrespective of whether or not it was executed at its displayed price. The Printable field of each such message will be "Y" to indicate to recipients that they should update time and sales and statistics displays.

The Trade message will be used if the execution involved the non-displayed portion of an iceberg or reserve order.

4.5.4 Off-Book Trades

The details of privately negotiated trades confirmed by *NSE* will, after the applicable delay, be disseminated via the Off-Book Trade message. In addition to the instrument, price, quantity and Trade ID, this message will include the trade type as well as the date and time the trade was executed on the systems of the counterparties.

4.5.5 Trade Corrections and Cancellations

A Trade Correction or a Trade Break message will be sent if a trade is corrected or cancelled by *NSE* respectively. The message will include the Trade ID of the corrected or the cancelled trade along with an indication whether it is an on-book or off-book trade. A trade cancellation is final. Once a trade is broken it cannot be reinstated.

If a trade is executed during a session where trade publication is disabled and is corrected or cancelled during a session where it is enabled, recipients will not receive a Trade Correction or a Trade Break message. If a trade is executed during a session where trade publication is enabled and is corrected or cancelled during a session where it is disabled or when there is no session, recipients will receive a Trade Correction or a Trade Break message respectively. For on - book trades, the original session would be the session the trade took place in. For off - book trades, the original session would be the session the trade was published in.

NSE Does not support Trade Cancellations.

~~Details of trade corrections are not disseminated on the market data feed.~~[10]

4.6 Indicative Auction Information

The market data feed provides recipients with the indicative price for each auction (i.e. opening, closing, etc.) via the Auction Info message. The indicative auction price is disseminated along with the executable volume, imbalance quantity and the side of the imbalance at this price.

The indicative price will either be updated for every order book update or updated periodically every *<five>* seconds until *<two>* minutes prior to the auction at which point it will be updated every *<two>* seconds. The update frequency is configurable and may be changed with due notice to recipients.

[10] ~~Although the details of trade corrections are not disseminated on MITCH market data feed, statistics are published on trade corrections.~~

If an indicative auction price does not exist (i.e. the order book is not locked or crossed) or if there is no imbalance at the indicative price, the Imbalance Direction field of the message will be “O” or “N” respectively.

4.7 Statistics

4.7.1 Book-Level Statistics

The market data feed provides recipients with the statistics listed below for the sub books of each instrument. Each statistic applies only to the current day and to the specified sub book and will be published via either the Statistics or Extended Statistics message.

Statistics	Regular	Odd Lot	Early Settlement	Block Trade	Message
Opening price	√	×	×	×	Statistics
Closing price	√	×	×	×	Statistics
Previous close	√	×	×	×	Statistics
Highest price	√	√	√	√	Extended Statistics
Lowest price	√	√	√	√	Extended Statistics
VWAP	√	√	√	√	Extended Statistics
Volume	√	√	√	√	Extended Statistics
Turnover	√	√	√	√	Extended Statistics
Number of trades	√	√	√	√	Extended Statistics
Market Capitalization	√	×	×	×	Extended Statistics
Daily Foreign Buy Value	√	√	√	√	Extended Statistics
Daily Foreign Sell Value	√	√	√	√	Extended Statistics

In the unlikely event a book-level statistic needs to be corrected, a Statistics or Extended Statistics message will be transmitted with the corrected value. The field(e.g. high price, VWAP, turnover, etc.) will include a negative value if a previously published price is to be cleared.

Market data feed will also provide High Price, Low Price, VWAP, Volume, Turnover, Number of Trades, Market Capitalization, Daily Foreign Buy Value and Daily Foreign Sell Value via the Extended Statistics message. The fields will include a negative value in the relevant fields (i.e. High Price, Low Price etc.) if a previously published value is to be cleared.

4.7.2 Market, Sector and Instrument Type based Statistics

The feed also provides recipients with the market, sector and instrument type based statistics listed below via the Consolidated Statistics message. The Statistics Type field will be used to indicate whether the statistic being published relates to a market or sector. The market or sector will be identified via the Symbol field.

Statistics	Market	Sector	Instrument Type
Volume	√	√	√
Turnover	√	√	√
Number of trades	√	√	√
Market Capitalization	√	√	√
Daily Foreign Buy Value	√	√	√
Daily Foreign Sell Value	√	√	√

4.7.3 AON Statistics

The feed also provides recipients with the status of the All or None (AON) Auction via the AON Info message. The fields listed below will be used to indicate the current status of the auction.

(i) Symbol – Gives the symbol of the instrument being auctioned.

(ii) Price – Gives the current auction price

(iii) Side – Gives the side being auctioned

(iv) Quantity – Gives the quantity being auctioned

(v) Date – Gives the date on which the auction is to be held

(vi) Status – Gives the current status of the auction

4.8 Indices

The market data feed provides recipients with the value of each index which is updated *<<in real-time>* or *<every ten seconds>>*.

An Index message will be broadcast when the value of an index is updated. The message will include the index identifier, updated value and an Update Type of Intra-Day (0).

The value of each index will be updated to reflect the closing price of each constituent instrument once these prices are published. Each such index update will include an Update Type of Closing (1).

The closing value of each index from the previous trading day will be published soon after the market opens. Each such index update will include an Update Type of Previous Close (2).

4.9 Announcements

Market announcements are included in the market data feed. In addition to the actual text of the announcement and an associated headline or subject, recipients are provided with its urgency, the time it was generated, the list of instruments and underlying instrument, if any, to which it relates.

Announcements are disseminated via the News message

5 CONNECTIVITY

5.1 Transmission Standards

5.1.1 Multicast Channels

The Real-Time channel utilises UDP over IP version 4 (IPv4) Ethernet standards. UDP header information is as defined in the IETF RFC 791 (IPv4) and RFC 768 (UDP) transmission standards. Each UDP packet will contain just one Unit Header.

5.1.2 Unicast Channels

The Snapshot and Replay channels utilise TCP over IP version 4 (IPv4) Ethernet standards. TCP header information is as defined in the IETF RFC 793 standard and IPv4 is as defined in the RFC 791 standard.

5.2 CompIDs

The CompID of each client wishing to connect to the Snapshot and Replay channels must be registered with *NSE* before communications can begin. Each CompID will be assigned a password on registration.

A CompID may, at any particular time, only be logged into one TCP channel across all market data groups.

5.3 Production IP Addresses and Ports

The feed is load balanced by market data group. While each group will contain multiple instruments, each instrument is assigned to just one market data group. Although the group an instrument is assigned to may change from day to day, it will not change within a day. The Symbol Directory messages available on the Real-Time channel of the various market data groups may be utilized by recipients to identify the instruments assigned to each group.

The production IP addresses and ports of the Real-Time, Snapshot and Replay channels for each market data group are given below.

5.3.1 Main Site

Market Data Group		Real-Time Channel		Snapshot Channel		Replay Channel	
ID	Description	IP Address	Port	IP Address	Port	IP Address	Port
1	*<Group 1>*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*
2	*<Group 2>*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*
3	*<Group 3>*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*

5.3.2 Backup Site

Market Data Group		Real-Time Channel		Snapshot Channel		Replay Channel	
ID	Description	IP Address	Port	IP Address	Port	IP Address	Port
4	*<Group 1>*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*
5	*<Group 2>*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*
6	*<Group 3>*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*	*xxx.xxx.xx.xx*	*xxxxx*

5.4 Bandwidth

The recommended bandwidth for the Real-Time, Snapshot and Replay channels of each market data group is given below.

Market Data Group		Real-Time Channel		Snapshot Channel		Replay Channel	
ID	Description	Main	Backup	Main	Backup	Main	Backup
1	*<Group 1>*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*
2	*<Group 2>*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*
3	*<Group 3>*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*	*x Mbps*

5.5 Failover and Recovery

NSE will have a resilient solution at primary site. For all TCP/IP connections clients will be given two pairs of IP addresses, a pair (Primary and Backup) for the Production Site and a pair (Primary and Backup) for the Secondary / Disaster Recovery Site. Clients should be directed to use the Production Site pair until directed that a site failover has been invoked – following this the Secondary site pair should be used. On unexpected disconnection from the Production Site primary gateway a client should try to reconnect 3 times to the primary gateway with a time out value of three seconds on each connection before attempting to connect to the Production Site secondary gateway – and this should then be retried a further 3 times. After six failed connection attempts (3 on each gateway) the client should contact *NSE* for guidance.

In case a successful connection is made with the secondary gateway and reconnection is required on unexpected disconnection, it is expected that the client should try to reconnect to the last successful IP (secondary gateway) three times and then attempt to connect to the primary gateway thrice. If the six connection attempts (3 on each gateway) fail, the client should contact *NSE* for guidance.

6 RECOVERY

6.1 Recipient Failures

Recipients have access to two identically sequenced Real-Time feeds: one from the main site (Feed A) and one from the backup site (Feed B). Recipients may process both feeds and arbitrate between them to minimise the probability of a data loss. However, those co-located at the main site should consider the additional latency of Feed B.

If a gap in sequence numbers is detected on the Real-Time channel, the recipient should assume that some or all of the order books maintained on its systems are incorrect and initiate one of the recovery processes outlined below.

6.1.1 Replay Channel

The TCP Replay channel should be used by recipients to recover from a small-scale data loss. It permits clients to request the retransmission of a limited number of messages already published on the Real-Time channel. The channel supports the retransmission of the last *<10,000>* messages published on the Real-Time channel.

Each CompID may login to the Replay channel of a particular market data group up to *<10>*[11] times each day. The total number of Replay Requests that a client may send for a particular market data group is also limited to *<10>*[12] each day. Recipients may request *NSE* to reset its login and request counts. This feature is intended to help manage an emergency situation and should not be relied upon as a normal practice.

[11] Insert login limit for Replay channel here and press Ctrl A and then F9 to update all other references to it.
[12] Insert request limit for Replay channel here and press Ctrl A and then F9 to update all other references to it. [15] Insert concurrent login limit here and press Ctrl A and then F9 to update all other references to it.

If a client submits multiple requests on the Replay channel, they will be processed serially (i.e. one at a time). Active requests of multiple clients will be served on a round robin basis. Clients are unable to cancel outstanding Replay Requests.

6.1.1.1 Establishing a Connection

The client should use the relevant IP address and port (as outlined in Section 5.3) to establish a TCP/IP session with the Replay channel. The client should initiate a session by sending the Login Request message. The client should identify itself by specifying its CompID in the Username field. The server will validate the CompID, password and IP address of the client.

Once the client is authenticated, the server will respond with a Login Response message with the Status "A".

The client must wait for the server's Login Response before sending additional messages. Messages received from the client before the exchange of logons will be ignored.

If a logon attempt fails because of an invalid CompID, password or IP address, the server will break the TCP/IP connection with the client without sending a Login Response.

If a logon attempt fails because of a locked CompID or if logins are not currently permitted, the server will send a Login Response and then break the TCP/IP connection with the client.

If a client has already logged into the Replay channel *<10>* times during the current day, the server will reject any new logon attempt with a Login Response and then break the TCP/IP connection. The Status of such a Login Response message will be "b".

The Replay channel supports only *<100>*[15] concurrent logins across all clients. Once the number of active logins has reached this limit, the server will reject login requests from additional clients with a Login Response and then break the TCP/IP connection. The Status of such a Login Response message will be "d".

If a Login Request is not received within*<5>*[13]seconds of the establishment of a TCP/IP connection or a Replay Request is not received within *<5>* seconds of a successful logon, the server will break the TCP/IP connection with the client.

A second attempt to log in to the same Market data Replay channel or to a Market Data Replay channel of a different Market Data Group, by an already logged in CompID will be rejected immediately by breaking the TCP/IP connection without sending a Login Response. No message is sent to the client in this case, as the client is not authenticated. The original session is not affected by this disconnection.

6.1.1.2 Heartbeats

The server will not send heartbeats on the Replay channel during periods of inactivity.

6.1.1.3 Requesting Missed Messages

Once connected to the Replay channel, clients may use the Replay Request message to request the retransmission of missed messages. The request should include the sequence number of the first message in the range to be retransmitted along with the number of messages to be retransmitted.

The retransmission request will be serviced from the server's cache of the last *<10,000>* messages published on the Real-Time channel. If the retransmission request includes one or more messages that are not in the server's cache, the entire request will be rejected and no messages will be retransmitted.

While a client may submit multiple Replay Requests, it may not have more than *<1>* concurrent unprocessed request at any point in time.

6.1.1.4 Response to a Retransmission Request

The server will respond to the Replay Request with a Replay Response message to indicate whether the retransmission request is successful or not. A Status other than “A” will indicate that the request has been rejected.

In the case of a successful request, the server will retransmit the requested messages immediately after the Replay Response. The sequence numbers of the retransmitted messages will be the same as when they were first disseminated on the Real-Time channel. The framing of the replayed messages inside of Unit Headers may differ between the original transmission and the retransmission.

6.1.1.5 Termination of the Connection

If the client does not send a Logout Request and terminate the connection within *<5>* seconds of the retransmission of the last missed message, the server will break the TCP/IP connection with the client.

The server will terminate the TCP/IP connection if the number of messages that are buffered for a client exceeds *<1,000>*.

6.1.2 Snapshot Channel

The TCP Snapshot channel should be used by recipients to recover from a large-scale data loss (i.e. late joiner or major outage).

The channel permits clients to request a snapshot of the order book and book-level statistics for the instruments in the market data group as well as their current trading status. In addition, it enables recipients to request the retransmission of trades published during the last *<10>* minutes on the Real-Time channel. It also enables recipients to download the list of instruments in the market data group. Furthermore it enables the recipients to request the retransmission of the last *<10,000>* market announcements published on Real Time channel. Snapshots of index values, market statistics and sector statistics are not available.

Each CompID may login to the Snapshot channel of a particular market data group up to *<5>*[14]times each day. The total number of Snapshot Request messages that a client may submit for a particular market data group is also limited to *<100>*[15] each day. Recipients may request **Error! Unknown switch argument.** to reset its login and request counts. This feature is intended to help manage an emergency situation and should not be relied upon as a normal practice.

While a client may submit multiple Snapshot Requests, it may not have more than *<10>* concurrent unprocessed requests at any point in time. If a client submits multiple concurrent requests, they will be processed serially (i.e. one at a time). Active requests of multiple clients will be served on a round robin basis. Clients are unable to cancel outstanding Snapshot Requests.

6.1.2.1 Establishing a Connection

The client should use the relevant IP address and port (as outlined in Section 5.3) to establish a TCP/IP session with the Snapshot channel. The client should initiate a connection by sending the Login Request message. The client should identify itself by specifying its CompID in the Username field. The server will validate the CompID, password and IP address of the client.

Once the client is authenticated, the server will respond with a Login Response message with the Status “A”.

The client must wait for the server’s Login Response before sending additional messages. Messages received from the client before the exchange of logons will be ignored.

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If a logon attempt fails because of an invalid CompID, password or IP address, the server will break the TCP/IP connection with the client without sending a Login Response.

If a logon attempt fails because of a locked CompID or if logins are not currently permitted, the server will send a Login Response and then break the TCP/IP connection with the client.

If a client has already logged into the Snapshot channel <5> times during the current day, the server will reject any new logon attempt with a Login Response and then break the TCP/IP connection. The Status of such a message will be “b”.

The Snapshot channel supports only <100> concurrent logins across all clients. Once the number of active logins has reached this limit, the server will reject login requests from additional clients with a Login Response and then break the TCP/IP connection. The Status of such a Login Response message will be “d”.

If aLogin Request is not received within<5>seconds of the establishment of a TCP/IP connection or a Snapshot Requestis not received within <5> seconds of a successful logon, the server will break the TCP/IP connection with the client.

A second attempt to log in to the same Market data Snapshot channel or to a Market Data Snapshot channel of a different Market Data Group, by an already logged in CompID will be rejected immediately by breaking the TCP/IP connection without sending a Login Response.

No message is sent to the client in this case, as the client is not authenticated. The original session is not affected by this disconnection.

At a particular point of time the Snapshot channel can queue only <*100*> *(a configurable number)* unprocessed requests from a client. The server will reject any further Snapshot Request messages via a Snapshot Response message. The Status of such a message will be “c”.

6.1.2.2 Heartbeats

The server will not send heartbeats on the Snapshot channel during periods of inactivity.

6.1.2.3 General Event Model

Once connected to the Snapshot channel, clients may use the Snapshot Request message to download the list of instruments, request a snapshot of an order book, statistics or trading status, download the trades published during the last <10>minutes or recover the last <10,000> market announcements. The Snapshot Type field of the message should be used to indicate the nature of the request.

The server will transmit a Snapshot Response to indicate whether the request is accepted or rejected. A Status other than “A” will indicate that the request is rejected.

If the request is successful, a series of application messages (e.g. Add Order, Symbol Directory, Recovery Trade, etc.) will then be disseminated to serve the request.

A Snapshot Complete message will be sent once all application messages have been transmitted in response to a request. Snapshot Complete messages may also be sent prior to the final Snapshot Complete to indicate that all messages relating to a particular sub book or instrument have been transmitted.

A Snapshot Request may optionally include a Request ID which, if specified, will be included in each Snapshot Response and Snapshot Complete sent in response to it.

6.1.2.4 Instrument List

A Snapshot Request with a Snapshot Type of Instrument (2) may be used to request the details of all instruments in the market data group or those in the group from a particular segment. The request will be deemed as one for all instruments if it does not contain a value in the Segment field. The Sequencer Number, Symbol, Sub Book and Recover From Time fields of the request will be ignored by the server.

The server will send a Snapshot Response to indicate whether the request is accepted or rejected. The Sequence Number and Order Count fields of this message should be ignored.

If the request is successful, the server will then disseminate a series of Symbol Directory messages. Each such message will provide the details of a requested instrument.

The server will transmit a Snapshot Complete once the details of all instruments are disseminated. The message will include the appropriate value in the Segment field if the request was for a particular segment. In addition the message will include the sequence number of the Real-Time channel with which the instrument snapshot was synchronised. The ~~Sequence Number~~, Symbol, Sub Book and Trading Status fields of the message should be ignored.

The Snapshot Response will be immediately followed a Snapshot Complete if there are no instruments for the specified segment.

6.1.2.5 Order Book Snapshots

Order books are maintained per sub book of an instrument (e.g. regular, bulletin board, etc.) A Snapshot Request with a Snapshot Type of Order Book (0) may be used to request a snapshot of the current order book for one of the following:

(i) All sub books for all instruments in a specified segment.

(ii) All sub books for a single instrument.

(iii) Multiple sub books for a single instrument.

(iv) A single instrument and sub book combination.

NSE currently supports multiple sub books per instrument: regular, offbook, bulletin board, block trade, odd lot, early settlement, AON and auctions. An order book request that includes the off-book sub book will be rejected.

A request that relates to a single sub book of an instrument may include the sequence number of the Real-Time channel from which the client can build its order book. The sequence number, if any, included in such a Snapshot Request is validated by the server against the sequence number with which its current order book snapshot is synchronised. In the unlikely event the sequence number included in the Snapshot Request is higher than that with which the server's current order book snapshot is synchronised, the request will be rejected. The Snapshot Response transmitted in such an event will include a Status of "O".

The value in the Sequence Number field of a Snapshot Request is ignored by the server if the request relates to more than one sub book.

6.1.2.5.1 Response to an Order Book Request for an Instrument

The server will send a Snapshot Response to indicate whether the request is accepted or rejected. The Sequence Number and Order Count fields of the Snapshot Response should be ignored if the request is rejected.

The Snapshot Response will, if the request is accepted, include the message sequence number of the Real-Time channel with which the instrument's order book snapshot will be synchronised. This sequence number will be equal to or higher than the one, if any, included in the Snapshot Request. The response will also include the total number of active orders for the requested instrument. The client should buffer all messages on the Real-Time channel for the order book with sequence numbers greater than that specified in the Snapshot Response.

If the request is successful, the server will then disseminate a snapshot of the current order book via series of Add Order and Add Attributed Order messages. Each such message will represent a single active order and will not include a sequence number. If a particular price point contains multiple orders, they will be disseminated in terms of their time priority (i.e. the oldest order first).

The server will transmit the Snapshot Complete message once the details of all active orders for the instrument are disseminated. The message will include the sequence number of the

Real-Time channel with which the order book snapshot was synchronised and the instrument and sub book to which it relates. It will also include the current trading status of the book. The client may begin processing the buffered messages for the instrument from the Real-Time channel once the order book snapshot is processed.

The Snapshot Response will be immediately followed by the Snapshot Complete message if there are no active orders for the instrument.

6.1.2.5.2 Response to an Order Book Request for a Segment

The server will send a Snapshot Response to indicate whether a Snapshot Request for a segment is accepted or rejected. The Sequence Number and Order Count Fields of the Snapshot Response should be ignored.

If the request is successful, the server will then disseminate a snapshot of the current order book for all instruments in the requested segment via series of Add Order and Add Attributed Order messages. Each such message will represent a single active order and will not include a sequence number. If a particular price point contains multiple orders, they will be disseminated in terms of their time priority (i.e. the oldest order first).

Order book snapshots for the requested instruments will be transmitted serially (i.e. one instrument at a time). The server will transmit a Snapshot Complete message once the details of all active orders for a particular instrument are disseminated. This message will include the sequence number of the Real-Time channel with which the order book snapshot for the instrument was synchronised. While such a Snapshot Complete will include the instrument and sub book to which it relates, it will not include a value in the Segment field. It will also include the current trading status of the book. The client may begin processing the buffered messages for the instrument from the Real-Time channel once its order book snapshot is processed. A Snapshot Complete will be sent if on-book trading is enabled for an instrument even if there are no active orders for it. A Snapshot Complete will not be sent if on-book trading is disabled for an instrument.

The server will also transmit a Snapshot Complete message once the details of all active orders for all instruments in the requested segment are disseminated. The final Snapshot Complete will include an indication of the segment to which it relates. The Sequence Number, Symbol, Sub Book and Trading Status fields of the message should be ignored.

6.1.2.6 Book-Level Statistics Snapshots

Statistics are maintained per sub book of an instrument (regular, off-book, odd lot, etc). A Snapshot Request with a Snapshot Type of Book-Level Statistics (4) may be used to request a snapshot of the statistics for one of the following:

(v) All sub books for all instruments in a specified segment.

(vi) All sub books for a single instrument.

(vii) Multiple sub books for a single instrument.

(viii) A single instrument and sub book combination.

The request will be deemed as one for a segment if it contains a value in the Segment field (the contents, if any, of the Symbol and Sub Book fields will be ignored). It will be deemed as one for all sub books of an instrument if it only contains a value in the Symbol field.

The server wills end a Snapshot Response to indicate whether the request is accepted or rejected. The Sequence Number and Order Count fields of this message should be ignored.

If the request is successful, the server will then disseminate a snapshot of the statistics for each requested sub book via a series of Statistics, Extended Statistics and AON Info messages. A separate Statistics or AON Info message will be published for each type of statistic disseminated via this message (e.g. opening price, closing price, etc.) and a separate Extended Statistics message will be published for each sub book.

Statistics snapshots for the requested sub books will be transmitted serially (i.e. one sub book at a time). The server will transmit a Snapshot Complete once all statistics for a particular sub book are disseminated. The message will include the sequence number of the Real-Time channel with which the statistics snapshot was synchronised and the instrument and sub book to which it relates. It will also include the current trading status of the sub book. The client may begin processing the buffered messages for the instrument from the Real-Time channel once the statistics snapshot is processed. The Segment field of the message should be ignored. Just a Snapshot Complete will be transmitted for a sub book if there are no statistics for it (i.e. no trades for the day).

In the case of segment-level request, the server will also transmit a Snapshot Complete message once the statistics for all sub books in the requested segment are disseminated. This final Snapshot Complete will include an indication of the segment to which it relates. The Sequence Number, Symbol, Sub Book and Trading Status fields of the message should be ignored.

6.1.2.7 Missed Trades

A Snapshot Request with a Snapshot Type of Trades (3) may be used to request missed trades for all instruments in a particular segment or for a single instrument. The ability to request missed trades for a particular instrument and sub book combination is not currently available[16]. The request should include the sending time of the last trade on the Real-Time channel processed by the client in the "Recover From Time" field. The request will be deemed as one for a segment if it contains a value in the Segment field (the contents, if any, of the Symbol field will be ignored).

The server only caches the trades published during the last *<10>* minutes on the Real-Time channel. If the request includes a "Recover From Time" that is prior to that of the oldest trade in the server's cache, all eligible trades in the cache will be retransmitted. Clients are unable to recover trades not in the server's cache.

The server will send a Snapshot Response to indicate whether the request is accepted or rejected. The Sequence Number and Order Count fields of this message should be ignored.

If the request is successful, the server will then disseminate the continuous trades, auction trades, off-book trades and trade cancellations missed by the client via a series of Recovery Trade messages.

Trades for the requested instruments will be transmitted serially (i.e. one instrument at a time). The server will transmit a Snapshot Complete once all trades for a particular instrument are disseminated. The message will indicate the instrument to which it relates. In addition the message will include the sequence number of the Real-Time channel with which the instrument snapshot was synchronised. The Segment, Sub Book and Trading Status fields of the message should be ignored. Just a Snapshot Complete will be transmitted for an instrument if there are no trades for it in the server's cache.

In the case of segment-level request, the server will also transmit a Snapshot Complete message once trades for all instruments in the requested segment are disseminated. This final Snapshot Complete will include an indication of the segment to which it relates. The Sequence Number, Symbol, Sub Book and Trading Status fields of the message should be ignored.

6.1.2.8 Trading Status

Trading status is maintained per sub book of an instrument (i.e. regular or off-book). A Snapshot Request with a Snapshot Type of Symbol Status (1) may be used to request the trading status for one of the following:

(i) All sub books for all instruments in a specified segment.

[16] The Sub Book field is ignored by the server if the Snapshot Request is for missed trades. Hence sub book type is stamped as zero in the Snapshot Complete message

(ii) All sub books for a single instrument.

(iii) Multiple sub books for a single instrument.

(iv) A single instrument and sub book combination.

The request will be deemed as one for a segment if it contains a value in the Segment field (the contents, if any, of the Symbol and Sub Book fields will be ignored). It will be deemed as one for all sub books of an instrument if it only contains a value in the Symbol field.

The server will send a Snapshot Response to indicate whether the request is accepted or rejected. The Sequence Number and Order Count fields of this message should be ignored.

If the request is successful, the status for each requested sub book will be disseminated via a series of Symbol Status messages. Each such message will include the applicable Trading Status and a Session Change Reason of Unavailable (9).

The server will transmit a Snapshot Complete message after the Symbol Status for a particular sub book. The Snapshot Complete will include the sequence number of the RealTime channel with which the trading status was synchronised and the instrument and sub book to which it relates. The Segment and Trading Status fields of the message should be ignored.

In the case of segment-level request, the server will also transmit a Snapshot Complete once the trading status for all sub books in the requested segment is disseminated. This final Snapshot Complete will include an indication of the segment to which it relates. The Sequence Number, Symbol, Sub Book and Trading Status fields of the message should be ignored.

6.1.2.9 Announcements

A Snapshot Request with a Snapshot Type of News (5) may be used to request missed market announcements published by the system. The request should include the sending time of the last announcement on the Real-Time channel processed by the client in the Recover From Time field.

The server only caches the last <10,000> market announcements published on the RealTime channel. If the request includes a Recover From Time that is prior to that of the oldest announcement in the server's cache, all eligible announcements in the cache will be retransmitted. Clients are unable to recover announcements not in the server's cache.

The server will send a Snapshot Response to indicate whether the request is accepted or rejected. The Sequence Number and Order Count fields of this message should be ignored.

If the request is successful, the server will then disseminate market announcements missed by the client via a series of News messages.

Announcements will be transmitted serially (i.e. one instrument at a time). The server will transmit a Snapshot Complete once all qualifying announcements are disseminated. The message will include the sequence number of the Real-Time channel with which the announcements snapshot was synchronised. Just a Snapshot Complete will be transmitted if there are no announcements in the server's cache.

6.1.2.10 Termination of the Connection

If the client does not send a Logout Request and terminate the connection or submit another Snapshot Request within*<5>* seconds of the transmission of the Snapshot Complete message, the server will break the TCP/IP connection with the client.

The server will terminate the TCP/IP connection if the number of messages that are buffered for a client exceeds *<1,000>*.

6.2 Failures at *NSE*

6.2.1 Snapshots on the Real-Time Channel

In the unlikely event of an outage at *NSE*, recipients may be required to refresh their order book and statistics displays for one or more instruments.

In such a scenario the server will, on the Real-Time channel, broadcast an Order Book Clear message for each affected instrument. In such an event recipients must discard the contents of their order book and book-level statistics displays for these instruments.

The server will then transmit a series of Add Order, Add Attributed Order, Statistics, and Extended Statistics messages, on the Real-Time channel, to disseminate the current order book and statistics for each affected instrument.

6.2.2 Resetting Sequence Numbers

If the market data feed is, in the unlikely event of an outage, failed over to the backup site or is restarted, the message sequence number of the Real-Time channel will be reset to 1. In such a case, messages sent on the Real-Time channel prior to the resetting of sequence numbers will not be available for retransmission on the Replay channel.

Trades executed just prior to and during the failover or restart may not be published on the Real-Time channel once it resumes. Clients may, if required, recover these trades from the Snapshot channel.

7 MESSAGE FORMATS

This section provides details on the data types, unit header, nine administrative messages and eighteen application messages utilised by the server. For each message, a description of each field is provided along with the applicable data type, offset and length (in bytes).

In certain scenarios, a single event in the matching system will result in the publication of multiple messages on the market data feed. *NSE* may change the order in which these messages are published at any time without prior notice. Recipients should ensure that their applications are developed to process each of the messages covered in this section irrespective of the order in which they are transmitted.

NSE reserves the right to add new message types and increase the length of any message without prior notice. Recipients should develop their decoders to ignore unknown message types and handle messages that grow beyond the expected length. Message lengths will generally only be increased to add additional fields to the end of a message.

7.1 Packet Composition

The Unit Header is used to deliver all administrative and application messages to and from the server on all three channels. A Unit Header may contain zero, one or more payload messages. While a Unit Header may contain multiple application messages, it will never contain more than one administrative message. A Unit Header will not contain both administrative and application messages.

7.2 Sequence Numbers

All application messages transmitted by the server on the Real-Time and Replay channels are sequenced. The Unit Header only contains the sequence number of the first message. Each subsequent message in the Unit Header will have an implied sequence number one greater than the previous message. The sequence number of first message of the next Unit Header can be determined by adding the value in the Message Count field of the Unit Header to the value in its Sequence Number field.

The application messages sent by the server on the Snapshot channel as well as all administrative messages transmitted by both the server and the client are un-sequenced. The Unit Header used to transport all such messages, other than a Heartbeat, will include a Sequence Number of zero.

7.3 Timestamps

Application messages on the Real-Time channel will include an indication of when they were generated. The server will, on the Real-Time channel, transmit a Time message for every second for which at least one application message is generated. The time specified in this message serves as a reference for the times specified in all other application messages. The timestamps in the other messages are specified as a nanosecond offset from the most recent Time message. The Time message is not transmitted during periods where no application messages are generated for the Real-Time channel.

The retransmission of messages on the Replay channel will include the Time messages originally broadcast on the Real-Time channel (i.e. with the same timestamp).

While Time messages will be included when an order book snapshot is provided on the Snapshot channel, the times in these messages will be different from those published when the active orders were originally disseminated on the Real-Time channel. Clients are unable to estimate the time at which an active order was submitted from the messages transmitted on the Snapshot channel.

7.4 Data Types

The fields of the messages utilised by the server will support the data types outlined below.

Data Type	Length	Description
Alpha	Variable	These fields use standard ASCII character bytes. They are left justified and padded on the right with spaces.
Bit Field	1	A single byte used to hold up to eight 1-bit flags. Each bit will represent a Boolean flag. The 0 bit is the lowest significant bit and the 7 bit is the highest significant bit.
Byte	1	A single byte used to hold one ASCII character.
Date	8	Date specified in the YYYYMMDD format using ASCII characters.
Time	8	Time specified in the HH:MM:SS format using ASCII characters.
Price	4	Signed Little-Endian encoded four byte integer field with four implied decimal places.
Long Price	8	Signed Little-Endian encoded eight byte integer field up to eight implied decimal places.
UInt8	1	8 bit unsigned integer.
UInt16	2	Little-Endian encoded 16 bit unsigned integer.
UInt32	4	Little-Endian encoded 32 bit unsigned integer.
UInt64	8	Little-Endian encoded 64 bit unsigned integer.

7.5 Message Overview

7.5.1 Administrative Messages

Name	Message Type		Usage
	ASCII	Hex	
Heartbeat	-	-	Used by the server, on the Real-Time channel, to exercise the communication line during periods of inactivity.
Login Request	(soh)	0x01	Used by the client to login to the Replay or Snapshot channel.
Login Response	(stx)	0x02	Used by the server to accept or reject a login request to the Replay or Snapshot channel.
Logout Request	(enq)	0x05	Used by the client to logout of the Replay or Snapshot channel.
Replay Request	(etx)	0x03	Used by the client to request a retransmission of messages on the Replay channel.
Replay Response	(eot)	0x04	Used by the server to respond to a retransmission request on the Replay channel.

Snapshot Request	•	0x81	Used by the client to request for a snapshot of the current order book on the Snapshot channel.
Snapshot Response	,	0x82	Used by the server to respond to a snapshot request on the Snapshot channel.
Snapshot Complete	*f*	0x83	Used by the server to indicate that the transmission of an order book snapshot is complete.

7.5.2 Application Messages

Applications messages may only be sent by the server.

Name	Message Type		Usage
	ASCII	Hex	
Time	T	0x54	Sent by the server for every second for which at least one application message is generated. This message is not transmitted during periods where no other application messages are generated.
System Event	S	0x53	Sent to indicate the start and end of the day.
Symbol Directory	R	0x52	Used to disseminate information (e.g. symbol, segment, ISIN, underlying, etc.) on each instrument.
Symbol Status	H	0x48	Indicates the trading session (e.g. pre-opening, regular trading, etc.) that currently applies to an instrument.
Add Order	A	0x41	Sent to indicate that an anonymous limit or market order is added to the order book.
Add Attributed Order	F	0x46	Indicates that an attributable limit order is added to the order book. The identity of the submitting firm is included in the message.

Name	Message Type		Usage
	ASCII	Hex	
Order Deleted	D	0x44	Sent to indicate that the remainder of a displayed order is cancelled.
Order Modified	U	0x55	Indicates that the displayed quantity or price of a displayed order has been updated. The message will include an indication whether the order has retained or lost its time priority.
Order Book Clear	y	0x79	Sent to instruct recipients to remove all orders from the order book for the specified instrument.
Order Executed	E	0x45	Indicates that the displayed portion of an order is fully or partially filled at its displayed price. The executed quantity is included in the message.

Order Executed With Price/ Size	C	0x43	Sent if a displayed order is fully or partially filled at a price that is different from its displayed price. The executed quantity and price is included in the message along with an indication of whether the trade should update time and sales and statistics displays.
Trade	P	0x50	Sent if the non-displayed portion of an iceberg order or a reserve order is fully or partially filled or if the negotiated non-disclosed order in the block trade order book is executed.
Auction Trade	Q	0x51	Sent to report details of an auction (e.g. opening, closing, etc.). The message indicates the price and bulk volume associated with the auction.
Off-Book Trade	x	0x78	Sent to report the details of a privately negotiated trade.
Trade Break	B	0x42	Indicates that a previously reported traded is cancelled.
Trade Correction	`	0x60	Indicates that a previously reported trade is corrected.
Recovery Trade	v	0x76	Used to disseminate the details of missed on-book and off-book trades on the Snapshot channel.
Auction Info	I	0x49	Used to disseminate the indicative auction price and the tradable quantity and imbalance at this price.
Statistics	w	0x77	Used to disseminate statistics (e.g. previous close, opening price, closing price, etc.).
Extended Statistics	€	0x80	Used to disseminate the High Price, Low Price, VWAP, Volume, Turnover and Number of Trades.
Consolidated Statistics	d	0x64	Used to disseminate market and sector statistics.
Index	b	0x62	Used to disseminate indices.
AON Info	e	0x65	Used to disseminate AON statistics
News	u	0x75	Used to publish market announcements.
Update Price Point	s	0x73	Used to communicate the addition of a new price point and a size update to an already published price point in Price Depth Service (MBP).
Delete Price Point	r	0x72	Used to communicate the removal of a price point in Price Depth Service (MBP).
Top of Book	q	0x71	Used to communicate the best bid and the best offer prices and sizes of an order book.

7.6 Unit Header

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of the message block including the header and all payload messages.
Message Count	2	1	UInt8	Number of payload messages that will follow the header.
Market Data Group	3	1	Byte	Identity of the market data group the payload messages relate to.
Sequence Number	4	4	UInt32	Sequence number of the first payload message.
Payload	8	Variable	-	One or more payload messages.

7.7 Administrative Messages (Client – Initiated)

7.7.1 Login Request

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x01 Login Request
Username	3	6	Alpha	CompID assigned to the client.
Password	9	10	Alpha	Password assigned to the CompID.

7.7.2 Replay Request

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x03 Replay Request
Market Data Group	3	1	Byte	Identity of the market data group the replay request relates to.
First Message	4	4	UInt32	Sequence number of the first message in range to be retransmitted.
Count	8	2	UInt16	Number of messages to be resent

7.7.3 Snapshot Request

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x81 Snapshot Request
Sequence Number	3	4	UInt32	Sequence number from which client can build the order book.
Segment	7	6	Alpha	Segment the request relates to. The field should contain only spaces if it does not relate to a segment.
Symbol	13	12	Alpha	Instrument the request relates to. The field should contain only spaces if it does not relate to an instrument. This field is ignored if Segment is specified.
Sub Book	25	1	Bit Field	**Bit** **Name** **Meaning** 0 Regular 0: No 1: Yes 1 Off-Book 0: No 1: Yes 2 Block Trade 0: No 1:Yes 3 Odd Lot 0: No 1: Yes 4 Early Settlement 0: No 1: Yes 5 Bulletin Board 0: No 1: Yes 6 Auction 0: No 1: Yes 7 All or None 0: No 1: Yes
Snapshot Type	26	1	UInt8	**Value Meaning** 0 Order Book 1 Symbol Status 2 Instrument 3 Trades 5 News 4 Book-Level Statistics

				8 Top of Book
Recover From Time	27	8	Time	Sending time of the last processed trade specified in terms of local time for the server (i.e. not UTC) with regards to Trades (3) or the last received announcement with regards to News (5).This field is ignored if the Snapshot Type is not Trades (3) or News (5).
Request ID	35	4	UInt32	Optional identifier of the request

7.7.4 Logout Request

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x05 Logout Request

7.8 Administrative Messages (Server – Initiated)

7.8.1 Heartbeat

A Unit Header with a Message Count of zero will be used by the server as a Heartbeat message. Such a message will never increment the sequence number of the Real-Time channel. However, the next expected sequence number will be included in the Sequence Number to enable recipients to detect gaps on the Real-Time channel.

7.8.2 Login Response

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x02 Login Response

Status	3	1	Byte	Status of the login request. **Value Meaning** A Login Accepted a CompID Inactive/Locked b Login Limit Reached c Service Unavailable d Concurrent Limit Reached e Failed (Other)

7.8.3 Replay Response

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x04 Replay Response
Market Data Group	3	1	Byte	Identity of the market data group the replay request relates to.
First Message	4	4	UInt32	Sequence number of the first message in range to be retransmitted. This will be zero if Status is not “A”.
Count	8	2	UInt16	Number of messages to be resent. This will be zero if Status is not “A”.
Status	10	1	Byte	**Value Meaning** A Request Accepted D Request Limit Reached I Invalid Market Data Group O Out of Range U Replay Unavailable c Concurrent Limit Reached d Unsupported Message Type e Failed (Other)

7.8.4 Snapshot Response

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.

Message Type	2	1	Byte	**Hex** **Meaning** 0x82 Snapshot Response
Sequence Number	3	4	UInt32	Sequence number with which the snapshot is synchronised.This will be zero if Status is not "A". Ignore if Snapshot Type is not Order Book (0).
Order Count	7	4	UInt32	Number of orders that will be transmitted in the snapshot.This will be zero if Order Book is empty or Status is not "A". Ignore if Snapshot Type is not Order Book (0).
Status	11	1	Byte	**Value Meaning** A Request Accepted O Out of Range U Snapshot Unavailable a Segment, Symbol or Sub Book Invalid or Not Specified[17] b Request Limit Reached c Concurrent Limit Reached d Unsupported Message Type e Failed (Other)
Snapshot Type	12	1	UInt8	**Value Meaning** 0 Order Book 1 Symbol Status 2 Instrument 3 Trades 4 Book-Level Statistics 5 News 8 Top of Book
Request ID	13	4	UInt32	Identifier, if any, of Snapshot Request.

[17] If the provided Segment does not have any instruments or if the Segment is invalid, this value (a) will be sent.

7.8.5 Snapshot Complete

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x83 Snapshot Complete
Sequence Number	3	4	UInt32	Sequence number with which the snapshot is synchronised.
Segment	7	6	Alpha	Segment the snapshot relates to. The field will contain only spaces if it does not relate to a segment.
Symbol	13	12	Alpha	Instrument the snapshot relates to. The field will contain only spaces if it does not relate to an instrument.
Sub Book	25	1	Bit Field	**Bit** **Name** **Meaning** 0 Regular 0: No 1: Yes 1 Off-Book 0: No 1: Yes 2 Block Trade 0: No 1:Yes 3 Odd Lot 0: No 1: Yes 4 Early Settlement 0: No 1: Yes 5 Bulletin Board 0: No 1: Yes 6 Auction 0: No 1: Yes 7 All or None 0: No 1: Yes

Field	Offset	Length	Type	Description

<table>
<tr><td>Trading Status</td><td>26</td><td>1</td><td>Byte</td><td>This will only be indicated if the message is sent as a book level complete and the Snapshot Type is Order Book (0) or Statistics (4).
Value Meaning
H Halt
T Regular Trading
a Opening Auction Call
b Post-Close
c Market Close
d Closing Auction Call
e Re-Opening Auction Call
l Pause
n Order Entry
s Start of AON Order Entry
t End of AON Order Entry
u Closing Price Cross
w No Active Session
y Pre-Trading z Closing Price Publication
p Auction Initiation
q Start of Auction Call
r End of Auction Call
o Intraday Auction Call</td></tr>
<tr><td>Snapshot Type</td><td>27</td><td>1</td><td>UInt8</td><td>Value Meaning
0 Order Book
1 Symbol Status
2 Instrument
3 Trades
4 Book-Level Statistics
5 News
8 Top of Book</td></tr>
<tr><td>Request ID</td><td>28</td><td>4</td><td>UInt32</td><td>Identifier, if any, of Snapshot Request.</td></tr>
</table>

7.9 Application Messages

7.9.1 Time

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x54 Time
Seconds	3	4	UInt32	Number of seconds since midnight. Midnight will be in terms of the local time for the server (i.e. not UTC).

7.9.2 System Event

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x53 System Event
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Event Code	7	1	Byte	**Value Meaning** C End of Day O Start of Day

7.9.3 Symbol Directory

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x52 Symbol Directory
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol.
Symbol Status	19	1	Alpha	**Value Meaning** H Halted S Suspended a Inactive This field will contain a space if the instrument is active.

Identification Number	20	12	Alpha	Instrument identification number (e.g. ISIN, CUSIP, etc.)
Segment	32	6	Alpha	Segment the instrument is assigned to. Please refer to Section 8 for the valid segments.
Expiration Date	38	8	Date	Date aninstrument expires or matures. This field will contain only spaces if the instrument is not a derivative or fixed income instrument.
Underlying	46	6	Alpha	Symbol of the underlying instrument. This field will contain only spaces if the instrument is not a derivative.
Strike Price	52	4	Price	Strike price of an option. The price will be zero if the instrument is not an option.
Option Type	56	1	Alpha	**Value Meaning** C Call Option P Put Option This field will contain a space if the instrument is not an option.
Issuer	57	6	Alpha	Issuer of the instrument. This field will contain all spaces if the instrument is not anequity or fixed income instrument.
Issue Date	63	8	Date	Date instrument was issued. This field will contain all spaces if the instrument is not a fixed income instrument.

Field	Offset	Length	Type	Description
Coupon	71	4	Price	Rate of interest applied to the face value. This is a percentage field (e.g. 0.05 represents 5%). The price will be zero if the instrument is not a fixed income instrument.
Flags	75	1	Bit Field	**Bit** **Name** **Meaning** 0 Inverse Order Book 0: No 1: Yes

Sub Book	76	1	Bit Field	**Bit**	**Name**	**Meaning**
				0	Regular	0: No 1: Yes
				1	Off-Book	0: No 1: Yes
				2	Block Trade	0: No 1:Yes
				3	Odd Lot	0: No 1: Yes
				4	Early Settlement	0: No 1: Yes
				5	Bulletin Board	0: No 1: Yes
				6	Auction	0: No 1: Yes
				7	All or	0: No None 1: Yes
Corporate Action	77	5	Alpha	Pipe separated field. Identifies the type of Corporate Actions applicable on the instrument for the current Trading day		
Issued Quantity	82	8	Long Price	Issued Quantity of the instrument.		

7.9.4 Symbol Status

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x48 Symbol Status
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol.

Trading Status	19	1	Byte	**Value Meaning** H Halt T Regular Trading a Opening Auction Call b Post-Close c Market Close d Closing Auction Call e Re-Opening Auction Call l Pause n Order Entry p Auction Initiation q Start of Auction Call r End of Auction Call s Start of AON Order Entry t End of AON Order Entry u Closing Price Cross v Reserved for backward compatibility. w No Active Session x End of Post Close y Pre-Trading z Closing Price Publication o Intraday Auction Call 0 Auction Execution
Flags	20	1	Bit Field	Reserved for future use.

Field	Offset	Length	Type	Description
Halt Reason	21	4	Alpha	Reason for the trading halt. Please refer to Section 10 for an explanation of the reason codes. This field will contain only spaces if Trading Status is not “H”.

Session Change Reason	25	1	UInt8	**Value Meaning** 0 Scheduled Transition 1 Extended by Market Ops 2 Shortened by Market Ops 3 Market Order Extension 4 Price Monitoring Extension 5 Circuit Breaker Tripped 9 Unavailable
New End Time	26	8	Time	New session end time specified in terms of local time for server(i.e. not UTC). The field will contain only spaces if Session Change Reason is “0” or “9”.
Sub Book	34	1	UInt8	**Value Meaning** 1 Regular 2 Off-Book 3 Odd Lot 4 Block Trade 5 All or None 6 Early Settlement 7 Auction 9 Bulletin Board

7.9.5 Add Order

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x41 Add Order

Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Order ID	7	8	UInt64	Unique identifier of the order.
Side	15	1	Byte	**Value Meaning** B Buy Order Sell S Order
Quantity	16	4	UInt32	Displayed quantity of the order.
Symbol	20	12	Alpha	Instrument's symbol.
Price	32	4	Price	Limit price of the order.

Field	Offset	Length	Type	Description
Flags	36	1	Bit Field	**Bit** **Name** **Meaning** 4 Market Order 0: No 1: Yes 5 Bulletin Board 0: No 1: Yes
Sub Book	37	1	UInt8	**Value Meaning** 1 Regular 3 Odd Lot 4 Block Trade 5 All or None 6 Early Settlement 7 Auction
Settlement Type	38	1	Byte	Type of settlement. Only valid when Order Book is Block Trade (4). **Value Meaning** 1 Cash (T+0) 2 Early Settle (T+1) 3 (T+2) 4 Regular (T+3)
Interest Rate	39	4	Price	Gives the interest rate for a Repo order. Only valid when Order Book is Block Trade (4).
Term	43	1	UInt8	Gives the term of settlement of the 2nd leg of the Repo. Only valid when Order Book is Block Trade (4).

7.9.6 Add Attributed Order

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x46 Add Attributed Order
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Order ID	7	8	UInt64	Unique identifier of the order.
Side	15	1	Byte	**Value Meaning** Buy Order Sell Order

Quantity	16	4	UInt32	Displayed quantity of the order.
Symbol	20	12	Alpha	Instrument's symbol.
Price	32	4	Price	Limit price of the order.
Attribution	36	6	Alpha	Identity of firm that submitted the order.
Flags	42	1	Bit Field	**Bit** **Name** **Meaning** 5 Bulletin Board 0: No 1: Yes
Sub Book	43	1	UInt8	**Value** **Meaning** 1 Regular 3 Odd Lot 6 Early Settlement

7.9.7 Order Deleted

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x44 Order Deleted
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Order ID	7	8	UInt64	Identifier for the order.

7.9.8 Order Modified

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x55 Order Modified
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Order ID	7	8	UInt64	Identifier for the order.
New Quantity	15	4	UInt32	New displayed quantity of the order.
New Price	19	4	Price	New limit price of the order.

Flags	23	1	Bit Field	**Bit** **Name** **Meaning** 0 Priority Flag: 0: Priority Lost; 1: Priority Retained
Settlement Type	24	1	Byte	Type of settlement. Only valid when Order Book is Block Trade (4). **Value Meaning** 1 Cash (T+0) 2 Early Settle (T+1) 3 (T+2) 4 Regular (T+3)
Interest Rate	25	4	Price	Gives the interest rate for a Repo order. Only valid when Order Book is Block Trade (4).
Term	29	1	UInt8	Gives the term of settlement of the 2nd leg of the Repo. Only valid when Order Book is Block Trade (4).

7.9.9 Order Book Clear

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x79 Order Book Clear
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol.
Sub Book	19	1	UInt8	**Value Meaning** 1 Regular 2 Off-Book 3 Odd Lot 4 Block Trade 6 Early Settlement 7 Auction 9 BulletinBoard
Book Type	20	1	Byte	**Value** **Meaning** 0 MBP/MBO/Statistics 1 Top of Book

7.9.10 Order Executed

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x45 Order Executed
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Order ID	7	8	UInt64	Identifier for the order.
Executed Quantity	15	4	UInt32	Quantity executed.
Trade ID	19	8	UInt64	Unique identifier of the trade.
Buy Firm	27	6	Alpha	Identifier of the firm which submitted the buy order. Required only if the 'Publish Firms' is enabled for the order book in which the execution occurred.
Sell Firm	33	6	Alpha	Identifier of the firm which submitted the sell order. Required only if the 'Publish Firms' is enabled for the order book in which the execution occurred.
LastOptPx	39	8	Long Price	Converted price of the executed volatility of the options instrument.
Volatility	47	8	Long Price	Converted volatility of the executed price of the options instrument.
Underlying Reference Price	55	8	Long Price	Underlying Reference Price related to converted value calculated upon an options instrument trade execution.

7.9.11 Order Executed With Price/Size

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x43 Order Executed With Price/Size
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Order ID	7	8	UInt64	Identifier for the order.
Executed Quantity	15	4	UInt32	Quantity executed.

Display Quantity	19	4	UInt32	Displayed quantity of the order after the execution.
Trade ID	23	8	UInt64	Unique identifier of the trade.
Printable	31	1	Byte	**Value** **Meaning** N Non-Printable Y Printable
Price	32	4	Price	Price at which the order was executed.
Buy Firm	36	6	Alpha	Identifier of the firm which submitted the buy order. Required only if the 'Publish Firms' is enabled for the order book in which the execution occurred.
Sell Firm	42	6	Alpha	Identifier of the firm which submitted the sell order. Required only if the 'Publish Firms' is enabled for the order book in which the execution occurred.
LastOptPx	48	8	Long Price	Converted price of the executed volatility of the options instrument.
Volatility	56	8	Long Price	Converted volatility of the executed price of the options instrument.
Underlying Reference Price	64	8	Long Price	Underlying Reference Price related to converted value calculated upon an options instrument trade execution.

7.9.12 Trade

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x50 Trade
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Executed Quantity	7	4	UInt32	Quantity executed.
Symbol	11	12	Alpha	Instrument's symbol.
Price	23	4	Price	Executed price.
Trade ID	27	8	UInt64	Unique identifier of the trade.
Sub Book	35	1	UInt8	**Value Meaning** 1 Regular 3 Odd Lot 4 Block Trade

				5 All or None 6 Early Settlement 7 Auction
Buy Firm	36	6	Alpha	Identifier of the firm which submitted the buy order. Required only if the 'Publish Firms' is enabled for the order book in which the execution occurred.
Sell Firm	42	6	Alpha	Identifier of the firm which submitted the sell order. Required only if the 'Publish Firms' is enabled for the order book in which the execution occurred.
LastOptPx	48	8	Long Price	Converted price of the executed volatility of the options instrument.
Volatility	56	8	Long Price	Converted volatility of the executed price of the options instrument.
Underlying Reference Price	64	8	Long Price	Underlying Reference Price related to converted value calculated upon an options instrument trade execution.

7.9.13 Auction Trade

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x51 Auction Trade
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Executed Quantity	7	4	UInt32	Quantity executed in auction.
Symbol	11	12	Alpha	Instrument's symbol.
Price	23	4	Price	Price of auction.
Trade ID	27	8	UInt64	Unique identifier of the trade.
Auction Type	35	1	Byte	**Value Meaning** A Re-Opening Auction C Closing Auction O Opening Auction K Intra-Day Auction
LastOptPx	36	8	Long Price	Converted price of the executed volatility of the options instrument.

Volatility	44	8	Long Price	Converted volatility of the executed price of the options instrument.
Underlying Reference Price	52	8	Long Price	Underlying Reference Price related to converted value calculated upon an options instrument trade execution.

7.9.14 Off-Book Trade

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x78 Off-Book Trade
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Executed Quantity	7	4	UInt32	Quantity executed.
Symbol	11	12	Alpha	Instrument's symbol.
Price	23	4	Price	Executed price.
Trade ID	27	8	UInt64	Unique identifier of the trade.
Off Book Trade Type	35	4	Alpha	Type of off-book trade. Please refer to Section 9 for the valid trade types.
Trade Time	39	8	Time	Time off-book trade was executed. The time is specified in terms of the local time for the server (i.e. not UTC).
Trade Date	47	8	Date	Date off-book trade was executed.
LastOptPx	55	8	Long Price	Converted price of the executed volatility of the options instrument.
Volatility	63	8	Long Price	Converted volatility of the executed price of the options instrument.
Underlying Reference Price	71	8	Long Price	Underlying Reference Price related to converted value calculated upon an options instrument trade execution.

7.9.15 Trade Break

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x42 Trade Break

Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Trade ID	7	8	UInt64	Identifier of the cancelled trade.
Trade Type	15	1	Byte	**Value Meaning** On-Book Trade Off-Book Trade

7.9.16 Trade Correction

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex Meaning** 0x60 Trade Correction
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Trade ID	7	8	UInt64	Unique identifier of the trade.
Symbol	15	12	Alpha	Symbol of the trade
Price	27	4	Price	The original executed price (price of a trade cannot be amended)
Quantity	31	4	UInt32	New executed quantity of the trade
Sub Book	35	1	UInt8	**Value Meaning** 1 Regular 3 Odd Lot 4 Block Trade 5 All or None 6 Early Settlement 7 Auction 9 Bulletin Board
Buy Firm	36	6	Alpha	Gives the broker ID who submitted the buy order
Sell Firm	42	6	Alpha	Gives the broker ID who submitted the sell order.

7.9.17 Recovery Trade

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x76 Recovery Trade
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Executed Quantity	7	4	UInt32	Quantity executed.
Symbol	11	12	Alpha	Instrument's symbol.
Price	23	4	Price	Executed price.
Trade ID	27	8	UInt64	Unique identifier of the trade.
Auction Type	35	1	Byte	**Value Meaning** A Re-Opening Auction C Closing Auction O Opening Auction K Intra-Day Auction This field will contain a space if the trade is not an auction trade.
Off Book Trade Type	36	4	Alpha	Type of off-book trade. Please refer to Section 9 for the valid trade types. This field will contain only spaces for on-book trades.
Trade Time	40	8	Time	Time trade was executed. The time is specified in terms of the local time for the server (i.e. not UTC).
Trade Date	48	8	Date	Date the off-book trade was executed. This field will contain onlyspacesfor onbook trades.
Action Type	56	1	Byte	**Value Meaning** C Cancelled Trade N Trade A Amend Trade
Sub Book	57	1	UInt8	**Value Meaning** 1 Regular 2 Off-Book 3 Odd Lot 4 Block Trade 5 All or None

				6 Early Settlement 7 Auction
Buy Firm	58	6	Alpha	Identifier of the firm which submitted the buy order. Required only if the 'Publish Firms' is enabled for the order book in which the execution occurred.
Sell Firm	64	6	Alpha	Identifier of the firm which submitted the sell order. Required only if the 'Publish Firms' is enabled for the order book in which the execution occurred.
LastOptPx	70	8	Long Price	Converted price of the executed volatility of the options instrument.
Volatility	78	8	Long Price	Converted volatility of the executed price of the options instrument.
Underlying Reference Price	86	8	Long Price	Underlying Reference Price related to converted value calculated upon an options instrument trade execution.
Auction Trade Type	94	1	Byte	Denotes the type of the auction trade being disseminated. For regular trades this field will be unset. **Value Meaning** B Bulk Trade S Supplementary Trade

7.9.18 Auction Info

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x49 Indicative Auction Info
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Paired Quantity	7	4	UInt32	Quantity that will be matched at the indicative price.
Imbalance Quantity	11	4	UInt32	Quantity that is eligible to be matched at the indicative price but will not be matched.
Imbalance Direction	15	1	Byte	**Value Meaning** B Buy Imbalance N No Imbalance O Insufficient Orders for Auction S Sell Imbalance
Symbol	16	12	Alpha	Instrument's symbol.
Price	28	4	Price	Indicative auction price.
Auction Type	32	1	Byte	**Value Meaning** A Re-Opening Auction C Closing Auction O Opening Auction K Intra-Day Auction

7.9.19 Statistics

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x77 Statistics
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol.

Statistic Type	19	1	Byte	**Value Meaning** C Closing Price O Opening Price P Previous Close
Price	20	4	Price	Opening or closing price.
Open Close Indicator	24	1	Byte	**Value Meaning** A Auction Trade B Regular Trade C Mid-Point D Last Regular Trade E Last Auction F Manual H VWAP I Previous Close T Theoretical Price U Best Bid V Best Offer W None X VWAP of Last n Trades Y Reference Price Z Price Unavailable
SubBook	25	1	UInt8	**Value Meaning** 1 Regular 2 Off-Book 9 BulletinBoard

7.9.20 Extended Statistics

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x80 Extended Statistics
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol.
High Price	19	4	Price	High price for the sub book. Will be set to a negative value if the value is not set or withdrawn.
Low Price	23	4	Price	Low price for the sub book. Will be set to a negative value if the value is not set or withdrawn.
VWAP	27	4	Price	VWAP for the sub book. Will be set to a negative value if the value is not set or withdrawn.
Volume	31	4	UInt32	Volume for the sub book. Will be set to a negative value if the value is not set or withdrawn.
Turnover	35	8	Long Price	Turnover for the sub book. Will be set to a negative value if the value is not set or withdrawn.
Trades	43	4	UInt32	Number of trades for the sub book. Will be set to a negative value if the value is not set or withdrawn.
Reserved Field	47	8	-	Reserved for future use.
Sub Book	55	1	UInt8	**Value Meaning** 1 Regular 2 Off-Book 3 Odd Lot 4 Block Trade 6 Early Settlement 7 Auction
Notional Exposure	56	8	Long Price	Notional exposure related to the options trade executions

Notional Delta Exposure	64	8	Long Price	Notional exposure updated by the delta of the option based on trade executions.
Daily Foreign Buy Value	72	8	Long Price	Total foreign buy trade value for the day for the sub book. Will be set to a negative value if the value is not set or withdrawn.
Daily Foreign Sell Value	80	8	Long Price	Total foreign sell trade value for the day for the sub book. Will be set to a negative value if the value is not set or withdrawn.

Market Capitalization	88	8	Long Price	Market Capitalization of the instrument. Will be set to a negative value if the value is not set or withdrawn.

7.9.21 Consolidated Statistics

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x64 Consolidated Statistics
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Statistics Type	7	1	UInt8	**Value** **Meaning** 0 Market 1 Sector 2 Instrument Type
Symbol	8	12	Alpha	Unique identifier of market or sector.
Volume	20	4	UInt32	Traded volume for the market or sector.
Turnover	24	8	Long Price	Turnover of the market or sector.
Trades	32	4	UInt32	Number of trades for market or sector.
Daily Foreign Buy Value	36	8	Long Price	Total foreign buy trade value for the day for the market, sector or instrument type.
Daily Foreign Sell Value	44	8	Long Price	Total foreign sell trade value for the day for the market, sector or instrument type.
Market Capitalization	52	8	Long Price	Market Capitalization of the Market or Sector. Will be set to a negative value if the value is not set or withdrawn.

7.9.22 Index

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x62 Index
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Unique identifier of the index.
Index Value	19	4	Price	Index value.

Update Type	23	1	UInt8	**Value** **Meaning** 0 Intra Day 1 Closing 2 Previous Close 3 Indicative 4 High 5 Low
Perctg Diff From Closing	24	4	Price	Percentage difference of the current Index value compared to the Previous Closing index value. This will be set to 0 when the Index Type is Previous Close (2).

7.9.23 AON Info

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x65 AON Info
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol.
Price	19	4	Price	AON Auction Price.
Side	23	1	Byte	**Value Meaning** Buy Order Sell Order
Quantity	24	4	UInt32	Quantity being auctioned.
AON Status	28	1	Alpha	**Value Meaning** A Active C Completed H Halted I Inactive X Cancelled

Date	29	8	Date	Date the auction is being held. This field will contain only spaces if the instrument contains an AON Status of 'Inactive' or 'Cancelled'.

7.9.24 News

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x75 News
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Time	7	8	Time	Time the announcement was published. The time is specified in terms of the local time for the server (i.e. not UTC).
Urgency	15	1	Byte	**Value** **Meaning** 0 Regular 1 High Priority 2 Low Priority
Headline	16	100	Alpha	Headline or subject of announcement.
Text	116	750	Alpha	Text of the announcement.
Instruments	866	100	Alpha	Pipe separated list of symbols of the instruments announcement relates to.
Underlyings	966	100	Alpha	Pipe separated list of symbols of the underlyings announcement relates to.

7.9.25 Update Price Point

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x73 UpdatePrice Point
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol
Sub book	19	1	Bit-Field	**Bit** **Name** **Meaning** 0 Regular 0:No 1: Yes 2 Block Trade[21] 0: No 1:Yes 3 Odd Lot 0: No 1: Yes 4 Early Settlement 0: No 1: Yes 5 Bulletin Board 0:No 1: Yes 6 Default Auction 0: No 1: Yes
Action	20	1	Byte	**Value** **Meaning** **Description** 0 Add Addition of a new price point 1 Change Change to the size of an already published price point
Side	21	1	Byte	**Value** **Meaning** Buy Order Sell Order
Price Level	22	1	UInt8	Price Level of the order. A smaller number will denote a more marketable price point. A Price Level of 0 will denote market orders.
Price	23	4	Price	Limit price of the order. Will be set to 0 if the entry refers to market orders.

Quantity	27	4	UInt32	Total visible size at this price point.
Splits	31	4	UInt32	Number of orders that contribute to this price point. Only the orders with a visible portion will be considered.
Flags	35	1	Bit-Field	**Bit** **Name** **Meaning** 4 Market Order 0: No 1: Yes
Reserved Field	36	1	-	Reserved for future use.

7.9.26 Delete Price Point

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x72 DeletePrice Point
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol
Sub book	19	1	Bit-Field	**Bit** **Name** **Meaning** 0 Regular 0:No 1: Yes 2 Block Trade[22] 0: No 1:Yes 3 Odd Lot 0: No 1: Yes 4 Early Settlement 0: No 1: Yes 5 Bulletin Board 0:No 1: Yes 6 Default Auction 0: No 1: Yes
Side	20	1	Byte	**Value** **Meaning** B Buy Order S Sell Order
Price Level	21	1	UInt8	Price Level that needs to be deleted.

Reserved Field	22	1	-	Reserved for future use.

[21] Even though practically does not make sense for a Trader to subscribe for Top of Book for the Block Trade Order Book, this is still included for consistency purposes.

[22] Even though practically does not make sense for a Trader to subscribe for Top of Book for the Block Trade Order Book, this is still included for consistency purposes.

7.9.27 Top of Book

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x71 Top of Book
Nanosecond	3	4	UInt32	Nanoseconds offset from the last Time message.
Symbol	7	12	Alpha	Instrument's symbol.
Sub Book	19	1	Bit-Field	**Bit** **Name** **Meaning** 0 Regular 0: No 1: Yes 2 Block Trade[18] 0: No 1:Yes 3 Odd Lot 0: No 1: Yes 4 Early Settlement 0: No 1: Yes 5 Bulletin Board 0: No 1: Yes 6 Default Auction 0: No 1: Yes

[18] Even though practically does not make sense for a Trader to subscribe for Top of Book for the Block Trade Order Book, this is still included for consistency purposes.

Action	20	1	Byte	**Value** **Meaning** 1 Update 2 Delete
Side	21	1	Byte	**Value Meaning** B Buy S Sell
Price	22	4	Price	Best price for the particular side.
Quantity	26	4	UInt32	Cumulative visible size at best price. This will be set to zero on a delete action.
Market Order Quantity	30	4	UInt32	Cumulative visible size of market orders.
Reserved Field	34	2	-	Reserved for future use.

8 SEGMENTS

Segment	Description
MBD	Main Board
SBD	Secondary Board
DBD	Default Board
<XXXX>	*<Specify>*
<XXXX>	*<Specify>*

9 OFF-BOOK TRADE TYPES

Trade Type	Description
16	Block Trade
20	Not to Mark
37	Crossed Trade
39	Large in Scale
Space	Trade type not available

10 TRADING HALT REASON CODES

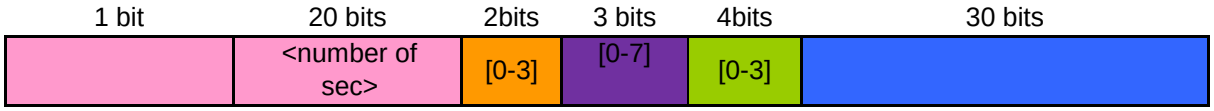
Code	Reason
101	Instrument-level circuit breaker tripped
102	Instrument Status is Halted
<XXXX>	*<Specify>*
9998	Matching partition suspended
9999	System suspended
Space	Reason not available

11 CONVERSION OF ORDERAND TRADE IDENTIFIERS

11.1 Order ID

11.1.1 Order ID format (in binary)

The composition of the binary Order IDs assigned by the market data feed is given below. This Order ID is specified as a Little-Endian encoded unsigned integer.



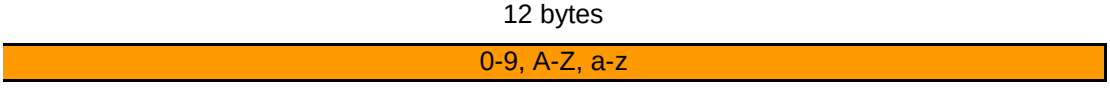
Prefix — The number of 5 ID — Order number — Partition ID — Thread ID — minute intervals ID from Jan 1, 2010)

As indicated above, the Order ID consists of the following fields:

Field	Description
Prefix	O
Start Up Time	Date and time the system was started,which is specified as the number of five minute intervalssince midnight of 1st January 2010 (i.e. in UTC). The number of intervals is expressed as a string of ASCII characters representing base 62 digits
ID	Type of the Identifier **Value Meaning** 2 OrderID
Partition ID	Load ID
Thread ID	Internal load ID
Order Number	Sequence number

11.1.2 Order ID Format (in ASCII)

The composition of the Order IDs assigned by the matching system is given below. This Order ID is specified as ASCII printable characters and will not exceed 12 bytes.



Base 62 encoded order id

The FIX Order ID can be directly converted to MITCH Order ID by using base 62 decoding.

Conversion LogicThe Order IDs assigned by the market data feed are specified as LittleEndian encoded 64 bit unsigned integers.Thelogic used to convert the Order IDassigned by the matching system into the format used by the market data feed is as follows:

- Remove the left most byte (i.e. O of Order ID)
- Convert the rest of the digits to decimal using the base 62 dictionary

  Convert the decimal values to binary

Example

OrderID of Matching System (ASCIIbase 62 characters)	O06WoCOv0Lwq

Step 1: Remove the left most Byte "O" → 06WoCOv0Lwq

Step 2: Convert the rest of the digits to decimal using the base 62 dictionary. Please refer to the base 62 conversion table provided in Section 11.3.

Order ID (ASCII Character)	**Decimal Value**	**Base 62^x**	**Value**	**Multiplied Decimal Value**
q	52	62^0	1	52
w	58	62^1	62	3596
L	21	62^2	3,844	80724
0	0	62^3	238,328	0
v	57	62^4	14,776,336	842251152
O	24	62^5	916,132,832	21987187968
C	12	62^6	56,800,235,584	681602827008
o	50	62^7	3,521,614,606,208	176080730310400
W	32	62^8	218,340,105,584,896	6986883378716672
6	6	62^9	13,537,086,546,263,552	81222519277581312
0	0	62^10	839,299,365,868,340,224	0
Total				**88386187818958884**

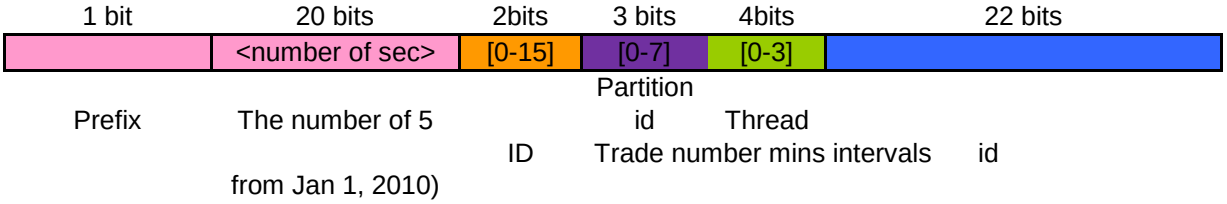
Step 3: Convert the decimal values to binary.

OrderID on Market Data Feed	1001110100000001011000101000000000000000000000000100100

11.2 Trade ID

11.2.1 Trade ID format (in binary)

The composition of the binary Trade IDs assigned by the market data feed is given below. This Trade ID is specified as a Little-Endian encoded unsigned integer.

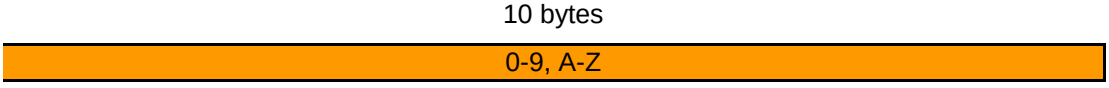


As indicated above, the Trade ID consists of the following fields:

Field	Description
Prefix	**Value** **Meaning** T On-Book Trade N Off-Book Trade
Start Up Time	Date and time the system was started which is specified as the number of five minute intervalssince midnight of 1st January 2010 (i.e. in UTC). The number of intervals is expressed as a string of ASCII characters representing base 62 digits
ID	Type of the Identifier **Value Meaning** 1 TradeID
Partition ID	Load ID
Thread ID	Internal load ID
Trade Number	Sequence number

11.2.2 Trade ID format (in ASCII)

The composition of the Trade IDs assigned by the matching system is given below. This Trade ID is specified as ASCII printable characters.



Base 36 encoded Trade ID

The FIX Trade ID can be directly converted to MITCH Trade ID by using base 36 decoding.

11.2.3 Conversion Logic

TheTrade IDs assigned by the market data feed are specified as Little-Endian encoded 64 bit unsigned integers.Thelogic used to convert the TradeIDassigned by the post trade system into the format used by the market data feed is as follows:

- Remove the left most byte (i.e. T of Trade ID)
- Convert the rest of the digits to decimal using the base 62 dictionary

  Convert the decimal values to binary

Example

OrderID of Post Trade System (ASCII base 62 characters)	T1aNhwVdkv

Step 1: Remove the left most Byte "T" → 1aNhwVdkv

Step 2: Convert the rest of the digits to decimal using the base 62 dictionary. Please refer to the base 62 conversion table provided in Section 11.3.

Trade ID (ASCII Character)	Decimal Value	Base 62^x	Value	Multiplied Decimal Value
v	57	62^0	1	57
k	46	62^1	62	2852
d	39	62^2	3,844	149916
V	31	62^3	238,328	7388168
w	58	62^4	14,776,336	857027488
h	43	62^5	916,132,832	39393711776
N	23	62^6	56,800,235,584	1306405418432
a	36	62^7	3,521,614,606,208	126778125823488
1	1	62^8	218,340,105,584,896	218340105584896
Total				**346464895107073**

Step 3: Convert the decimal values to binary.

Trade ID on Market Data Feed	10011101100011011101001010000000000000000000000001

11.3 Base 62 Mapping Table

0	0	20	K	40	e	60	y
1	1	21	L	41	f	61	z
2	2	22	M	42	g		
3	3	23	N	43	h		
4	4	24	O	44	i		
5	5	25	P	45	j		

6	6	26	Q	46	k
7	7	27	R	47	l
8	8	28	S	48	m
9	9	29	T	49	n
10	A	30	U	50	o
11	B	31	V	51	p
12	C	32	W	52	q
13	D	33	X	53	r
14	E	34	Y	54	s
15	F	35	Z	55	t
16	G	36	a	56	u
17	H	37	b	57	v
18	I	38	c	58	w
19	J	39	d	59	x