



Optimise™

Market Data Interface (MDI)

Programming Manual

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Abstract

This document provides information on business descriptions, programming interfaces and protocols for connecting client applications to ISE's Optimise™ system.

This version is applicable for Optimise v1.6.x.

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1. About This Document

This document is a programmer's reference guide intended to aid in the development and integration of the market data feeds produced by the ISE's trading system. It covers the general business behavior of the market data feeds and the technology standards and techniques employed to provide this service. The most recent version is available at <https://members.ise.com>.

1.1 Optimise™

Optimise is a high-throughput, low-latency trading platform. Optimise offers four interfaces:

1. Direct Trading Interface (DTI): This is the binary trading interface to the core trading system. Members and third party software vendors may develop trading applications that communicate directly to the exchange system.
2. FIX Interface (IORS): This is an industry standard trading interface for sending orders and receiving execution reports in standard FIX ver. 4.2 format.
3. Market Data Interface (MDI): High volume market data are distributed using Multicast (UDP), over high volume data lines or via cross connects at data centers.
4. PrecISE Trade®: ISE's proprietary trader workstation that displays the ISE market prices and provides the full suite of trading functions available from the ISE Exchange.

This document describes the Market Data Interface (MDI).

1.2 Intended Audience

This document is for programmers, analysts, and IT managers who are developing applications to process market data feeds from the ISE's trading system.

1.3 FIX/FAST-Related Documents

The ISE MDI makes use of the FAST protocol (FIX Adapted for STreaming data). Users without prior knowledge of FAST should review these documents.

NOTE: The documents listed below are not under the ISE's control. As documents may be moved, deleted, or updated, we recommend that you navigate to the main FIX Protocol web site at <http://fixprotocol.org> to find the latest documents in the document repository directory.

Table 1: FAST Protocol Documentation

Document	Description	Location
FAST Technical Overview	Explains in detail how FAST successfully presents a solution to the problem of spiraling market data volumes.	http://fixprotocol.org/documents/2801/FIX%20Adapted%20for%20STreaming%20-%20FAST%20Protocol.pdf
FAST Protocol Specification v1.1	Defines the structure and semantics of FAST	http://www.fixprotocol.org/documents/3066/FAST%20Specification%201%20x%201.pdf

Document	Description	Location
Transfer Encoding Specification v1.01	Describes the serialization process used to reduce the size of a data stream	http://www.fixprotocol.org/documents/3062/FAST%2520Transfer%2520Encoding%2520Specification%25201.0.2.pdf
Field Encoding Specification v1.0	Describes field-level operations used to reduce redundant information	http://www.fixprotocol.org/documents/3063/FAST%2520Field%2520Encoding%2520Specification%25201.0.pdf
Basic FAST Users Guide	Describes the proper use of the FAST Protocol in a one-way exchange of data	http://fixprotocol.org/documents/2301/A%20Basic%20Guide%20to%20FAST%20v1.0.pdf
FIX Protocol Version 5.0 SP2 Recommended Book Management Practices	FIX Protocol Standard Specification	www.fixprotocol.org/specifications

1.4 ISE Related Documents

The following are documents related to Optimise.

Table 2: ISE-Related Documentation

Document	Description	Location
Optimise™ Direct Trading Interface (DTI) Programming Manual	Guide to developing trading applications to connect to Optimise	https://members.ise.com
ISE FIX Interface	Guide to developing trading applications to connect to the ISE FIX interface.	https://members.ise.com

2. Introduction

2.1 Available Data Feeds

The feeds available over the MDI consist of market data and reference data.

All data feeds are FAST encoded. All feeds are duplicated using an A/B configuration. Optimise may be configured for multiple markets in which case each market will have its own set of feeds.

- **Depth Of Market (Depth)** – The Depth Feed shows the top five price levels with the aggregated quantity on each level. Customer quantity and Professional Customer quantity are also shown. This feed also contains trading status messages, but not trades.
- **Top Quote (Top Of Book – TOB)** – The Top Quote Feed contains the same Best Bid/Offer quotes and trades information that is sent to OPRA. Customer quantity and Professional Customer quantity, which are not part of OPRA, are also shown. This feed also provides trading state information.
- **Pre-Open** – This feed is similar to Top Quote except that it also provides the quantity of market orders on each side of the book and is only disseminated prior to the opening of the market. This feed is provided so that market makers may align their quotes prior to the opening to resolve any opening imbalance issues.
- **Trade** – The Trade Feed provides trade information for all ISE executed orders.
- **Order** – The Order Feed provides information about orders that did not trade on entry and currently rest on the order book. It also provides information about auctions, including Flash orders, solicitations, facilitations, and PIMs.
- **Spread Feed** – The market data feeds described above —Depth of Market, Top Quote, Pre-Open, Trade, and Order feeds — are segregated by instrument type — simple or complex — and sent out on different multicast addresses. The collection of market data feeds for complex instruments is called the “Spread Feed,” and the descriptions of the discrete feeds within this document serve for both simple and complex instruments. Any specific differences between the simple and complex feed instances will be noted in that feed’s description.
- **Reference Data** – The Reference Data Feed describes all products (Underlyings) and all simple and complex instruments (Series). Each instrument is fully described with internal identifier and OSI Symbol. Each product also defines its internal identifier and has a full description of its trading rules. In addition, the snapshot for each product lists the multicast addresses used by each data feed for that product.

2.2 Overview of the Data Feeds

The ISE market data feeds only provide information about ISE’s markets. They do not contain data from other options exchanges. The information provided in the Top Quote Feed and the top price-level of the Depth Feed contain identical quotes to those provided to OPRA except that “customer quantity” and “professional customer quantity” are not sent to OPRA. The Spread Feed provides quote and order data on complex instruments that are not provided to OPRA.

- The ISE market data service is based on industry and technology standards including Financial Information eXchange (FIX) protocol for business level messaging, FIX Adapted for STreaming (FAST) protocol, and UDP and IPv4 standards for transmission of broadcast data.
- The feeds are distributed over multiple multicast addresses (channels) and the ISE will proactively balance the load across the addresses from day to day. In other words, each Symbol for each product is assigned to a set of addresses that can change from day to day, but not within a trading day.
- The data feeds are multicast over various networks in an A-feed / B-feed format, similar to OPRA.
- There are no recovery channels, nor is it possible to request a retransmission of missed blocks. If you are late to join the data feed or a packet is lost, you must process a complete cycle of the snapshot messages (as defined for each feed) to ensure that the order book data are accurate. The full refresh or complete rotation of the order book for all instruments will take approximately three minutes.
- The messages are defined using the FIX.5.0 SP2 standard for market data, and follow the best practices outlined by the FIX Market Data Working Group. The data are transmitted in the FAST v1.1 encoding method. There are minor deviations from the FIX 5.0 SP2 standards to improve the efficiency of the feeds.

For more information about the FIX and FAST Protocols and specifications, please refer to the FIX Protocol web site: <http://fixprotocol.org/specification> and <http://fixprotocol.org/fast>.

2.3 Hours of Operation

Normal trading hours for the ISE Options market are from 9:30am to 4:00pm Eastern Time (ET) of equity options and from 9:30am to 4:15pm for ETF and Index Options.

The ISE MDI will be available at approximately 6:00am and will continue to broadcast information throughout the trading day. The service will stop broadcasting at approximately 8:00pm.

Table 3: Hours of Operation Schedule

Time	Activity
4:00 a.m.	RefData: the snapshot feed will provide a complete snapshot of all products and instruments at regular intervals. This feed walks through all products and instruments on a constant basis every one minute. Some new instruments and products can be added or changed prior to the opening of the market and intraday.
6:00am	<p>All other data feeds begin.</p> <p>Top Quote and Depth: Market Data Full Refresh messages with no price level information are sent. The Security Trading Status = 21 (pre-open) and will be sent for all instruments every three minutes.</p> <p>Pre-Open: will show the BBO and size of market orders as the book is updated.</p> <p>Order and Trade Feeds will just contain HeartBeat messages.</p>

Time	Activity
9:30am	<p>The market opens and regular trading begins.</p> <p>Top Quote and Depth: An Instrument List Status message is sent as each product is opened. Quote messages are sent with market updates. Snapshots continue every three minutes.</p> <p>Trade messages are sent on the Trade and Top Quote Feeds.</p> <p>Orders that rest on the book and auctions are sent on the Order Feed.</p> <p>No further information is sent on the Pre-Open Feed (HeartBeats only).</p> <p>RefData: incremental feed sends Instrument Incremental Updates as complex and simple Instruments are created. Snapshot feed continues to send snapshots of all products and instruments at regular intervals.</p>
4:00pm/4:15pm	<p>Regular trading ends.</p> <p>Top Quote and Depth: An Instrument List Status message is sent as each product is closed. Snapshot messages continue to be disseminated however all BBO prices are zero.</p> <p>Order and Pre-Open Feeds: No further information is sent (HeartBeats only).</p>
5:31 p.m.	Reference Data Feeds: Continue to provide snapshot information every minute until 5:31 p.m.
8:00pm	All feeds are closed

2.4 Support and Connectivity

ISE support for the MDI is available from 8 am to 6 pm (Eastern Time) on market days and the contacts are as follows:

Table 4: ISE Contact List

ISE Contact List		
Business Issues	212 897-8160	marketdata@ise.com
Technical Support	212 897-0284	computeroperations@ise.com
Market Data Support	212 897-0244, #1	tms@ise.com
Member Connectivity	212 897-0244, #3	connect@ise.com

The ISE market feeds are currently distributed by:

- Activ
- Atrium
- BT Radianz
- Lime
- NYSE
- Option IT
- SAVVIS
- Verizon

Members may use their existing connections to access this data but their routers may need to be upgraded to support multicast data.

3. Data Feed Descriptions

This section provides a description of each data feed. All feeds are defined according to the FIX 5.0 SP2 standard.

- All multicast data are sent in blocks (UDP packets) that do not exceed 1000 bytes:
- The first message in each block is the FAST Reset message.
- The second message in each block is a Block Header message, which contains a block number and timestamp.
- The rest of the block contains the FIX market data messages.

The FIX messages do not have standard headers. The only fields at the start of each message are the message type and sequence number. The Timestamp, Source ID, and version number have been moved into the Header message of each Block to improve efficiency.

Each data feed has its own version of a snapshot and incremental message, defined using specific message formats. The feeds available on the MDI are:

- Depth of Market (Depth)
- Top Quote (Top Of Book—TOB)
- Pre-Open
- Trades
- Order
- Reference Data (RefData)

Except for the Reference Data, the feeds for simple and complex instruments are separated, and sent out on different multicast addresses. As indicated previously, the market data feeds for complex instruments are collectively known as the “Spread Feed.”

A single FIX message may be used for multiple feeds. For example, the Market Data Incremental Refresh is used on both the Trade and the Top Quote Feeds. In this document, and in the FAST template file, messages are assigned discrete, feed-specific names to better describe their purpose.

All feeds are disseminated in duplicate over two multicast addresses as is done for OPRA, and referred to as the A feed and the B feed. The reference data provide the IP/Port addresses of each feed, both A and B, for each product.

3.1 Definitions

Channel: One multicast IP address and port number. For example, 172.2.3.4:200 is one channel.

Stream: A Market data feed can be partitioned over multiple streams depending upon its capacity requirements. For example, the Depth Feed is partitioned over 24 Streams.

Each data stream is sent over two channels in an A/B configuration (like OPRA). For example, Trade is sent over A channel 172.2.3.4:200 and B channel 172.3.3.4:300.

Each market data feed is separated by instrument type: simple instruments and complex instruments. For example, the Top Quote Feed has 16 streams for the simple instruments and

another 16 streams for complex instruments. The number of streams is configurable based on capacity requirements.

Reference data are sent on two separate feeds: a snapshot feed of all products and instruments (simple and complex); and an incremental updates feed which describes products and/or instruments (simple and complex) as they are added or changed intraday.

The IP/Port of each channel for each market data feed is described in the reference data for each product.

3.2 Depth of Market (Depth) Feed

The Depth of Market feed is described below:

- Purpose (page 12)
- Messages (page 12)
- Concepts (page 13)
- Daily Schedule (page 14)
- Depth Snapshot Message (page 14)
- Depth Quote (page 17)
- Instrument Status Messages (page 23)

3.2.1 Purpose

The Depth Feed provides subscribers with the bids and offers at the top five price levels of the order book. All quotes and orders at each price level are aggregated into the total quantity. The quantity of Customer Orders and Customer Professional orders are also supplied in separate fields. Trade data are not present on this feed.

Depth data are only sent while the market is open for trading. The feed will show one level with zero quantity at 0.0 price when the instrument is not trading.

Depth for simple instruments and complex instruments are sent on separate multicast streams.

3.2.2 Messages

The Depth Feed utilizes four (five) messages:

- **Depth Snapshot** is used to send Snapshots and as the heartbeat for the feed
- **Depth Quote** for changes to the quotes within the top 5 price levels
- **Instrument Status** for trading state change of an instrument
- **Instrument List Status** for trading states changes of many instruments in a Product
- **(HeartBeat)** is sent only if no other data exist to indicate activity on an otherwise “dark” feed)

The FIX message types used for each message are:

Table 5: Depth FIX Message Types

Message	FIX Message	Msg Type	Notes
Depth Quote	Market Data Incremental Refresh	X	Used to send new quotes (may update multiple levels)
Depth Snapshot	Market Data Snapshot Full Refresh	W	A snapshot of an Instrument, giving Bid and Ask Quotes for five price levels, Trading Status, and some reference data.
Instrument Status	Security Status	f	Change of Trading Status of one instrument
Instrument List Status	Security Mass Status	CO	Status change of all instruments in a product
(HeartBeat)	(HeartBeat)	(0 (zero))	(Please refer to section 3.4.6)

NOTE: New MDI message type, not part of the current FIX specification, has shaded background.

3.2.3 Concepts

The Depth Feed provides a view of five levels of depth, showing the aggregate quantity of quotes and orders on each price level. Customer quantity and Professional Customer quantity is also shown on each level.

Example: the top five price levels provided in the Depth Feed:

Instrument: IBM 17Jun2011 80 C, Instrument ID 2026, Product ID 427								
Status: – Regular (17)								
Bid					Ask			
Qty Market Orders=-30					Qty Market Orders=100			
Lvl	Price	Qty	Cust	CustProf	Price	Qty	Cust	CustProf
1	0.98	20	10	5	1.00	50	0	10
2	0.97	30	0	10	1.01	30	0	0
3	0.96	10	5	5	1.03	10	5	0
4	0.94	80	40	0	1.05	10	0	0
5	0.93	10	0	10	1.08	10	0	0

There are two differences between the messages in Depth vs. Top Quote:

1. There is a price level field (MDPriceLevel) which controls where each price is to be inserted/changed in the depth display.
2. **Depth Quote** uses update actions “new,” “change,” and “delete” at each price level. TOB Quote uses only “new.”

Snapshots are sent using the **Depth Snapshot** message, and are sent for each instrument at regular three-minute intervals throughout the day. The **Depth Snapshot** message provides a

description of each instrument along with a unique product identifier and instrument identifier, the bid/offer quote (at up to 5 levels), and trading state. The **Depth Snapshot** message does not contain trade information. Snapshot messages are sent in-band.

Changes in trading state are sent using the **Instrument Status** message or the **Instrument List Status** message. The **Instrument Status** message is used when one instrument changes state independently, while the **Instrument List Status** message is used when all instruments in a product change state at the same time—for example, at the open, or at the close.

Once an instrument has opened, updates within any of the top five levels are sent with the **Depth Quote** message.

Quantity fields on the Depth messages provide separate Customer and Customer Professional quantities; as well as total quantity, which includes the Customer and Customer Professional quantities.

The **Depth Snapshot** message contains the Instrument and Product Identifiers, as well as the OSI name. The **Depth Quote** and **Instrument Status** messages have only the product identifier and instrument identifier. Recipients must use the information in the **Depth Snapshot** messages to create a mapping table between the product identifier/instrument identifier to the OSI name. This information can also be obtained from the Reference Data Feed.

Market data are only disseminated on the Depth Feed while the market is open for trading. At other times, the order book is shown to be empty.

3.2.4 Daily Schedule

The Depth Feed is on the same schedule as the Top Quote Feed. Please refer to the **Top Quote, Daily Schedule** section for a complete description.

3.2.5 Depth Snapshot Message

The **Depth Snapshot** message provides a snapshot of an instrument including the Bid and Offer for the top five price levels, and the trading state. This message is sent once every three minutes for every instrument and also serves as the heartbeat for the Depth Feed.

The recipient should process one complete pass of **Depth Snapshot** messages when first connecting for the day. After processing one complete pass, the **Depth Snapshot** can be ignored unless the field *RefreshIndicator* has the value "Y". This is used in the event that a new instrument is added intraday, or a system failure that requires the ISE to send snapshots for all instruments to refresh the order book. It is also set to "Y" when new Complex Instruments are created.

The **Depth Snapshot** message will only show the order book details during regular trading. When an instrument is not in Regular, the snapshot will show an empty book.

3.2.5.1 Message Layout – Depth Snapshot

The following table shows the layout of the **Depth Snapshot** message.

Table 6: Depth Snapshot Message Layout

Tag	Fieldname	Req	Comments
34	MsgSeqNum	Y	
35	MsgType	Y	W = Market Data Snapshot Full Refresh
1022	MDFeedType	Y	PD – Price Depth
1683	MDFeedSubType	Y	F – Depth Snapshot message
1187	RefreshIndicator	Y	Y = Mandatory refresh / N = Process if required (Default)
1300	MarketSegmentID	Y	Unique Product ID
48	SecurityID	Y	Unique Instrument ID
55	Symbol	N	OPRA Root Symbol, only present for simple instruments
201	PutOrCall	N	0=Put, 1=Call Only present for simple instruments
541	MaturityDate	N	YYYYMMDD Only present for simple instruments
202	Strike Price	N	Only present for simple instruments
555	NoLegs	N	Only present for complex instruments
602	> LegSecurityID	Y	
623	> LegRatioQty	Y	
624	> LegSide	Y	1=Buy, 2=Sell
1682	MDSecurityTradingStatus	Y	See SecurityTradingStatus (tag 326)
5292	BidMarketSize	Y	Size of Bid market orders. Use to convey market order quantity on the bid side. Only provided during regular trading or fast market. Default = 0.
5293	AskMarketSize	Y	Size of Ask market orders. Use to convey market order quantity on the ask side. Only provided during regular trading or fast market. Default = 0.
268	NoMDEntries	Y	
269	> MDEntryType	Y	0 = Bid, 1=Offer (Default), J=empty book. J=Empty Book required when switching to regular trading as receivers of the pre-open feed might have left the feed with a non-empty book that became empty during opening.
270	> MDEntryPx	N	Not present if empty book
271	> MDEntrySize	N	Not present if empty book
6709	> MDCustomerSize	N	customer quantity. Default = 0.
6208	> MDSecondaryCustomerSize	N	customer professional quantity. Default = 0.
1023	> MDPriceLevel	N	Price Level

3.2.5.2 Examples

Example of a **Depth Snapshot** sent after the open:

Table 7: Depth Snapshot Message Layout after Open

Tag	Tag Name	Value	Description
34	MsgSeqNum	123056	
35	MsgType	W	Depth Snapshot
1022	MDFeedType	PD	Depth Feed
1683	MDFeedSubType	F	Depth Snapshot message
1187	RefreshIndicator	N	No need to process
1300	MarketSegmentID	427	Unique product identifier
48	SecurityID	2026	Unique instrument identifier
55	Symbol	IBM1	OCC Root Symbol
201	PutOrCall	1	Call
541	MaturityDate	20110614	Expiration date YYYYMMDD
202	Strike Price	80.00	
1682	MDSecurityTradingStatus	17	Regular
268	NoMDEntries	3	
269	> MDEntryType	0	0=bid, 1=offer, or J=empty
270	> MDEntryPx	0.98	
271	> MDEntrySize	20	
6709	> MDCustomerSize	10	Customer
6208	> MDSecondaryCustomerSize	5	Customer Professional
1023	> MDPriceLevel	1	top price level
269	> MDEntryType	0	0=bid, 1=offer, or J=empty
270	> MDEntryPx	0.96	
271	> MDEntrySize	100	
1023	> MDPriceLevel	2	second price level
269	> MDEntryType	1	Offer
270	> MDEntryPx	1.01	
271	> MDEntrySize	100	
1023	> MDPriceLevel	1	top price level on Offer

3.2.6 Depth Quote

Depth Quote messages are used to send changes to any of the top five price levels. The **Depth Quote** contains multiple repeating items, each of which updates one side of one price level. All repeating items in one message relate to the same instrument.

3.2.6.1 Layout

The following table shows the layout of the **Depth Quote** Message.

Table 8: Depth Quote Message Layout

Tag	Fieldname	Req	Comments
34	MsgSeqNum	Y	
35	MsgType	Y	"X" = Market Data Incremental Refresh
1022	MDFeedType	Y	PD – Price Depth
1683	MDFeedSubType	Y	"U" = Incremental depth
1300	MarketSegmentID	Y	Integer Product ID
48	SecurityID	Y	Integer Instrument ID
5292	BidMarketSize	Y	Size of Bid market orders. Use to convey market order quantity on the bid side. Only provided during regular trading or fast market.
5293	AskMarketSize	Y	Size of Ask market orders. Use to convey market order quantity on the ask side. Only provided during regular trading or fast market.
268	NoMDEntries	Y	Default = 1
279	> MDUpdateAction	Y	0 = New, 1 = Change, 2 = Delete, 4 = Delete From
269	> MDEntryType	Y	0 = Bid, 1 = Offer
270	> MDEntryPx	N	Price
271	> MDEntrySize	N	Quantity, not including market orders. Conditionally required for MDUpdateAction = 0 or 1.
6709	> MDCustomerSize	N	Quantity of Customer orders. Conditionally required for MDUpdateAction = 0 or 1. Default = 0.
6208	> MDSecondaryCustomerSize	N	Quantity of Customer Professional orders
1023	> MDPriceLevel	Y	Price Level. Default = 1.

NOTE: This format deviates from the standard—several fields have been moved out of the MDEntries repeating group to improve the efficiency of the message.

The following sections explain how the update action field (*MDUpdateAction*) is used to maintain the view of the book:

3.2.6.2 New Price Level

When a new price level is created in the order book, a **Depth Quote** message is sent with *MDUpdateAction* set to zero ("New"). This indicates:

- That the new price level is to be inserted at the specified price level.
- All existing rows in the order book at this level and lower are to be pushed down. If there were already five price levels then the last level should be deleted.
- There is no explicit instruction to delete the bottom price level when inserting a new price level.

The field *MDPriceLevel* is used to identify which level is being inserted. If set to 1:

- It is to be inserted at the top, regardless of the prices.
- The subscriber's application should check that there are no prices higher than this price level and if they do exist then they should be deleted. This should not happen in normal operation.
- Complex Orders can have market orders residing on the book while the instrument is open for trading.

Example 1: An order creates a new Best Bid:

Initial State of the book:

Instrument: IBM 17Jun2011 80 C, Instrument ID 2026, Product ID 427								
Status: – Regular (17)								
Bid					Ask			
Qty Market Orders=0					Qty Market Orders=0			
Lvl	Price	Qty	Cust	CustProf	Price	Qty	Cust	CustProf
1	0.97	30	15	0	1.00	50	0	0
2	0.94	80	0	10				
3	0.92	60	0	0				
4	0.90	50	0	0				
5	0.88	10	0	0				

A new **Customer** order to Buy 20 @ 0.98 is added to the book.

Tag	Tag Name	Value	Description
35	MsgType	X	Depth Quote
34	MsgSeqNum	123056	
1022	MDFeedType	PD	Depth Feed
1683	MDFeedSubType	U	Depth Quote
1300	MarketSegmentID	427	Unique product identifier
48	SecurityID	2026	Unique instrument identifier

Tag	Tag Name	Value	Description
268	NoMDEntries	1	
279	> MDUpdateAction	"0=New"	New
269	> MDEntryType	0	Bid
1023	> MDPriceLevel	1	Up to 5 levels; 1 = Top
270	> MDEntryPx	0.98	Price
271	> MDEntrySize	20	Total Quantity is 20
6709	> MDCustomerSize	20	

The new row is inserted as Price Level 1 and all subsequent rows are pushed down. The old row number 5 is deleted.

State of the book after the order is entered:

Instrument: IBM 17Jun2011 80 C, Instrument ID 2026, Product ID 427								
Status: – Regular (17)								
Bid					Ask			
Qty Market Orders=0					Qty Market Orders=0			
Lvl	Price	Qty	Cust	CustProf	Price	Qty	Cust	CustProf
1	0.98	20	20	0	1.00	50	0	0
2	0.97	30	15	0				
3	0.94	80	0	10				
4	0.92	60	0	0				
5	0.90	50	0	0				

3.2.6.3 Change Price Level

A **Depth Quote** Message with *MDUpdateAction* equal to one ("Change") indicates:

- A change at a given price level
- All fields on the specified side at the price level should be updated.

Example: An order at the top price level is partially executed:

The quantity of an existing buy order is reduced from 20 contracts to 10.

Tag	Tag Name	Value	Description
35	MsgType	X	Depth Quote
34	MsgSeqNum	123555	
1022	MDFeedType	PD	Depth Feed
1683	MDFeedSubType	U	Depth Quote
1300	MarketSegmentID	427	Unique instrument identifier
48	SecurityID	2026	Unique instrument identifier
1682	MDSecurityTradingStatus	17	Regular
268	NoMDEntries	1	

Tag	Tag Name	Value	Description
279	> MDUpdateAction	1	0 = New, 1 = Change, 2 = Delete, 4 = Delete From
269	> MDEntryType	0	Bid
1023	> MDPriceLevel	1	
270	> MDEntryPx	0.98	Price
271	> MDEntrySize	10	Total Quantity is 10
6709	> MDCustomerSize	10	

State of the book after the order is executed:

Instrument: IBM 17Jun2011 80 C, Instrument ID 2026, Product ID 427								
Status: – Regular (17)								
Bid					Ask			
Qty Market Orders=0					Qty Market Orders=0			
Lvl	Price	Qty	Cust	CustProf	Price	Qty	Cust	CustProf
1	0.98	10	10	0	1.00	50	0	0
2	0.97	30	15	0				
3	0.94	80	0	10				
4	0.92	60	0	0				
5	0.90	50	0	0				

3.2.6.4 Delete Price Level

A **Depth Quote** with *MDUpdateAction* equal to two (“Delete”) is used to delete a price level.

Example: The remaining quantity at the top price level on the Bid is deleted:

A **Depth Quote** is sent to delete Price Level 1 on the Bid side. The message will contain a second item to add the 88c price level back as the new level 5.

Tag	Tag Name	Value	Description
35	MsgType	X	Depth Quote
34	MsgSeqNum	123555	
1022	MDFeedType	PD	Depth Feed
1683	MDFeedSubType	U	Depth Quote
1300	MarketSegmentID	427	Unique product identifier
48	SecurityID	2026	Unique instrument identifier
1682	MDSecurityTradingStatus	17	Regular
268	NoMDEntries	2	
279	> MDUpdateAction	2	Delete
269	> MDEntryType	0	Bid
1023	> MDPriceLevel	1	
270	> MDEntryPx	0.98	Price

Tag	Tag Name	Value	Description
271	> MDEntrySize	10	Total Quantity is 10
6709	> MDCustomerSize	10	
279	> MDUpdateAction	0	Add
269	> MDEntryType	0	Bid
1023	> MDPriceLevel	5	
270	> MDEntryPx	0.88	Price
271	> MDEntrySize	10	Total Quantity is 10

The state of the book after deleting Price Level 1 and adding the new Price Level 5.

Instrument: IBM 17Jun2011 80 C, Instrument ID 2026, Product ID 427								
Status: – Regular (17)								
Bid					Ask			
Qty Market Orders=0					Qty Market Orders=0			
Lvl	Price	Qty	Cust	CustProf	Price	Qty	Cust	CustProf
1	0.97	30	15	0	1.00	50	0	0
2	0.94	80	0	10				
3	0.92	60	0	0				
4	0.90	50	0	0				
5	0.88	10	0	0				

3.2.6.5 Multiple Updates

There can be multiple updates in one message. The bid is updated first, and in a rising market, the bid can overlap the offer before the offer is moved out of the way. The recipient must apply all items in a message before evaluating the resulting book.

NOTE: The Price Level changes as each update is applied within a message. For example, delete Price Level 3, Change Price Level 3:

The first update to delete Price Level 3 will result in row 4 being moved up to row 3.

The next update to change Price Level 3 will result in a change to the new row 3.

Example: Multiple updates

A Market Maker updates its quote

from 15@ 0.97 x 50 @ 1.00 to 50 @ .98 x 50 @ 1.01

A **Depth Quote** message is sent to Delete the current quote and insert the new quote.

Tag	Tag Name	Value	Description
35	MsgType	X	Depth Quote
34	MsgSeqNum	123555	
1022	MDFeedType	PD	Depth Feed

Tag	Tag Name	Value	Description
1683	MDFeedSubType	U	Depth Quote
1300	MarketSegmentID	427	Unique product identifier
48	SecurityID	2026	Unique instrument identifier
268	NoMDEntries	4	
279	> MDUpdateAction	1	1 = Change
269	> MDEntryType	0	Bid
1023	> MDPriceLevel	1	
270	> MDEntryPx	0.97	Price
271	> MDEntrySize	15	Quantity
6709	> MDCustomerSize	15	
279	> MDUpdateAction	0	New
269	> MDEntryType	0	Bid
1023	> MDPriceLevel	1	
270	> MDEntryPx	0.98	Price
271	> MDEntrySize	50	Quantity
279	> MDUpdateAction	2	Delete Price Level
269	> MDEntryType	1	Ask
1023	> MDPriceLevel	1	Price Level 1
270	> MDEntryPx	1.00	Price
271	> MDEntrySize	50	Quantity
279	> MDUpdateAction	0	New
269	> MDEntryType	1	Ask
1023	> MDPriceLevel	1	Price Level 1
270	> MDEntryPx	1.01	Price
271	> MDEntrySize	50	Quantity

The state of the book after changing the quote:

Instrument: IBM 17Jun2011 80 C, Instrument ID 2026, Product ID 427								
Status: – Regular (17)								
Bid					Ask			
Qty Market Orders=0					Qty Market Orders=0			
Lvl	Price	Qty	Cust	CustProf	Price	Qty	Cust	CustProf
1	0.98	50	0	0	1.01	50	0	0
2	0.97	15	15	0				
3	0.94	80	0	10				
4	0.92	60	0	0				
5	0.90	50	0	0				

3.2.6.6 Clear the book

The *MDUpdateAction*, 4 (“Delete From”), is used to clear the book on one side of the book. It is also used to delete the whole book when an instrument goes into Halt.

Example: Clear the book.

The market halts at 16:00. A **Depth Quote** message is sent to clear the book:

Tag	Tag Name	Value	Description
35	MsgType	X	Depth Quote
34	MsgSeqNum	123555	
1022	MDFeedType	PD	Depth Feed
1683	MDFeedSubType	U	Depth Quote
1300	MarketSegmentID	427	Unique product identifier
48	SecurityID	2026	Unique instrument identifier
1682	MDSecurityTradingStatus	21	Pre-Open
268	NoMDEntries	2	
279	> MDUpdateAction	4	4=Delete From – Clear the book from price level
269	> MDEntryType	1	Bid
1023	> MDPriceLevel	1	
270	> MDEntryPx	.98	Price
271	> MDEntrySize	50	
279	> MDUpdateAction	4	4=Delete From –Clear the book from Price level
269	> MDEntryType	2	Ask
1023	> MDPriceLevel	1	
270	> MDEntryPx	1.01	Price
271	> MDEntrySize	50	Total Quantity is 50

3.2.7 Instrument Status Messages

The **Instrument Status** message is sent when a *single* instrument changes state during the day. For example, when quotes are removed from one instrument, or if one instrument is manually halted by Market Operations.

The **Instrument List Status** message is sent when *all* instruments for a product change state at the same time; for example, at the opening or the close. The field *SecurityMassTradingStatus* defines the current state for the instruments. If one or more instruments cannot change state, the **Instrument List Status** message will contain an exception list identifying the instruments that could not change state. The field *SecurityTradingStatus* will define the current state for the excepted instrument(s). As those excepted instruments are handled, the **Instrument List Status** message will be sent with an ever-decreasing exceptions list.

3.2.7.1 Layout – Instrument Status

The following table shows the layout of the **Instrument Status** Message:

Table 9: Instrument Status Message Layout

Tag	Fieldname	Req	Comments
34	MsgSeqNum	Y	
35	MsgType	Y	"f" = Security Status. Instrument state changes (one per instrument).
1300	MarketSegmentID	Y	Unique product identifier
1227	ProductComplex	Y	See Section 8 on page 62 .
48	SecurityID	Y	Unique instrument identifier
326	SecurityTradingStatus	Y	See Section 8 on page 62 .
1174	SecurityTradingEvent	N	6 = Change of Security Trading Status (Default) 100 = Change of Linkage Handling
8642	LinkageHandlingIndicator	N	0 = Linkage Handling Inactive 1 = Linkage Handling Active (Default)

3.2.7.2 Layout—Instrument List Status

The following table shows the layout of the **Instrument List Status** Message:

Table 10: Instrument List Status Message Layout

Tag	Fieldname	Req	Comments
34	MsgSeqNum	Y	
35	MsgType	Y	CO = Security Mass Status
1300	MarketSegmentID	Y	Integer Product ID
1544	InstrumentScopeProductComplex	Y	See Section 8 on page 62 .
1679	SecurityMassTradingStatus	Y	See Section 8 on page 62 .
146	NoRelatedSym	Y	Number of exceptions. Use to convey exception list of instruments. Default = 0.
48	> SecurityID	N	Unique instrument identifier. Req'd if NoRelatedSym > 0.
326	> SecurityTradingStatus	N	See Section 8 on page 62 . Req'd if NoRelatedSym > 0.

NOTE: **Instrument Status** and **Instrument List Status** messages are also sent on the Top Quote Feed.

3.2.7.3 Examples

Example: Market Operations halt one instrument

Tag	Tag Name	Value	Description
34	MsgSeqNum	123770	
35	MsgType	f	Security Status

Tag	Tag Name	Value	Description
1300	MarketSegmentID	427	
1227	ProductComplex	1	
48	SecurityID	2026	
326	SecurityTradingStatus	21	Pre-open

Example: All instruments in IBM open at 9:30am, except one that has an imbalance:

Tag	Tag Name	Value	Description
34	MsgSeqNum	123770	
35	MsgType	CO	Security Mass Status
1300	MarketSegmentID	427	
1544	InstrumentScopeProductComplex	1	
1679	SecurityMassTradingStatus	17	Regular
146	NoRelatedSym	1	
48	> SecurityID	2026	
326	> SecurityTradingStatus	1	Opening Delay

Example: The imbalance is removed and now all instruments are open

Tag	Tag Name	Value	Description
35	MsgType	CO	Security Mass Status
34	MsgSeqNum	123770	
1300	MarketSegmentID	427	
1544	InstrumentScopeProductComplex	1	
1679	SecurityMassTradingStatus	17	Regular
146	NoRelatedSym	0	

3.3 Top Quote Feed

The Top Quote feed is described below:

- Purpose (page 25)
- Messages (page 26)
- Concepts (page 26)
- Daily Schedule (page 27)
- TOB Full Message (page 28)
- TOB Quote (page 30)
- TOB Ticker (page 33)
- Instrument Status Messages (page 34)

3.3.1 Purpose

Top Quote provides subscribers with the ISE Best Bid Offer (BBO) at the top price level of the order book, as well as trades and trading status information.

- All quotes and orders at the top price level are aggregated into the total quantity. The quantity of Customer Orders and Customer Professional orders are also supplied in separate fields.
- Top Quote updates match those sent to OPRA and the top price level of the Depth Feed.
- Top Quote data are sent only when the market is open for trading. The feed will show zero quantity at zero price when the instrument is not trading. See **Section 3.4 Pre-Open Feed** on **page 34** for more information.
- Top Quote for simple instruments and Top Quote for complex instruments are sent as separate streams.

3.3.2 Messages

The ISE Top Quote Feed utilizes five (possibly six) messages:

- **Top Of Book (TOB) Full** is used to send Snapshots and as the heartbeat for the stream
- **Top Of Book (TOB) Quote** for changes to the ISE BBO
- **Top Of Book (TOB) Ticker** for trades
- **Instrument Status** and **Instrument List Status** for trading states
- **(HeartBeat)** is sent only if no other data exist to indicate activity on an otherwise “dark” feed)

The FIX message types used for each message are:

Table 11: Top Quote FIX Message Types

Message	FIX Message	Msg Type	Notes
TOB Quote	Market Data Incremental Refresh	X	quotes
TOB Ticker	Market Data Full Snapshot Refresh	W	Trades
TOB Full	Market Data Full Snapshot Refresh	W	
Instrument Status	Security Status	f	Change of Trading Status of one instrument
Instrument List Status	Security Mass Status	CO	Status change of all instruments in a product
(HeartBeat)	(HeartBeat)	(0 (zero))	(Please refer to section 3.4.6)

NOTE: New MDI message type, not part of the current FIX specification, has shaded background.

3.3.3 Concepts

The Top Quote Feed provides quote, trade, and status information for each Instrument.

An example of the top of the order book provided in the Top Quote Feed:

Instrument: IBM 17Jun2011 80 C, Instrument ID 2026, Product ID 427
Status: – Regular (17)
Trade Information: Last=30@0.97, Open=0.95, High=0.99, Low=0.92, Turnover=2050

Instrument: IBM 17Jun2011 80 C, Instrument ID 2026, Product ID 427							
Bid				Ask			
Qty Market Orders=30				Qty Market Orders =100			
Price	Quantity	Cust	CustProf	Price	Quantity	Cust	CustProf
0.98	20	10	5	1.00	50	10	0

- Snapshots are sent using the **TOB Full** message, and are sent for each instrument at regular intervals throughout the day. The **TOB Full** message provides a description of each instrument along with a unique product identifier and instrument identifier, the bid/offer quote, trading state, and trade information. Snapshot messages are sent in-band.
- Changes in trading state are sent using the **Instrument Status** message or the **Instrument List Status** message. The **Instrument Status** message is used when one instrument changes state independently, while the **Instrument List Status** message is used when all instruments in a product change state at the same time—for example, at the open, or at the close.
- Once an Instrument has opened, updates to the ISE BBO are sent with the **TOB Quote** message. Trades are sent with the **TOB Ticker** message.
- Quantity fields on the Top Quote messages provide separate Customer and Customer Professional quantities, as well as total quantity (which includes the Customer and Customer Professional quantities). The quantities of Bid and Ask Market Orders are provided in separate fields and are *not* included in the total quantity. These are only filled when Market Orders are present (such as during Pre-Open trading state). Market Order quantities are also provided for Complex Instruments, which *can* have Market Orders on the book, unable to trade, during regular trading.
- The **TOB Full** message, only, contains the OSI name. The **TOB Quote**, **TOB Ticker**, and instrument status messages have only the product identifier and instrument identifier. Recipients can use the information in the **TOB Full** messages to create a mapping table between the product identifier/instrument identifier to the OSI name. This information can also be obtained from the Reference Data Feed.
- The ISE BBO is only disseminated while the market is open for trading. At other times, the order book is shown to be empty (zero quantity at zero price). Trade information will be disseminated at all times and can be received before the markets open and after the market has closed.

3.3.4 Daily Schedule

The Top Quote Feed commences each day at 6:00am ET with the dissemination of **TOB Full** messages. The instrument trading status will be “Pre-open” (21). At this point, the **TOB Full** will not have any price information, containing only static data for each instrument.

- All Instruments will receive a **TOB Full** message every three minutes and the messages are spread evenly over the interval.

- The Refresh Indicator will be “Y” on the first snapshot cycle and then it will be set to N in subsequent cycles. It is only set to “Y” when the system is being restarted and when new instruments are being added to the market.
- When the market opens at 9:30am, an **Instrument List Status** message will be disseminated for each product with *Security Mass Trading Status* set to “Rotation” (22). This is the indication that the Primary Market Makers can open the market.
- When a product is rotated, an **Instrument List Status** message will be disseminated with *Security Mass Trading Status* set to “Regular” (17). Occasionally, individual instruments within a product cannot open. The **Instrument List Status** exception list will indicate the status of those instruments and provide further updates as the instruments are opened.
- When all instruments within a product open, an **Instrument List Status** message will be sent where the state is “Regular,” and the number of excepted instruments will be zero.
- Once an instrument is open, the **TOB Quote** message will be disseminated for every BBO change. The MD Update Action is always “New.”
- If a single instrument changes state—for example, it halts because there are no quotes—then an **Instrument Status** message will be sent for that one instrument.
- **TOB Ticker** messages will be sent for each trade. The Open/High/Low fields are also sent on the **TOB Ticker** message.
- When the market closes at either 4:00pm or 4:15pm ET, **Instrument List Status** messages will be sent for each product. (The **Product Snapshot** message on the Reference Data Feed indicates the actual closing time for each product.)
- It is possible to receive **TOB Ticker** messages before the markets open and after the close.
- **TOB Full** messages will continue on the Top Quote Feed, but with bid and offer set to zero, until the feed stops at 8pm.

3.3.5 TOB Full Message

The **TOB Full** message provides a snapshot of an instrument including the bid, offer, last sale, and the trading state. This message is sent once every three minutes for every instrument and also serves as the heartbeat for the Top Quote Feed.

- The recipient should process one complete pass of **TOB Full** messages when first connecting for the day. After processing a complete pass, **TOB Full** may be ignored unless the field *Refresh Indicator* has the value “Y.” This is used in the event of a system failure that requires the ISE to send snapshots for all instruments to refresh the order book, or if a new instrument is added intraday. It is also set to “Y” when new complex instruments are created.
- The **TOB Full** message does not contain the complete definition of the complex instrument. That must be obtained from the Reference Data Feed.
- The **TOB Full** message will only show the order book details during regular trading.

3.3.5.1 Layout

The following table shows the layout of the **TOB Full Message**:

Table 12: TOB Full Message Layout

Tag	Field name	Req	Description
35	MsgType	Y	W = MarketDataSnapshotFullRefresh
34	MsgSeqNum	Y	
1022	MDFeedType	Y	TB – Top-of-Book
1683	MDFeedSubType	Y	F=TOB Full Message
1187	RefreshIndicator	Y	Y = Mandatory refresh N = Process as required
1300	MarketSegmentID	Y	Unique Product ID
48	SecurityID	Y	Unique Instrument ID
55	Symbol	N	OPRA Root Symbol. Only present for simple instruments.
201	PutOrCall	N	0=Put, 1=Call. Only present for simple instruments.
541	MaturityDate	N	YYYYMMDD as a string. Only present for simple instruments.
202	Strike Price	N	
555	NoLegs	N	For Complex Instruments
602	> LegSecurityID	Y	
623	> LegRatioQty	Y	
624	> LegSide	Y	1 = Buy, 2 = Sell
1682	MDSecurityTradingStatus	Y	See SecurityTradingStatus (tag 326)
5292	BidMarketSize	Y	Quantity of contracts at Bid. Use to convey market order quantity on the bid side. Only provided during regular trading or fast market.
5293	AskMarketSize	Y	Quantity of contracts at Ask. Use to convey market order quantity on the ask side. Only provided during regular trading or fast market.
268	NoMDEntries	Y	
269	> MDEntryType	Y	0=Bid, 1=Offer, 2=Trade. “Empty” book indicated with Px=Size=0 (zero price valid for complex instruments).
270	> MDEntryPx	Y	
271	> MDEntrySize	Y	Total quantity
6709	> MDCustomerSize	N	Customer quantity. Default = 0.
6208	> MDSecondaryCustomerSize	N	Professional Customer quantity. Default = 0.
332	> HighPx	N	only present for MDEntryType=2 (Trade)
333	> LowPx	N	only present for MDEntryType=2 (Trade)
1025	> FirstPx	N	only present for MDEntryType=2 (Trade)
1020	> TradeVolume	N	only present for MDEntryType=2 (Trade)

3.3.5.2 Examples

An example of a **TOB Full** message for a Simple Instrument, sent after the open:

Tag	Tag Name	Value	Description
35	MsgType	W	TOB Full
34	MsgSeqNum	123056	
1022	MDFeedType	TB	TOB Feed
1683	MDFeedSubType	F	TOB Full message
1187	RefreshIndicator	N	No need to process
1300	MarketSegmentID	427	Unique product identifier
55	Symbol	IBM1	OCC Root Symbol
201	PutOrCall	1	0=Put 1=Call
541	MaturityDate	20110614	Expiration date YYYYMMDD
202	StrikePrice	80.00	
48	SecurityID	2026	Unique instrument identifier
1682	MDSecurityTradingStatus	17	regular
268	NoMDEntries	3	
269	> MDEntryType	0	Bid
270	> MDEntryPx	0.98	
271	> MDEntrySize	20	
6709	> MDCustomerSize	10	Customer
6208	> MDSecondaryCustomerSize	5	Customer Professional
269	> MDEntryType	1	Offer
270	> MDEntryPx	1.00	
271	> MDEntrySize	50	
6709	> MDCustomerSize	10	Customer
269	> MDEntryType	2	Trade
270	> MDEntryPx	0.99	
271	> MDEntrySize	30	
332	> HighPx	0.99	
333	> LowPx	0.92	
1025	> FirstPx	0.95	
1020	> TradeVolume	2050	

3.3.6 TOB Quote

The **TOB Quote** message is used to send changes to the ISE BBO. The **TOB Quote** can update just the bid, just the offer, or both sides.

NOTE: A quote can move the bid and the offer within one message. The bid is always moved first which can lead to an overlapping market after the bid has been applied. The recipient must process both updates—the bid *and* the offer—before evaluating the updated book.

3.3.6.1 Layout

The following table shows the layout of the TOB Quote Message.

Table 13: TOB Quote Message Layout

Tag	Fieldname	Req	Comments
34	MsgSeqNum	Y	
35	MsgType	Y	"X" = MarketDataIncrementalRefresh
1022	MDFeedType	Y	TB – Top-of-Book
1683	MDFeedSubType	Y	"U" = Incremental depth
1300	MarketSegmentID	Y	Product ID
48	SecurityID	Y	Instrument ID
5292	BidMarketSize	Y	Quantity of contracts at Bid. Use to convey market order quantity on the bid side. Only provided during regular trading or fast market.
5293	AskMarketSize	Y	Quantity of contracts at Ask. Use to convey market order quantity on the ask side. Only provided during regular trading or fast market.
268	NoMDEntries	Y	1-2
279	> MDUpdateAction	Y	Always 0=New
269	> MDEntryType	Y	0 = Bid, 1 = Offer
270	> MDEntryPx	Y	
271	> MDEntrySize	Y	Total Quantity of contracts at price level
6709	> MDCustomerSize	Y	Customer quantity if present
6208	> MDSecondaryCustomerSize	Y	Customer Professional quantity if present

3.3.6.2 Examples:

Example: A new Customer BUY order for 20 @ 0.98 is entered

Tag	Tag Name	Value	Description
34	MsgSeqNum	123765	
35	MsgType	X	
1022	MDFeedType	TB	
1683	MDFeedSubType	U	
1300	MarketSegmentID	427	
48	SecurityID	2026	
22	BidMarketSize	0	
22	AskMarketSize	0	
268	NoMDEntries	1	
279	> MDUpdateAction	0	New
269	> MDEntryType	0	Bid
270	> MDEntryPx	0.98	
271	> MDEntrySize	20	

Tag	Tag Name	Value	Description
6709	> MDCustomerSize	20	

Example: Quotes are updated which changes the bid and offer

Tag Number	Tag Name	Value	Description
34	MsgSeqNum	123765	
35	MsgType	X	
1022	MDFeedType	TB	
1683	MDFeedSubType	U	
1300	MarketSegmentID	427	
48	SecurityID	2026	
22	BidMarketSize	0	
22	AskMarketSize	0	
268	NoMDEntries	2	
279	> MDUpdateAction	0	New
269	> MDEntryType	0	Bid
270	> MDEntryPx	0.99	
271	> MDEntrySize	100	
279	> MDUpdateAction	0	New
269	> MDEntryType	1	Ask
270	> MDEntryPx	1.02	
271	> MDEntrySize	100	

Example: Quotes are removed which removes all prices from offer

Tag Number	Tag Name	Value	Description
34	MsgSeqNum	123768	
35	MsgType	X	
1022	MDFeedType	TB	
1683	MDFeedSubType	U	
1300	MarketSegmentID	427	
48	SecurityID	2026	
22	BidMarketSize	0	
22	AskMarketSize	0	
268	NoMDEntries	2	
279	> MDUpdateAction	0	New
269	> MDEntryType	0	Bid
270	> MDEntryPx	0.98	
271	> MDEntrySize	20	
6709	> MDCustomerSize	20	

Tag Number	Tag Name	Value	Description
279	> MDUpdateAction	0	New
269	> MDEntryType	1	Ask
270	> MDEntryPx	0.0	
271	> MDEntrySize	0	

NOTE: Quantity of zero indicates an empty book, not price. For complex instruments, zero is a valid price.

3.3.7 TOB Ticker

The **TOB Ticker** message is used to send trade information. It is available both on the Top Quote Feed and as a standalone Trade Feed.

3.3.7.1 Layout

The following table shows the layout of the **TOB Ticker** Message.

Table 14: TOB Ticker Message Layout

Tag	Fieldname	Req	Comments
34	MsgSeqNum	Y	
35	MsgType	Y	"W" = MarketDataSnapshotFullRefresh
1022	MDFeedType	Y	TI – Ticker
1300	MarketSegmentID	Y	Integer Product ID
48	SecurityID	Y	Integer Instrument ID
268	NoMDEntries	Y	Always 1
269	> MDEntryType	Y	2=Trade
270	> MDEntryPx	Y	Trade Price
271	> MDEntrySize	Y	Trade Quantity
273	> MDEntryTime	Y	Time of trade
1020	> TradeVolume	Y	Total turnover in this instrument
332	> HighPx	Y	High price for day
333	> LowPx	Y	Low price for day
1025	> FirstPx	Y	Opening price for day
277	> TradeCondition	Y	See Section 8 on page 62 .

3.3.7.2 TOB Ticker Examples

A trade for 30 @ 0.97

Tag	Fieldname	Value	Comments
34	MsgSeqNum	123769	
35	MsgType	W	
1022	MDFeedType	TB	
1683	MDFeedSubType	T	

Tag	Fieldname	Value	Comments
1300	MarketSegmentID	427	
48	SecurityID	2026	
268	NoMDEntries	1	
269	> MDEntryType	2	Trade
270	> MDEntryPx	0.97	
271	> MDEntrySize	30	
273	> MDEntryTime	09:30:01.503	
1020	> TradeVolume	30	
332	> HighPx	0.97	
333	> LowPx	0.97	
1025	> FirstPx	0.97	
277	> TradeCondition	U	See Section 8 on page 62 .

3.3.8 Instrument Status Messages

Instrument Status and **Instrument List Status** messages are sent when instruments change state during the day.

The Top Quote Feed instrument status messages are the same as the Depth Feed. Please refer to the **Depth, Instrument Status Messages** section on **page 23** for a complete description.

3.4 Pre-Open Feed

The Pre-Open feed is described below:

- Purpose (page 34)
- Messages (page 34)
- Concepts (page 35)
- Daily Schedule (page 35)
- Pre-Open Messages (page 35)

3.4.1 Purpose

The Pre-Open Feed is used to provide Market Makers with pre-opening prices so that they can align their quotes prior to the opening rotation. Pre-Open for simple instruments and Pre-Open for complex instruments are sent as separate streams.

Pre-Open for simple instruments is available only to Market Makers.

Pre-Open for complex instruments is available to all.

3.4.2 Messages

The Pre-Open Feed utilizes three messages:

- **Top Of Book (TOB) Full** is used to send pre-open snapshots of the top of the order book
- **Top Of Book (TOB) Quote** for changes, pre-open, to the top of the book
- **HeartBeat** message

The FIX message types used for each message are as follows:

Table 15: Pre-Open FIX Message Types

Message	FIX Message	Msg Type	Notes
TOB Quote	Market Data Incremental Refresh	X	
TOB Full	Market Data Full Snapshot Refresh	W	
HeartBeat	HeartBeat	0 (zero)	

3.4.3 Concepts

The Pre-Open Feed contains messages only for the top price level. Pre-Open messages are sent while an instrument is in “Pre-open” or “Rotation.” Updates will cease as soon as the instrument opens (“Regular”).

Prior to the opening, members will get updates on the Top Quote and Depth Feeds that say that the book is empty, while the Pre-Open Feed will give the actual values in the book.

When an instrument rotates to regular, a final **TOB Full** message, with status set to “Regular,” and showing an empty book, will be sent. Market makers consuming the Pre-Open Feed must discard the book when the instrument changes state to open.

3.4.4 Daily Schedule

The Pre-Open Feed commences at 6:00am ET with the dissemination of **TOB Full** messages. **TOB Quote** messages will be disseminated as the book is updated.

When the market opens at 9:30am ET, message traffic on this stream will cease as instruments are rotated into an open state. Normally, only **HeartBeat** messages will be seen after the open.

Note that if an instrument moves back into a pre-open or rotation state, **TOB Full** and **TOB Quote** messages will again be seen on this feed. After market close (4:00/4:15pm ET), only **HeartBeat** messages will be seen on this feed. The feed closes at 8:00pm ET.

3.4.5 Pre-Open Messages

Please refer to the **Top Quote Feed** section for a description of the **TOB Full** (page 28) and **TOB Quote** (page 30) messages.

3.4.6 HeartBeat Message

The **HeartBeat** message is sent once per minute while the feed is open if nothing else is sent in that minute.

3.4.6.1 Message Layout – HeartBeat

The following table shows the layout of the **HeartBeat** message.

Table 16: HeartBeat Message Layout

Tag	Field Name	Description
35	MsgType	0=HeartBeat
34	MsgSeqNum	The sequence number of the <i>previous</i> FIX message

3.5 Trade Feed

The Trade feed is described below:

- Purpose (page 36)
- Messages (page 36)
- Daily Schedule (page 36)
- Top of Book (TOB) Ticker Message (page 37)
- HeartBeat Message (page 37)

3.5.1 Purpose

The Trade Feed contains only trade information.

There is no snapshot message. In other words, there is no recovery mechanism for the Trade Feed — detected message gaps in the stream cannot be recovered.

Trade for simple instruments and Trade for complex instruments are sent as separate streams.

3.5.2 Messages

The Trade Feed utilizes two messages:

- **Top Of Book (TOB) Ticker** for trades
- **HeartBeat** message

The FIX message types used for each message are as follows:

Table 17: Trade Feed FIX Message Types

Message	FIX Message	Msg Type	Notes
TOB Ticker	Market Data Snapshot Full Refresh	W	Trades
HeartBeat	HeartBeat	0 (zero)	

3.5.3 Daily Schedule

The Trade Feed commences at 6:00am ET. A **HeartBeat** message will be sent every minute to indicate that the feed is active.

When the market opens at 9:30am ET, **TOB Ticker** messages will be sent as trades occur in the market. A **HeartBeat** message will be sent if there are no **TOB Ticker** messages sent within the 60-second HeartBeat interval.

HeartBeat messages will continue to be sent after the market closes, at 4:00pm and 4:15pm ET, and until the feed is closed at 8:00pm ET.

TOB Ticker *may* continue to be sent after market close as post-trade activity occurs.

3.5.4 Top Of Book (TOB) Ticker Message

Please refer to the **Top Quote Feed TOB Ticker** section on **page 33** for a full description of this message.

3.5.5 HeartBeat Message

The **HeartBeat** message is sent once per minute while the feed is open if nothing else is sent in that minute.

Please refer to the **Pre-Open Feed HeartBeat Message** (section 3.4.6.1, **page35**) for a full description of this message.

3.6 Order Feed

The Order feed is described below:

- Purpose (page 37)
- Messages (page 37)
- Concepts (page 38)
- Daily Schedule (page 38)
- Order on Book Message (page 38)

3.6.1 Purpose

The Order Feed advises participants that a new order is now resting on the book. The quantity and price of the new order are disclosed. The Order Feed also announces that a new Auction order is in the market. Auctions orders include Flash, Facilitation, Solicitation, etc., and for PIM auction responses.

NOTE: Auction announcements are only available via the Order Feed; there are no auction order broadcasts through the DTI.

The Order Feed uses the **Order On Book** message to supply the information about each order.

The Order Feeds for simple instruments and for complex instruments are sent as separate streams.

3.6.2 Messages

The Order Feed utilizes two messages:

- **Order On Book** message
- **HeartBeat** message

The FIX message types used for each message are:

Table 18: Order Feed FIX Message Types

Message	FIX Message	Msg Type	Notes
Order On Book	Market Data Snapshot Full Refresh	W	A description of one order.
HeartBeat	HeartBeat	0 (zero)	HeartBeat

3.6.3 Concepts

The purpose of this feed is simply to notify participants that a new order has arrived and is resting on the book. This feed is also used to announce new auction orders (e.g. Flash, Facilitation, Solicitation, etc.), and for PIM auction responses.

- **Order On Book** messages will *not* be sent unless an instrument is open. Once an Instrument has opened, any new orders that arrive and *rest* on the book will result in an **Order On Book** message being sent. The message is sent even if the order is outside the current market.
- **Order On Book** messages are *not* sent for orders that arrive prior to the open; for orders that fill or are canceled on entry; for resting orders that are modified, canceled or traded; or for quotes.
- **This feed cannot be used to build the ISE order book.**
- For Reserve orders, only the **displayed quantity** is disclosed.

3.6.4 Daily Schedule

The Order Feed commences each day at 6:00am ET with **HeartBeats**. Starting at 9:30am ET, **Order On Book** messages are sent for new resting orders as well as new auctions. The **Order On Book** messages continue until each instrument closes. After market close (4:00pm/4:15pm ET), only **HeartBeats** will be sent until the feed closes at 8:00pm ET.

3.6.5 Order On Book Message

The **Order On Book** message is sent for each new order that rests on the order book. Each message describes one order, including price, size, order capacity, and, if the order is an Attributable order, may also disclose the identities of the sending and clearing firms.

For Auctions, many fields may not be disclosed in which case they will not be present in the message. These fields include *MDEntryPrice* and *MDEntrySize*.

All-or-None Orders are shown with *ExecInst=G*.

3.6.5.1 Message Layout – Order On Book

The following table shows the layout of the **Order On Book** Message.

Table 19: Order On Book Message Layout

Tag	Fieldname	Req	Comments
35	MsgType	Y	"W" = MarketDataSnapshotFullRefresh
34	MsgSeqNum	Y	
1022	MDFeedType	Y	OB – Order on Book

Tag	Fieldname	Req	Comments
1683	MDFeedSubType	Y	O=Order, A=Auction
1300	MarketSegmentID	Y	Product ID
48	SecurityID	Y	
555	NoLegs	N	Only present for complex instruments
602	>LegSecurityID	Y	
623	>LegRatioQty	Y	
624	>LegSide	Y	1 = Buy, 2 = Sell
6682	>LegAllocAccount	N	Clearing account (PartyRole 83), if disclosed.
6684	> LegAllocClearingAccount	N	Clearing CMTA firm (PartyRole 4), if disclosed.
268	NoMDEntries	Y	1-3 (Default = 1) More than one entry is only possible for PIM auctions. 3 entries are only possible for PIM auctions w/o disclosure of side.
269	> MDEntryType	Y	0=Bid, 1= Offer (Default), b=Auction Price (Side not disclosed)
270	> MDEntryPx	N	Price/Premium. Not present for market orders or auctions w/o price disclosure
271	> MDEntrySize	N	Quantity. Not present for auctions w/o volume disclosure
40	>OrdType	N	1=Market, 2=Limit Not present for PIM responses.
8522	>AuctionType	N	Present for auction orders. Not present for PIM responses. See Section 8 on page 62 .
276	>QuoteCondition	N	A=Start of auction, B=End of auction
37	>OrderID	N	Identifies the (auction) order. Not present for PIM responses.
110	>MinQty	N	for minimum execution quantity orders
18	>ExecInst	N	G=AON
528	>OrderCapacity	N	See Section 8 on page 62 . Not present for PIM responses.
453	> NoPartyIDs	N	Present only if Parties are disclosed.
448	>> PartyID	Y	
452	>> PartyRole	Y	4=Clearing Firm (CMTA) 59=Member ID 83=Clearing Acct (Give-Up)

3.6.5.2 Examples

An example of an **Order On Book** message for a Limit order during trading:

Tag	Tag Name	Value	Description
35	MsgType	W	TOB Full
34	MsgSeqNum	123056	
1022	MDFeedType	OB	Order Feed
1683	MDFeedSubType	O	Order
1300	MarketSegmentID	427	product identifier
48	SecurityID	2026	instrument identifier
268	NoMDEntries	1	
269	> MDEntryType	1	Ask
271	> MDEntryPx	0.99	
271	> MDEntrySize	20	
6709	> OrderCapacity	C	Customer

An example of a FLASH Auction announcement:

Tag	Tag Name	Value	Description
35	MsgType	W	TOB Full
34	MsgSeqNum	123056	
1022	MDFeedType	OB	Order Feed
1683	MDFeedSubType	A	Auction
1300	MarketSegmentID	427	product identifier
48	SecurityID	2026	instrument identifier
268	NoMDEntries	1	
269	> MDEntryType	"0"	Bid
270	> MDEntryPx	3.60	
271	> MDEntrySize	20	
8522	> AuctionType	3	FLASH auction
276	> QuoteCondition	A	Start of auction
37	> OrderID	"123456789"	identifies the auction order
6709	> OrderCapacity	C	Customer

An example of an ongoing PIM Auction (Side NOT disclosed):

Tag	Tag Name	Value	Description
35	MsgType	W	TOB Full
34	MsgSeqNum	123056	
1022	MDFeedType	OB	Order Feed
1683	MDFeedSubType	A	Auction

Tag	Tag Name	Value	Description
1300	MarketSegmentID	427	product identifier
48	SecurityID	2026	instrument identifier
268	NoMDEntries	3	
269	> MDEntryType	"b"	Auction Price (Side not disclosed)
270	> MDEntryPx	23.75	
271	> MDEntrySize	20	
8522	> AuctionType	12	PIM auction (simple instr.)
6709	> OrderCapacity	C	Customer
37	> OrderID	"123456789"	identifies the auction order
269	> MDEntryType	"0"	Bid
270	> MDEntryPx	23.77	
271	> MDEntrySize	20	
269	> MDEntryType	"1"	Offer
270	> MDEntryPx	23.74	
271	> MDEntrySize	20	

3.6.6 HeartBeat Message

The **HeartBeat** message is sent once per minute while the feed is open if nothing else is sent in that minute.

Please refer to the **Pre-Open Feed HeartBeat Message** (section 3.4.6.1, **page35**) for a full description of this message.

3.7 Reference Data Feed

The Reference Data feed is described below:

- Purpose (page 41)
- Messages (page 42)
- Concepts (page 42)
- Daily Schedule (page 43)
- Product Snapshot Message (page 43)
- Instrument Snapshot (page 45)
- Product Incremental Message (page 46)
- Instrument Incremental Message (page 48)

3.7.1 Purpose

The Reference Data (RefData) Feed continuously streams a complete list of all products and instruments (simple and complex) traded at the ISE.

The RefData is actually sent as two separate feeds:

- The **RefData Snapshot** Feed—provides a continuous cycle of all product and instrument definitions on one-minute intervals.

- The **RefData Incremental** Feed—provides real-time information about products and instruments that are added, changed, or deleted intraday. Note that the change (add/delete) shown on the RefData Incremental feed will appear in the *next* snapshot cycle.

Reference data for simple and complex instruments appear on the *same* feed.

3.7.2 Messages

The RefData feed utilizes seven messages:

3.7.2.1 RefData Snapshot Feed:

- **Product Snapshot**
- **Instrument Snapshot**
- **Start of Snapshot Cycle** which flags the start of the snapshot
- **End of Snapshot Cycle** which flags the end of the snapshot

3.7.2.2 RefData Incremental Feed:

- **Product Instrumental**
- **Instrument Incremental**
- **HeartBeat**

The FIX message types used for each message are as follows:

Table 20: RefData Message Types

Message	FIX Message	Msg Type	Notes
Product Snapshot	Market Definition	BU	
Instrument Snapshot	Security Definition	d	
Start of Snapshot Cycle	<none>	<none>	ISE defined message
End of Snapshot Cycle	<none>	<none>	ISE defined message
Product Incremental	Market Definition Update Report	BV	
Instrument Incremental	Security Definition Update Report	BP	
HeartBeat	HeartBeat	0 (zero)	

NOTE: New MDI message type, not part of the current FIX specification, has shaded background.

3.7.3 Concepts

The RefData Snapshot Feed is a complete snapshot of all reference data (products and instruments) and is sent in a continuous cycle throughout the full day.

- A complete snapshot cycle starts with the **Start of Snapshot Cycle** message, and proceeds with a **Product Snapshot**, followed by an **Instrument Snapshot** for each instrument (simple and complex) for that product. It will then move on to each product in turn until all products and all instruments have been sent. If there are multiple markets, each market will be completed before moving onto the next market. The cycle ends with the **End of Snapshot**

Cycle message, which includes counters indicating the total number of products and instruments sent in that cycle. The next full cycle begins immediately.

- When describing the instruments for a product, simple instruments will be defined first, then the complex instruments. All instruments for a product will be defined before moving on to the next product.
- If products or instruments are added, changed, or deleted intraday, that change is immediately reported on the RefData Incremental Feed, using the **Product Incremental** or the **Instrument Incremental** message, as appropriate.
- The system generates the snapshot messages for *all* products and instruments at the start of the snapshot cycle, which are then disseminated smoothly over the snapshot interval. If a product or instrument is added (changed, deleted) after a snapshot cycle has started, the change will not be reflected in the snapshot until the *next* full cycle.

NOTE: Some reference data are included in the **Top Quote** and **Depth** Feed snapshot messages. Those messages supply minimal, but sufficient data to map the ISE Product and Instrument IDs to regular OSI Symbolology.

3.7.4 Daily Schedule

The RefData Feeds (Snapshot and Incremental) start at 6:00am ET. The RefData Snapshot Feed continuously streams **Product/Instrument Snapshot** messages, bounded by the **Start/End of Snapshot Cycle** messages, until the feeds close at 8:00pm ET.

The RefData Incremental feed will send **HeartBeats**, unless a change is made to the reference data, at which point a **Product Incremental** or **Instrument Incremental**, as appropriate, is sent.

Product/Instrument Incremental messages may be sent at any time.

3.7.5 Product Snapshot Message

A **Product Snapshot** message will provide a complete description of a product including its trading parameters and the market data feed channels over which its instrument market data will be streamed.

Note that Tick Rules, Match Rules, and Auction Rules are defined for each of the Instrument Types (Simple, Combination, and Stock Combination). The Price Step table, for example, has one set of entries for Simple instruments, another set for Combination instruments, and a third set for Stock Combination instruments.

3.7.5.1 Product Snapshot Message Layout

The following table shows the layout of the **Product Snapshot** message.

Table 21: Product Snapshot Message Layout

Tag	Tag Name	Req	Description
34	MsgSeqNum	Y	
35	MsgType	Y	BU = MarketDefinition
1301	MarketID	Y	"XSIX" -- ISO 10383 MIC for the ISE

Tag	Tag Name	Req	Description
1300	MarketSegmentID	Y	Unique Integer Product ID
1396	MarketSegmentDesc	N	Product ID in the legacy OM system
8599	MarketSegmentStatus	Y	1=Active, 2=Inactive
1325	ParentMktSegmID	N	String concatenation of market segment and Bin ID for the product. "IXS" = Primary Options Market Segment "IXT" = Secondary Options Market Segment "IXC" = FX Market Segment
5948	PartitionID	Y	Partition of the product
5949	BinID	Y	Bin of the product
6653	UnderlyingSecurityType	Y	product category, e.g. Stock, ETF, Index
5336	UnderlyingID	N	LegSecurityID for the stock leg of a stock-complex instrument
6426	UnderlyingSymbol	N	Stock symbol
75	TradeDate	Y	Current business date
6254	StartTime	Y	product opens for trading
6255	EndTime	Y	product closes
453	NoPartyIDs	Y	Always 1
448	> PartyID	Y	Primary Market Maker (PMM)
1205	NoTickRules	Y	Price Step (Tick) Table
8596	> TickRuleID	Y	Instrument Type: 1=Simple, 2=Combination, 3=Stock Combination
1206	> StartTickPriceRange	Y	
1207	> EndTickPriceRange	Y	
1208	>TickIncrement	Y	
1235	NoMatchRules	Y	Allocation rules for matching
8597	> MatchRuleID	Y	Instrument Type: 1=Simple, 2=Combination, 3=Stock Combination
1142	> MatchAlgorithm	Y	PT = Price time, PR = Pro-rata
8595	> CustomerPriorityIndicator	Y	0=no priority for customer orders 1=priority for customer orders
8594	NoAuctionRules	Y	
8598	>AuctionRuleID	Y	Instrument Type: 1=Simple, 2=Combination, 3=Stock Combination
8522	>AuctionType	Y	Allowed Auction Types: See Section 8 on page 62 .
1141	NoMDFeedTypes	Y	
1022	> MDFeedType	Y	POS – Pre-Open Simple POC – Pre-Open Complex TBS – Top-of-Book Simple TBC – Top-of-Book Complex TIS – Ticker Simple

Tag	Tag Name	Req	Description
			TIC – Ticker Complex PDS – Price Depth Simple PDC – Price Depth Complex OBS – Order On Book Simple OBC – Order On Book Complex
264	> MarketDepth	N	Number of Price levels if Depth Feed
8590	> MDPrimaryFeedLineID	Y	IP Address A
8591	> MDPrimaryFeedLineSubID	Y	Port number for IP address A
8592	> MDSecondaryFeedLineID	N	IP Address B
8593	> MDSecondaryFeedLineSubID	N	Port number for IP address B

3.7.6 Instrument Snapshot

The Instrument Snapshot message provides a complete description of an instrument.

3.7.6.1 Instrument Snapshot Layout

The following table shows the layout of the **Instrument Snapshot** message.

Table 22: Instrument Snapshot Message Layout

Tag	Tag Name	Req	Description
35	MsgType	Y	"d"=Security Definition
34	MsgSeqNum	Y	
55	Symbol	N	OPRA root Symbol, only present for simple instruments
541	MaturityDate	N	Only present for simple instruments
202	StrikePrice	N	Only present for simple instruments
231	ContractMultiplier	N	contract size, only present for simple instruments
201	PutOrCall	N	0=Put, 1=Call. Only present for simple instruments.
206	OptAttribute	N	Only present for simple instruments
48	SecurityID	Y	Unique binary Integer Identifier for lifetime of the instrument
1227	ProductComplex	Y	Default = 1. See Section 8 on page 62 .
167	SecurityType	N	MLEG, only present for complex instruments
762	SecuritySubType	N	Vertical Calendar Straddle Strangle Other Non-Std — Only present for complex instruments
965	SecurityStatus	Y	1 = Active (default) 2 = Suspended 3 = Active, closing orders only

Tag	Tag Name	Req	Description
			4 = Expired 5 = Delisted
947	StrikeCurrency	N	<ISO 4217 values>
1194	ExerciseStyle	N	0=European, 1=American (default)
864	NoEvents	N	1 (deactivation time)
865	> EventType	N	6=Inactivation
866	> EventDate	N	last trading day
1145	> EventTime	N	last point in time for trading (for FX options)
711	NoUnderlyings	N	Information about deliverable
311	> UnderlyingSymbol	Y	
246	> UnderlyingFactor	Y	
973	> UnderlyingCashAmount	N	
318	> UnderlyingCurrency	N	<ISO 4217 values>
555	NoLegs	N	Used to describe complex instruments
602	> LegSecurityID	Y	instrument identifier of leg
623	> LegRatioQty	Y	
624	> LegSide	Y	1=Buy, 2=Sell
1310	NoMarketSegments	Y	Always 1 (instrument is associated with only a single product)
1300	> MarketSegmentID	Y	product identifier

3.7.7 Product Incremental Message

The Product Incremental message is sent if a new product is added, or an existing product is changed or deleted.

3.7.7.1 Format

The following table shows the layout of the **Product Incremental** message.

Table 23: Product Incremental Message Layout

Tag	Tag Name	Req	Description
35	MsgType	Y	BV = Market Definition Update Report
34	MsgSeqNum	Y	
1395	MarketUpdateAction	Y	A=Add, M=Modify, D=Delete
1301	MarketID	Y	XSIX
1300	MarketSegmentID	Y	Product ID
1396	MarketSegmentDesc	N	
8599	MarketSegmentStatus	Y	1=Active, 2=Inactive
1325	ParentMktSegmID	N	Concatenation of market segments above product
5948	PartitionID	N	Partition Number of Product
5949	BinID	N	Bin Assigned to this Product

Tag	Tag Name	Req	Description
6653	UnderlyingSecurityType	N	product category, e.g., Stock, ETF, Index (text field)
5336	UnderlyingID	N	LegSecurityID for the stock leg of a stock-complex instrument
6426	UnderlyingSymbol	N	Stock symbol
75	TradeDate	N	Current business date in the system
6254	StartTime	N	Product opens for trading
6255	EndTime	N	Product closes
453	NoPartyIDs	Y	1 – to specify Primary Market Maker
448	> PartyID	Y	Primary market maker mnemonic (role 66)
1205	NoTickRules	N	the Price Step table
8596	> TickRuleID	Y	Instrument Type (Simple, Combination, w/Stk)
1206	> StartTickPriceRange	Y	
1207	> EndTickPriceRange	Y	
1208	> TickIncrement	Y	
1235	NoMatchRules	N	Allocation rules for matching
8597	> MatchRuleID	Y	Instrument Type
1142	> MatchAlgorithm	Y	PR= Pro-Rata, PT= Price Time
8595	> CustomerPriorityIndicator	Y	0=no priority, 1=Priority
8594	NoAuctionRules	N	
8598	> AuctionRuleID	Y	Instrument Type
8522	> AuctionType	Y	See Section 8 on page 62 .
1141	NoMDFeedTypes	N	
1022	> MDFeedType	Y	<ul style="list-style-type: none"> ▪ POS – Pre-Open Simple ▪ POC – Pre-Open Complex ▪ TBS – Top-of-Book Simple ▪ TBC – Top-of-Book Complex ▪ TIS – Ticker Simple ▪ TIC – Ticker Complex ▪ PDS – Price Depth Simple ▪ PDC – Price Depth Complex ▪ OBS – Order On Book Simple ▪ OBC – Order On Book Complex <p>POS is only available for market maker whereas POC is public</p>
264	> MarketDepth	N	Use for price depth feeds of book data
8590	> MDPrimaryFeedLineID	Y	IP Address A
8591	> MDPrimaryFeedLineSubID	Y	Port number for IP address A
8592	> MDSecondaryFeedLineID	N	IP Address B
8593	> MDSecondaryFeedLineSubID	N	Port number for IP address B

3.7.8 Instrument Incremental Message

The Instrument Incremental message is sent if a new instrument is added, or an existing instrument is changed or deleted.

3.7.8.1 Format

The following table shows the layout of the **Instrument Incremental** message.

Table 24: Instrument Incremental Message Layout

Tag	Tag Name	Req	Description
35	MsgType	Y	"BP"=SecurityDefinitionUpdateReport
34	MsgSeqNum	Y	
980	SecurityUpdateAction	Y	▪ A = Add, M = Modify, D = Delete
55	Symbol	N	OPRA root Symbol, only for simple instruments
541	MaturityDate	N	Only present for simple instruments
202	StrikePrice	N	Only present for simple instruments
231	ContractMultiplier	N	contract size, only present for simple instruments
201	PutOrCall	N	0=Put, 1=Call
206	OptAttribute	N	Only present for simple instruments
48	SecurityID	Y	Binary ID for the lifetime of the instrument
1227	ProductComplex	N	See Section 8 on page 62 . Only present for complex instruments.
167	SecurityType	N	MLEG, only present for complex instruments
762	SecuritySubType	N	Vertical Calendar Straddle Strangle Other Non-Std — Only present for complex instruments
965	SecurityStatus	N	1 = Active (default) 2 = Suspended 3 = Active, closing orders only 4 = Expired 5 = Delisted
947	StrikeCurrency	N	<ISO 4217 values>
1194	ExerciseStyle	N	0=European, 1=American
864	NoEvents	N	deactivation time
865	> EventType	N	6=Inactivation
866	> EventDate	N	last trading day
1145	> EventTime	N	last point in time for trading (for FX options)
711	NoUnderlyings	Y	
311	> UnderlyingSymbol	Y	

Tag	Tag Name	Req	Description
246	> UnderlyingFactor	Y	
973	> UnderlyingCashAmount	N	
318	> UnderlyingCurrency	N	<ISO 4217 values>
555	NoLegs	N	Used to describe complex instruments
602	> LegSecurityID	Y	
623	> LegRatioQty	Y	
624	> LegSide	Y	1=Buy, 2=Sell
1310	NoMarketSegments	Y	Instrument is associated with only a single product
1300	> MarketSegmentID	Y	Product ID

3.7.9 HeartBeat Message

The **HeartBeat** message is sent once per minute while the feed is open if nothing else is sent in that minute.

Please refer to the **Pre-Open Feed HeartBeat Message** (section 3.4.6.1, **page35**) for a full description of this message.

4. FAST Message Decoding

4.1 Introduction

All of the ISE data feeds utilize FAST encoding to provide efficient delivery of the market data messages. The FAST encoder at ISE will encode the data according to the FAST v1.1 specification. The recipient must use a FAST v1.1 decoder to decode the data feed. **Section 1.3 FIX/FAST-Related Documents** on **page 6** contains references to the FAST specification on the FIXProtocol.org website.

On receipt of a UDP packet by the subscriber's application, the byte stream must be decoded.

A UDP packet will contain one or more FAST messages. The first message in each packet is a FAST Reset (Message ID = 120) which will reset the FAST dictionaries. Values are not cached across UDP packets.

The ISE implementation of FAST utilizes the following FAST data types:

- decimal
- length
- string
- Int32/Int64
- UInt32/UInt64
- Byte Vector

The ISE implementation of FAST utilizes the following FAST operators:

- constant
- copy
- default
- delta
- increment
- tail

Which can be combined with the following Attribute:

- Presence=optional

The ISE implementation will cache values within a UDP packet in the global dictionary and in the dictionary for each template. The Template file specifies which dictionary cache to use.

The maximum UDP packet size contains up to 1000 bytes of application data.

Messages may contain both optional groups and repeating groups.

5. FAST Message Formats

5.1 Introduction

This section describes messages not described in **Section 3**. **If there are discrepancies between this document and the ISE's FAST template file, please conform to the template file.** The purpose of this section is to add additional information to that supplied in the template file.

5.2 FAST Reset Message

5.2.1 Purpose

This message is used to clear the data cache. This message is the first message in each UDP packet.

5.2.2 Format

The FAST reset message has only the presence map followed by the template ID. The message does not contain any data fields. The ISE Template file does not contain a template for the FAST Reset Message.

5.2.3 Example

The following is a hex dump of a reset message.

| RESET |

1) C0 F8

5.3 Block Header Message

5.3.1 Purpose

The Block Header message will contain a Block Sequence number, Sending Time, and other fields normally found in the FIX message header. For performance reasons, some fields have been moved from each FIX message header to the Block header message, such as the timestamp.

Each network block will begin with a Reset message, followed by a Block Header Message.

The fields in the header record are sent as Byte vectors so that they occupy the same byte positions in every block. The fields always have the same length as described below.

The header record contains some information about the environment producing the data feed. Exchange is always "I" for ISE. Area is "P" or "S" for Production or Simulation. Environment is used when there are multiple test systems and has a value 1 to 99. Member Test-1 is 33, Member Test 2 is 34. Production will use environment number 1.

Time is only sent once in each header record. It is expressed as milliseconds since the Unix epoch (1/1/1970).

For example, the Byte Vector 88 00 00 01 2B 82 8A D9 0B is translated to: Tue Oct 12 14:29:25.115 EDT 2010.

The comments below describe the Byte positions within the UDP packet at which the field can be found without decoding the packet.

5.3.2 Format

The template for the Block Header has the following format:

Table 25: Block Header Message

Template ID = 1 Block Header						
Field Name	Tag	Req	Data Type	Field Encoding	Bytes	Comment
MsgPartition		Y	uint32	Byte Vector	4	Partition number (1 to 99), found at byte 9 (offset 8) of the <u>packet</u>
SequenceNumber		Y	uint32	Byte Vector	4	Block sequence number, found at bytes 11 – 14 (offset 10) of the <u>packet</u>
Exchange		Y	String	Byte Vector	1	value = "I", found at byte 16 (offset 15) of the <u>packet</u>
Area		Y	String	Byte Vector	1	P=Production / S=Simulation, found at byte 18 (offset 17) of the <u>packet</u>
Environment		Y	uint32	Byte Vector	4	Production is 1 (one), Member test is 33 or 34; found at byte 20 (offset 19) of the <u>packet</u>
SendingTime		Y	uint64	Byte Vector	8	ms from 1/1/1970, found at bytes 25 – 32 (offset 24) of the <u>packet</u> .

5.3.3 Example

The following example shows the start of a UDP packet. It begins with the FAST reset message, followed by the Block Header message. This is then followed by other application messages. The fields in the Header record will always occupy the same positions within the UDP packet. The data fields from the header record, as described above, are highlighted in the following example.

0000h: C0 F8 C0 81 84 00 00 00 **01** 84 **00 01 F0 D2** 81 **49**

0010h: 81 **53** 84 00 00 00 **21** 88 **00 00 01 2B 82 8A D9 0B**

5.4 HeartBeat Template

5.4.1 Purpose

The HeartBeat template is used for the **HeartBeat** message.

5.4.2 Format

The template for the **HeartBeat** message has the following format:

Table 26: HeartBeat Template

Template ID = 10 HeartBeat					
Field Name	Tag	Data Type	Field Encoding	Max Bytes	Comment
MsgType	35	String	Constant	1	Value "0" (zero) = HeartBeat
MsgSeqNum	34	uint32	None	4	

5.5 Sequence Number Reset Template

5.5.1 Purpose

The **Sequence Number Reset** message defines the next sequence numbers to expect on a block level and on a message level.

5.5.2 Format

The template for the **Sequence Number Reset** message has the following format:

Table 27: Sequence Number Reset Template

Template ID = 11 Sequence Number Reset					
Field Name	Tag	Data Type	Field Encoding	Max Bytes	Comment
MsgType	35	String	Constant	1	Value "4" = Sequence Reset
MsgSeqNum	34	uint32	Constant	1	Always set to 1
NewSeqNum	36	uint32	Constant Optional	1	Always set to 1
BlockSeqNum	6591	uint32	Constant Optional	1	Always set to 1

5.6 Start of Snapshot Cycle

5.6.1 Purpose

The Start of Snapshot Cycle template is used for the Start of Snapshot Cycle message. This message is sent on the Reference Data Snapshot Feed at the start of each pass. This message indicates the start of a snapshot cycle and gives the time at which all messages in the snapshot were prepared. It also provides the sequence number of the last Incremental message sent on the Reference Data Incremental Feed.

5.6.2 Format

The template for the **Start of Snapshot Cycle** message has the following format:

Table 28: Start of Snapshot Cycle Template

Template ID = 16 Start of Snapshot Cycle					
Field Name	Tag	Data Type	Field Encoding	Max Bytes	Comment
MsgSeqNum	34	uint32	Increment	4	
LastMsgSeqNumProcessed		uint32	None	4	
SnapshotCreationTime		uint64	None	8	

5.7 End of Snapshot Cycle

5.7.1 Purpose

The End of Snapshot Cycle template is used for the **End of Snapshot Cycle** message.

5.7.2 Format

The template for the **End of Snapshot Cycle** message has the following format:

Table 29: End of Snapshot Cycle Template

Template ID = 17 End of Snapshot Cycle					
Field Name	Tag	Data Type	Field Encoding	Max Bytes	Comment
MsgSeqNum	34	uint32	Increment	4	
SnapshotCreationTime		uint64	None	8	
NumOfProducts		uint32	None	2	
NumofInstruments		uint32	none	4	

6. Message Recovery

6.1 Introduction

This section discusses how messages can be recovered. The MDI transmits market data using UDP. The advantage of this type of transmission is the very low latency; however, there is no guarantee that all messages will be delivered. It is possible that network routers can join or split packets and even cause them to arrive out of sequence.

The data are sent in blocks such that the application data do not exceed 1000 bytes.

NOTE: This will reduce the chance that a block is split into multiple network packets, although it does not remove this risk entirely.

Each block begins with a four-byte sequence number so that the recipient can detect missing blocks (for more information, see Block Sequence Number in the [Block Header message](#)). Each data feed is split over a number of IP addresses. ISE has a number of matching engine partitions. Each block comes from just one partition and the partition number is specified within the block header.

Example

Matching Engine (ME) partitions one through four may be on IP address 1. The block sequence numbers for blocks from ME-1 will start at one and increment throughout the day. Blocks from ME-2 will also start at one and increment throughout the day. It is possible that blocks from ME-2 appear on multiple IP addresses in which case they will update separately. The blocks from ME-2 on IP-1 will start from one and increment throughout the day, and the blocks from ME-2 on IP-2 will also start from one.

In the event that a block is missed on the A feed, it might be possible to recover the block from the B feed. If it is not possible to recover the block, then you must re-initialize the feed using the in-band snapshot data.

6.2 In-Band Recovery

The Top Quote feed, for example, sends incremental changes using the **TOB Quote** message. In the event that a message is lost, the recipient must initialize the current state of every instrument on that feed using the **TOB Full** messages.

The snapshot messages are sent on a continual basis, and do a complete cycle of all instruments every three minutes. Changes to the book are never sent using the snapshot messages; they always reflect the state of the book as of the last incremental message.

Once the recipient has processed a complete cycle of snapshot messages upon connection to the feed, further snapshot messages can be ignored. The snapshot messages account for less than 5% of the total bandwidth on each feed.

When joining a data feed, the recipient must first process the snapshot messages. Once processed, a snapshot for an instrument, the recipient may then begin to process incremental messages for

that instrument. Once the recipient gets a snapshot for a known instrument, you have processed a complete cycle of snapshots and you can then ignore further snapshot messages.

A snapshot may be received with the *RefreshIndicator* set to "Y." This indicates that this snapshot message must be processed. The *RefreshIndicator* will be set to "Y" at the start of the day, when an Instrument is added intra-day, or in the case of a failover to a backup server at ISE.

6.3 Out-Of-Band Recovery

The Reference Data (RefData) Feed is sent as two feeds, the RefData Snapshot Feed, and the RefData Incremental Feed.

The Snapshot Feed provides a complete snapshot of all reference data (products and instruments) at regular intervals throughout the day. Any changes to the reference data (additions, changes, deletes) are broadcast in real-time over the RefData Incremental Feed.

When joining the RefData Feed, the recipient must listen to the RefData Incremental Feed *before* listening to the RefData Snapshot Feed, and coordinate received incremental messages with the snapshot cycle.

In other words, snapshot messages represent a static point in time while incremental messages represent real-time. A message received on the Incremental Feed before the **End of Snapshot Cycle** message on the Snapshot Feed indicates a reference data change that is *not* part of that snapshot cycle—the recipient must hold, and apply that change once the complete snapshot has been processed.

Once the recipient has processed a complete snapshot cycle (with any received incremental messages), it is no longer necessary to listen to the RefData Snapshot Feed—the RefData Incremental Feed provides all necessary updates.

If an incremental message is lost, the recipient *must* again listen to the Snapshot Feed and process a full snapshot cycle (with any received incremental messages). The full snapshot cycle will take approximately three minutes.

6.4 Backup Feed Recovery

ISE sends each data feed on two Multicast addresses, the A-feed and the B-feed. Members can receive the A-feed, or the B-feed, or both. Recipients should process both feeds and discriminate between the two by always taking the next data block from whichever feed provides it first.

7. Communications

7.1 Bandwidth Requirements

The following are **estimates** of the required bandwidth for each feed in the MDI. Data volumes are not expected to change from those required for the existing market data feeds. There may be growth due to changes in the market including the addition of new exchanges. The continued migration to pennies could cause a significant increase in bandwidth requirements.

These specifications provide for 100% headroom based on the peak data rates as of August 2010 (See **Section 6 Message Recovery** on **page 55**).

All PMMs and 10-bin CMMs are **required** to have two data lines:

- A line to the primary data center in Secaucus, New Jersey
- A line to the backup data center in Clifton, New Jersey

All Market Data Feeds can be combined onto the same data lines, and used for FIX interface, Direct Trading Interface and PrecISE Trade.

Table 30: Bandwidth Requirements

Feed	A Stream Requirements	B Stream Requirements
Top Quote Feed	200 Mb	200 Mb
Depth of Market Feed	500 Mb	500 Mb
Order Feed	5Mb	5Mb
Pre-Open Feed	10Mb	10Mb
Reference Data	30Mb	30Mb
Spread Feed	25Mb	25Mb
Trade Feed	5Mb	5Mb

Note: There is no primary stream as the same server sends both A and B feeds.

The contacts for support and connectivity are as follows:

Table 31: NYSE Euronext Advanced Trading Solutions Contact Information

Activ Financial		
Department	Phone	Email
Sales	212-599-1600	sales@activfinancial.com
Support	212-964-2600	mailto:clientservices@activfinancial.com

Table 32: NYSE Euronext Advanced Trading Solutions Contact Information

Atrium Networks		
Department	Phone	Email
Sales	212 387-2178	Contact-us@atriumnetwork.com
Support	212 387-2179	support@atriumnetwork.com

Table 33: Support and Connectivity Contact Information

BT Radianz Inc.	Phone	Email
Pam Friedberg	212 205-1895	pam.friedberg@bt.com
Support	877 882-1497	

Table 34: NYSE Euronext Advanced Trading Solutions – SFTI Contact Information

NYSE Technologies - SFTI (Secure Financial Transaction Infrastructure)		
Department	Phone	Email
Sales-Mike Misiaszek	212 510-3614	mmisiaszek@nyx.com
Support	800 873-7422	SFTI@SIAC.com

Table 35: NYSE Euronext Advanced Trading Solutions – SFTI Contact Information

NYSE Technologies – SuperFeed		
Department	Phone	Email
Sales-Mike Misiaszek	212 510-3614	mmisiaszek@nyx.com
Support	800 873-7422	SFTI@SIAC.com

Table 36: NYSE Euronext Advanced Trading Solutions – SFTI Contact Information

SAVVIS Financial Services		
Department	Phone	Email
Sales	800 463-8294	teamise@savvis.net
Support	800 639-6771	

Table 37: NYSE Euronext Advanced Trading Solutions Contact Information

Verizon Financial Networking		
Department	Phone	Email
Sales-Rhonda Grief	914 312 6082	Rhonda.gried@verizonbusiness.com
Support	800 825-9196	financialnetworking@lists.verizonbusiness.com

For additional information, please send email to MDI@ise.com.

The ISE market data feeds are currently distributed by a number of managed service providers. These providers use advanced telecommunications protocols, and designed to support a number of industry-standard protocols including IP and UDP as defined by the Internet Engineering Task Force (IETF). We expect additional extranet providers to distribute this data.

The ISE market data feeds are disseminated using multicast via two redundant lines (A and B) intended to provide a level of fault tolerance.

7.2 Transmission Standards

The market data service feed utilizes IP version 4 (IPv4) over UDP and Ethernet standards. The figure below illustrates the header information as defined in IETF RFC 791 (IPv4) and RFC 768 (UDP) transmission protocol standards.

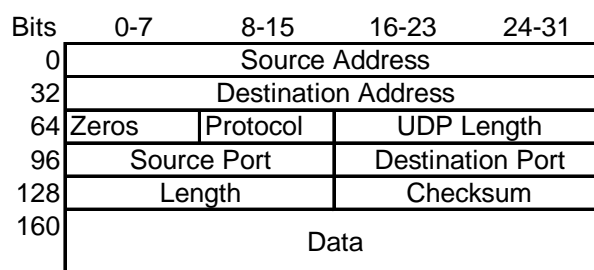


Figure 1 : UDP Header

One or more FAST encoded FIX.5.0 SP2 messages may be included in a single UDP packet.

7.3 Failover

The architecture of the market data service is that our primary datacenter (Equinix) will be the source of all feeds. Each market data server will output all feeds. Our disaster recovery data center (TelX) will have the WAN ability to disseminate market data sourced from Equinix (via an ISE cross-site). Only in the event of a disaster will market data be sourced from hosts / systems physically located in TelX.

7.3.1 Sequencing

Sequencing is the responsibility of a single server (primary and backup configuration). In the event of a server failure, a delay of several seconds may occur while the backup server resumes operation. In this instance, snapshot messages of all instruments will be sent before the updates resume. These snapshots could include state changes of the book that have not been included in update messages, and must be processed by client systems to assure data integrity. The full refresh of the order book will take approximately every three minutes.

When there has been a failure in the service at ISE, the *RefreshIndicator* field in the message will be set to "Y". Setting *RefreshIndicator* to "Y" indicates that the subscriber should discard the contents in the order book completely and replace it with the contents of this snapshot message. The *RefreshIndicator* field will also allow the subscriber to only process snapshots that are set to "Y" once the market is open.

7.4 Testing IP Groups

7.4.1 How to access the MDI in Member Simulation

The MDI will disseminate market data and reference data over a multicast network. As market and reference data will not be provided through the DTI, all DTI users must use the MDI as well.

The ISE will disseminate the following feeds in the member simulation environment.

All market participants will be entitled to receive all market and reference data streams.

Similar to the DTI, member simulation market and reference data can be received using modified lines to the current data center or Internet VPN.

The following tables provide the multicast IP-addresses used for the different feeds, depending on the type of connection used.

NOTE: Except for the Reference Data feeds, the third digit of the feed port number identifies the system partition: For example, the Order Feed for products in MT1, partition 2 is on channel 233.104.73.148:53250. For complete accuracy, please refer to the Product snapshot message for the correct channels.

7.4.2 Member Test 1 (MT1) Environment

Table 38: MT1 multicast IP-addresses and ports

			Primary (A Feed)	Secondary (B feed)
			Source:207.231.198.65 or	Source:207.231.198.65 or
Feed Name	Ports		66 or 67	66 or 67
Reference Data Feed	Snapshot	53150	224.0.75.1	224.0.75.7
	Incremental	53151		
Depth of Market Feed	53150 53250		224.0.75.4	224.0.75.8
Top Quote Feed	53150 53250		224.0.75.4	224.0.75.9
Trade Feed	53151 53251			
Pre-Open Feed	53150 53250		224.0.75.4	224.0.75.10
Order Feed	53150 53250		224.0.75.4	224.0.75.11

Feed Name		Ports	Primary (A Feed)	Secondary (B feed)
			Source:207.231.198.65 or 66 or 67	Source:207.231.198.65 or 66 or 67
Spread Feed	Depth	53150 53250	224.0.75.6	224.0.75.12
	Top Quote	53151 53251		
	Order	53152 53252		
	Trade	53153 53253		
	Pre open	53154 53254		

7.4.3 Member Test 2 (MT2) Environment

Table 39: MT2 multicast IP-addresses and ports

Feed Name		Ports	Primary (A Feed)	Secondary (B feed)
			Source:207.231.198.75 or 76 or 77	Source:207.231.198.75 or 76 or 77
Reference Data Feed	Snapshot	53150	224.0.75.65	224.0.75.71
	Incremental	53151		
Depth of Market Feed		53150 53250	224.0.75.66	224.0.75.72
Top Quote Feed		53150 53250	224.0.75.67	224.0.75.73
Trade Feed		53151 53251		
Pre-Open Feed		53150 53250	224.0.75.68	224.0.75.74
Order Feed		53150 53250	224.0.75.69	224.0.75.75
Spread Feed	Depth	53150 53250	224.0.75.70	224.0.75.77
	Top Quote	53151 53251		
	Order	53152 53252		
	Trade	53153 53253		
	Pre open	53154 53254		

8. Field Descriptions

The following table, ordered by field name, describes some of the possible values of some fields. Additional values for standard FIX fields may be found at fixprotocol.org.

Tag	Name	Type	Possible Values/Notes
8522	AuctionType	String	Simple Instruments: "1"=Block "2"=Directed Order "3"=Flash "6"=Facilitation "9"=Solicit "12"=PIM "15"=Directed Order PIM Complex Instruments: "4"=Exposure "5"=Exposure (with stock) "7"=Facilitation "8"=Facilitation (with stock) "10"=Solicit "11"=Solicit (with stock) "13"=PIM "14"=PIM (with stock)
1544	InstrumentScopeProductComplex	Integer	1=Simple Instrument (default) 2=Standard Combination 3=Stock Combination
1682	MDSecurityTradingStatus	Integer	See SecurityTradingStatus (tag 326)
528	OrderCapacity	String	"C"=Customer "D"=Customer Professional "B"=Broker/Dealer "G"=Proprietary "N"=Away Market Maker "M"=Market Maker
1227	ProductComplex	Integer	1=Simple Instrument (default) 2=Standard Combination 3=Stock Combination
1679	SecurityMassTradingStatus	Integer	See SecurityTradingStatus (tag 326)

Tag	Name	Type	Possible Values/Notes
326	SecurityTradingStatus	Integer	<ul style="list-style-type: none"> ▪ 1=Opening Delay (due to imbalance at opening) ▪ 2=Halt (Underlying is closed) ▪ 17=Regular (Open or Ready-to-trade) ▪ 18=Not Available for Trading (Closed) ▪ 20=Unknown or Invalid ▪ 21=Pre Open (Pre-Open or intraday Halt) ▪ 22=Rotation (ready to open) ▪ 23=Fast Market
277	TradeCondition	String	Condition Codes, multi-value string. <ul style="list-style-type: none"> ▪ "R" = Opening Price ▪ "U" = Exchange Last ▪ "k" = Out of Sequence ▪ "AA" = Spread ▪ "AC" = Straddle ▪ "AH" = Combo ▪ "AE" = Stopped ▪ "Z" = Intermarket Sweep ▪ "AU" = Trade Through Exempt (IAM trade) ▪ "3" = Multi Asset Class Multileg Trade ▪ "n" = Cancel Last ▪ "p" = Cancel Open ▪ "s" = Cancel Only "O" = Cancel
6653	UnderlyingSecurityType	String	"CURRENCY" "CURRENCY INDEX" "ENERGY" "ENERGY INDEX" "EQUITY" "ETF" "ETF INDEX" "FX " "FX INDEX " "INDEX" "INTEREST RATE" "INTEREST RATE INDEX" "METAL" "METAL INDEX" "SOFT AND AGRICS" "SOFTS AND AGRICS INDEX" "STOCK" "STOCK INDEX"

Appendix A: Production Multicast IP Addresses

The following are the details of the new Optimise production MDI feeds, including IP addresses, FeedInstanceID, and Feed Name.

Table 40: Multicast Configuration Details

Envt	Group	Source	Subnet	RP
Primary Data Center (Equinix NY4)	A	224.0.68.0/24	207.231.199.0/26	207.231.198.251/32
	B	224.0.69.0/24	207.231.199.128/26	207.231.198.252/32
Disaster Recovery Data Center (TelX)	A	224.0.68.0/24	74.120.87.0/26	207.231.198.251/32
	B	224.0.69.0/24	74.120.87.128/26	207.231.198.252/32

Table 41: Depth of Market Feed Addresses

Depth of Market Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	FeedName
224.0.68.0/27	224.0.69.0/27			
224.0.68.1	224.0.69.1	11001	121	Depth_Of_Market_SI_Cap_001
		11002	122	Depth_Of_Market_SI_Cap_002
		11003	123	Depth_Of_Market_SI_Cap_003
224.0.68.2	224.0.69.2	11004	124	Depth_Of_Market_SI_Cap_004
		11005	125	Depth_Of_Market_SI_Cap_005
		11006	126	Depth_Of_Market_SI_Cap_006
224.0.68.3	224.0.69.3	11007	127	Depth_Of_Market_SI_Cap_007
		11008	128	Depth_Of_Market_SI_Cap_008
		11009	129	Depth_Of_Market_SI_Cap_009
224.0.68.4	224.0.69.4	11010	130	Depth_Of_Market_SI_Cap_010
		11011	131	Depth_Of_Market_SI_Cap_011
		11012	132	Depth_Of_Market_SI_Cap_012
224.0.68.5	224.0.69.5	11013	133	Depth_Of_Market_SI_Cap_013
		11014	134	Depth_Of_Market_SI_Cap_014
		11015	135	Depth_Of_Market_SI_Cap_015
224.0.68.6	224.0.69.6	11016	136	Depth_Of_Market_SI_Cap_016
		11017	137	Depth_Of_Market_SI_Cap_017
		11018	138	Depth_Of_Market_SI_Cap_018
224.0.68.7	224.0.69.7	11019	139	Depth_Of_Market_SI_Cap_019
		11020	140	Depth_Of_Market_SI_Cap_020
		11021	141	Depth_Of_Market_SI_Cap_021

Depth of Market Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	FeedName
224.0.68.8	224.0.69.8	11022	142	Depth_Of_Market_SI_Cap_022
		11023	143	Depth_Of_Market_SI_Cap_023
		11024	144	Depth_Of_Market_SI_Cap_024
224.0.68.9	224.0.69.9	11025	145	Depth_Of_Market_SI_Cap_025
		11026	146	Depth_Of_Market_SI_Cap_026
		11027	147	Depth_Of_Market_SI_Cap_027
224.0.68.10	224.0.69.10	11028	148	Depth_Of_Market_SI_Cap_028
		11029	149	Depth_Of_Market_SI_Cap_029
		11030	150	Depth_Of_Market_SI_Cap_030
224.0.68.11	224.0.69.11	11031	151	Depth_Of_Market_SI_Cap_031
		11032	152	Depth_Of_Market_SI_Cap_032
		11033	153	Depth_Of_Market_SI_Cap_033
224.0.68.12	224.0.69.12	11034	154	Depth_Of_Market_SI_Cap_034
		11035	155	Depth_Of_Market_SI_Cap_035
		11036	156	Depth_Of_Market_SI_Cap_036
224.0.68.13	224.0.69.13	11037	157	Depth_Of_Market_SI_Cap_037
		11038	158	Depth_Of_Market_SI_Cap_038
		11039	159	Depth_Of_Market_SI_Cap_039
224.0.68.14	224.0.69.14	11040	160	Depth_Of_Market_SI_Cap_040
		11041	161	Depth_Of_Market_SI_Cap_041
		11042	162	Depth_Of_Market_SI_Cap_042
224.0.68.15	224.0.69.15	11043	163	Depth_Of_Market_SI_Cap_043
		11044	164	Depth_Of_Market_SI_Cap_044
		11045	165	Depth_Of_Market_SI_Cap_045
224.0.68.16	224.0.69.16	11046	166	Depth_Of_Market_SI_Cap_046
		11047	167	Depth_Of_Market_SI_Cap_047
		11048	168	Depth_Of_Market_SI_Cap_048
224.0.68.17	224.0.69.17	11049	169	Depth_Of_Market_SI_Cap_049
		11050	170	Depth_Of_Market_SI_Cap_050
		11051	171	Depth_Of_Market_SI_Cap_051
224.0.68.18	224.0.69.18	11052	172	Depth_Of_Market_SI_Cap_052
		11053	173	Depth_Of_Market_SI_Cap_053
		11054	174	Depth_Of_Market_SI_Cap_054
224.0.68.19	224.0.69.19	11055	175	Depth_Of_Market_SI_Cap_055
		11056	176	Depth_Of_Market_SI_Cap_056
		11057	177	Depth_Of_Market_SI_Cap_057

Depth of Market Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	FeedName
224.0.68.20	224.0.69.20	11058	178	Depth_Of_Market_SI_Cap_058
		11059	179	Depth_Of_Market_SI_Cap_059
		11060	180	Depth_Of_Market_SI_Cap_060
224.0.68.21	224.0.69.21	11101	375	Depth_Of_Market_SI_Cap_101
		11111	376	Depth_Of_Market_SI_Cap_111
		11121	377	Depth_Of_Market_SI_Cap_121
224.0.68.22	224.0.69.22	11131	378	Depth_Of_Market_SI_Cap_131
		11141	379	Depth_Of_Market_SI_Cap_141
		11151	380	Depth_Of_Market_SI_Cap_151
224.0.68.23	224.0.69.23	11102	381	Depth_Of_Market_SI_Cap_102
		11112	382	Depth_Of_Market_SI_Cap_112
		11122	383	Depth_Of_Market_SI_Cap_122
224.0.68.24	224.0.69.24	11132	384	Depth_Of_Market_SI_Cap_132
		11142	385	Depth_Of_Market_SI_Cap_142
		11152	386	Depth_Of_Market_SI_Cap_152
224.0.68.25	224.0.69.25	11103	457	Depth_Of_Market_SI_Cap103
		11113	458	Depth_Of_Market_SI_Cap113
		11123	459	Depth_Of_Market_SI_Cap123
224.0.68.26	224.0.69.26	11133	460	Depth_Of_Market_SI_Cap133
		11143	461	Depth_Of_Market_SI_Cap143
		11153	462	Depth_Of_Market_SI_Cap153
224.0.68.27	224.0.69.27	11104	463	Depth_Of_Market_SI_Cap104
		11114	464	Depth_Of_Market_SI_Cap114
		11124	465	Depth_Of_Market_SI_Cap124
224.0.68.28	224.0.69.28	11134	466	Depth_Of_Market_SI_Cap134
		11144	467	Depth_Of_Market_SI_Cap144
		11154	468	Depth_Of_Market_SI_Cap154
224.0.68.29	224.0.69.29	11105	469	Depth_Of_Market_SI_Cap105
		11115	470	Depth_Of_Market_SI_Cap115
		11125	471	Depth_Of_Market_SI_Cap125
224.0.68.30	224.0.69.30	11135	472	Depth_Of_Market_SI_Cap135
		11145	473	Depth_Of_Market_SI_Cap145
		11155	474	Depth_Of_Market_SI_Cap155

Table 42: Top Quote Feed Addresses

Top Quote Feed Addresses				
A Groups	B Group	Ports	FeedInstanceID	FeedName
224.0.68.32/27	224.0.69.32/27			
224.0.68.33	224.0.69.33	12001	61	Top_Of_Quote_SI_Cap001
		12002	62	Top_Of_Quote_SI_Cap002
		12003	63	Top_Of_Quote_SI_Cap003
224.0.68.34	224.0.69.34	12004	64	Top_Of_Quote_SI_Cap004
		12005	65	Top_Of_Quote_SI_Cap005
		12006	66	Top_Of_Quote_SI_Cap006
224.0.68.35	224.0.69.35	12007	67	Top_Of_Quote_SI_Cap007
		12008	68	Top_Of_Quote_SI_Cap008
		12009	69	Top_Of_Quote_SI_Cap009
224.0.68.36	224.0.69.36	12010	70	Top_Of_Quote_SI_Cap010
		12011	71	Top_Of_Quote_SI_Cap011
		12012	72	Top_Of_Quote_SI_Cap012
224.0.68.37	224.0.69.37	12013	73	Top_Of_Quote_SI_Cap013
		12014	74	Top_Of_Quote_SI_Cap014
		12015	75	Top_Of_Quote_SI_Cap015
224.0.68.38	224.0.69.38	12016	76	Top_Of_Quote_SI_Cap016
		12017	77	Top_Of_Quote_SI_Cap017
		12018	78	Top_Of_Quote_SI_Cap018
224.0.68.39	224.0.69.39	12019	79	Top_Of_Quote_SI_Cap019
		12020	80	Top_Of_Quote_SI_Cap020
		12021	81	Top_Of_Quote_SI_Cap021
224.0.68.40	224.0.69.40	12022	82	Top_Of_Quote_SI_Cap022
		12023	83	Top_Of_Quote_SI_Cap023
		12024	84	Top_Of_Quote_SI_Cap024
224.0.68.41	224.0.69.41	12025	85	Top_Of_Quote_SI_Cap025
		12026	86	Top_Of_Quote_SI_Cap026
		12027	87	Top_Of_Quote_SI_Cap027
224.0.68.42	224.0.69.42	12028	88	Top_Of_Quote_SI_Cap028
		12029	89	Top_Of_Quote_SI_Cap029
		12030	90	Top_Of_Quote_SI_Cap030
224.0.68.43	224.0.69.43	12031	91	Top_Of_Quote_SI_Cap031
		12032	92	Top_Of_Quote_SI_Cap032
		12033	93	Top_Of_Quote_SI_Cap033
224.0.68.44	224.0.69.44	12034	94	Top_Of_Quote_SI_Cap034
		12035	95	Top_Of_Quote_SI_Cap035

Top Quote Feed Addresses				
A Groups	B Group	Ports	FeedInstanceID	FeedName
		12036	96	Top_Of_Quote_SI_Cap036
224.0.68.45	224.0.69.45	12037	97	Top_Of_Quote_SI_Cap037
		12038	98	Top_Of_Quote_SI_Cap038
		12039	99	Top_Of_Quote_SI_Cap039
224.0.68.46	224.0.69.46	12040	100	Top_Of_Quote_SI_Cap040
		12041	101	Top_Of_Quote_SI_Cap041
		12042	102	Top_Of_Quote_SI_Cap042
224.0.68.47	224.0.69.47	12043	103	Top_Of_Quote_SI_Cap043
		12044	104	Top_Of_Quote_SI_Cap044
		12045	105	Top_Of_Quote_SI_Cap045
224.0.68.48	224.0.69.48	12046	106	Top_Of_Quote_SI_Cap046
		12047	107	Top_Of_Quote_SI_Cap047
		12048	108	Top_Of_Quote_SI_Cap048
224.0.68.49	224.0.69.49	12049	109	Top_Of_Quote_SI_Cap049
		12050	110	Top_Of_Quote_SI_Cap050
		12051	111	Top_Of_Quote_SI_Cap051
224.0.68.50	224.0.69.50	12052	112	Top_Of_Quote_SI_Cap052
		12053	113	Top_Of_Quote_SI_Cap053
		12054	114	Top_Of_Quote_SI_Cap054
224.0.68.51	224.0.69.51	12055	115	Top_Of_Quote_SI_Cap055
		12056	116	Top_Of_Quote_SI_Cap056
		12057	117	Top_Of_Quote_SI_Cap057
224.0.68.52	224.0.69.52	12058	118	Top_Of_Quote_SI_Cap058
		12059	119	Top_Of_Quote_SI_Cap059
		12060	120	Top_Of_Quote_SI_Cap060
224.0.68.53	224.0.69.53	12101	363	Top_Of_Quote_SI_Cap101
		12111	364	Top_Of_Quote_SI_Cap111
		12121	365	Top_Of_Quote_SI_Cap121
224.0.68.54	224.0.69.54	12131	366	Top_Of_Quote_SI_Cap131
		12141	367	Top_Of_Quote_SI_Cap141
		12151	368	Top_Of_Quote_SI_Cap151
224.0.68.55	224.0.69.55	12102	369	Top_Of_Quote_SI_Cap102
		12112	370	Top_Of_Quote_SI_Cap112
		12122	371	Top_Of_Quote_SI_Cap122
224.0.68.56	224.0.69.56	12132	372	Top_Of_Quote_SI_Cap132
		12142	373	Top_Of_Quote_SI_Cap142
		12152	374	Top_Of_Quote_SI_Cap152
224.0.68.57	224.0.69.57	12103	439	Top_Of_Quote_SI_Cap103

Top Quote Feed Addresses				
A Groups	B Group	Ports	FeedInstanceID	FeedName
224.0.68.58	224.0.69.58	12113	440	Top_Of_Quote_SI_Cap113
		12123	441	Top_Of_Quote_SI_Cap123
		12133	442	Top_Of_Quote_SI_Cap133
224.0.68.59	224.0.69.59	12143	443	Top_Of_Quote_SI_Cap143
		12153	444	Top_Of_Quote_SI_Cap153
		12104	445	Top_Of_Quote_SI_Cap104
224.0.68.60	224.0.69.60	12114	446	Top_Of_Quote_SI_Cap114
		12124	447	Top_Of_Quote_SI_Cap124
		12134	448	Top_Of_Quote_SI_Cap134
224.0.68.61	224.0.69.61	12144	449	Top_Of_Quote_SI_Cap144
		12154	450	Top_Of_Quote_SI_Cap154
		12105	451	Top_Of_Quote_SI_Cap105
224.0.68.62	224.0.69.62	12115	452	Top_Of_Quote_SI_Cap115
		12125	453	Top_Of_Quote_SI_Cap125
		12135	454	Top_Of_Quote_SI_Cap135
		12145	455	Top_Of_Quote_SI_Cap145
		12155	456	Top_Of_Quote_SI_Cap155

Table 43: Order Feed Addresses

Order Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
224.0.68.136/29	224.0.69.136/29			
224.0.68.137	224.0.69.137	13001	1	Order_On_Book_SI_Cap001
		13002	2	Order_On_Book_SI_Cap002
		13003	3	Order_On_Book_SI_Cap003
		13004	4	Order_On_Book_SI_Cap004
		13005	5	Order_On_Book_SI_Cap005
		13006	6	Order_On_Book_SI_Cap006
		13007	7	Order_On_Book_SI_Cap007
		13008	8	Order_On_Book_SI_Cap008
		13009	9	Order_On_Book_SI_Cap009
		13010	10	Order_On_Book_SI_Cap010
		13011	11	Order_On_Book_SI_Cap011
		13012	12	Order_On_Book_SI_Cap012

Order Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
224.0.68.138	224.0.69.138	13013	13	Order_On_Book_SI_Cap013
		13014	14	Order_On_Book_SI_Cap014
		13015	15	Order_On_Book_SI_Cap015
		13016	16	Order_On_Book_SI_Cap016
		13017	17	Order_On_Book_SI_Cap017
		13018	18	Order_On_Book_SI_Cap018
		13019	19	Order_On_Book_SI_Cap019
		13020	20	Order_On_Book_SI_Cap020
		13021	21	Order_On_Book_SI_Cap021
		13022	22	Order_On_Book_SI_Cap022
		13023	23	Order_On_Book_SI_Cap023
		13024	24	Order_On_Book_SI_Cap024
224.0.68.139	224.0.69.139	13025	25	Order_On_Book_SI_Cap025
		13026	26	Order_On_Book_SI_Cap026
		13027	27	Order_On_Book_SI_Cap027
		13028	28	Order_On_Book_SI_Cap028
		13029	29	Order_On_Book_SI_Cap029
		13030	30	Order_On_Book_SI_Cap030
		13031	31	Order_On_Book_SI_Cap031
		13032	32	Order_On_Book_SI_Cap032
		13033	33	Order_On_Book_SI_Cap033
		13034	34	Order_On_Book_SI_Cap034
		13035	35	Order_On_Book_SI_Cap035
		13036	36	Order_On_Book_SI_Cap036
224.0.68.140	224.0.69.140	13037	37	Order_On_Book_SI_Cap037
		13038	38	Order_On_Book_SI_Cap038
		13039	39	Order_On_Book_SI_Cap039
		13040	40	Order_On_Book_SI_Cap040
		13041	41	Order_On_Book_SI_Cap041
		13042	42	Order_On_Book_SI_Cap042
		13043	43	Order_On_Book_SI_Cap043
		13044	44	Order_On_Book_SI_Cap044
		13045	45	Order_On_Book_SI_Cap045
		13046	46	Order_On_Book_SI_Cap046
		13047	47	Order_On_Book_SI_Cap047
		13048	48	Order_On_Book_SI_Cap048

Order Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
224.0.68.141	224.0.69.141	13049	49	Order_On_Book_SI_Cap049
		13050	50	Order_On_Book_SI_Cap050
		13051	51	Order_On_Book_SI_Cap051
		13052	52	Order_On_Book_SI_Cap052
		13053	53	Order_On_Book_SI_Cap053
		13054	54	Order_On_Book_SI_Cap054
		13055	55	Order_On_Book_SI_Cap055
		13056	56	Order_On_Book_SI_Cap056
		13057	57	Order_On_Book_SI_Cap057
		13058	58	Order_On_Book_SI_Cap058
		13059	59	Order_On_Book_SI_Cap059
		13060	60	Order_On_Book_SI_Cap060
224.0.68.142	224.0.69.142	13101	351	Order_On_Book_SI_Cap101
		13111	352	Order_On_Book_SI_Cap111
		13121	353	Order_On_Book_SI_Cap121
		13131	354	Order_On_Book_SI_Cap131
		13141	355	Order_On_Book_SI_Cap141
		13151	356	Order_On_Book_SI_Cap151
		13102	357	Order_On_Book_SI_Cap102
		13112	358	Order_On_Book_SI_Cap112
		13122	359	Order_On_Book_SI_Cap122
		13132	360	Order_On_Book_SI_Cap132
		13142	361	Order_On_Book_SI_Cap142
		13152	362	Order_On_Book_SI_Cap152
224.0.68.143	224.0.69.143	13103	421	Order_On_Book_SI_Cap103
		13113	422	Order_On_Book_SI_Cap113
		13123	423	Order_On_Book_SI_Cap123
		13133	424	Order_On_Book_SI_Cap133
		13143	425	Order_On_Book_SI_Cap143
		13153	426	Order_On_Book_SI_Cap153
		13104	427	Order_On_Book_SI_Cap104
		13114	428	Order_On_Book_SI_Cap114
		13124	429	Order_On_Book_SI_Cap124
		13134	430	Order_On_Book_SI_Cap134
		13144	431	Order_On_Book_SI_Cap144
		13154	432	Order_On_Book_SI_Cap154
		13105	433	Order_On_Book_SI_Cap105
		13115	434	Order_On_Book_SI_Cap115

Order Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
		13125	435	Order_On_Book_SI_Cap125
		13135	436	Order_On_Book_SI_Cap135
		13145	437	Order_On_Book_SI_Cap145
		13155	438	Order_On_Book_SI_Cap155

Table 44: Spread Feed Addresses

Spread Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	FeedName
224.0.68.96/27	224.0.69.96/27			
224.0.68.97	224.0.69.97	14001	301	Order_On_Book_CI_001
		14002	302	Order_On_Book_CI_002
		14003	303	Order_On_Book_CI_003
224.0.68.98	224.0.69.98	14004	304	Order_On_Book_CI_004
		14005	305	Order_On_Book_CI_005
		14006	306	Order_On_Book_CI_006
224.0.68.99	224.0.69.99	14007	307	Order_On_Book_CI_007
		14008	308	Order_On_Book_CI_008
		14009	309	Order_On_Book_CI_009
224.0.68.100	224.0.69.100	14010	310	Order_On_Book_CI_010
		14011	311	Top_Of_Quote_CI_001
		14012	312	Top_Of_Quote_CI_002
224.0.68.101	224.0.69.101	14013	313	Top_Of_Quote_CI_003
		14014	314	Top_Of_Quote_CI_004
		14015	315	Top_Of_Quote_CI_005
224.0.68.102	224.0.69.102	14016	316	Top_Of_Quote_CI_006
		14017	317	Top_Of_Quote_CI_007
		14018	318	Top_Of_Quote_CI_008
224.0.68.103	224.0.69.103	14019	319	Top_Of_Quote_CI_009
		14020	320	Top_Of_Quote_CI_010
		14021	321	Trade_CI_001
224.0.68.104	224.0.69.104	14022	322	Trade_CI_002
		14023	323	Trade_CI_003
		14024	324	Trade_CI_004
224.0.68.105	224.0.69.105	14025	325	Trade_CI_005
		14026	326	Trade_CI_006
		14027	327	Trade_CI_007

Spread Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	FeedName
224.0.68.106	224.0.69.106	14028	328	Trade_CI_008
		14029	329	Trade_CI_009
		14030	330	Trade_CI_010
224.0.68.107	224.0.69.107	14031	331	Depth_Of_Market_CI_001
		14032	332	Depth_Of_Market_CI_002
		14033	333	Depth_Of_Market_CI_003
224.0.68.108	224.0.69.108	14034	334	Depth_Of_Market_CI_004
		14035	335	Depth_Of_Market_CI_005
		14036	336	Depth_Of_Market_CI_006
224.0.68.109	224.0.69.109	14037	337	Depth_Of_Market_CI_007
		14038	338	Depth_Of_Market_CI_008
		14039	339	Depth_Of_Market_CI_009
224.0.68.110	224.0.69.110	14040	340	Depth_Of_Market_CI_010
		14041	341	Pre_Open_CI_Cap_001
		14042	342	Pre_Open_CI_Cap_002
224.0.68.111	224.0.69.111	14043	343	Pre_Open_CI_Cap_003
		14044	344	Pre_Open_CI_Cap_004
		14045	345	Pre_Open_CI_Cap_005
224.0.68.112	224.0.69.112	14046	346	Pre_Open_CI_Cap_006
		14047	347	Pre_Open_CI_Cap_007
		14048	348	Pre_Open_CI_Cap_008
224.0.68.113	224.0.69.113	14049	349	Pre_Open_CI_Cap_009
		14050	350	Pre_Open_CI_Cap_010
		14111	411	Order_On_Book_CI_011
224.0.68.114	224.0.69.114	14211	412	Top_Of_Quote_CI_011
		14311	413	Trade_CI_011
		14411	414	Depth_Of_Market_CI_011
224.0.68.115	224.0.69.115	14511	415	Pre_Open_CI_Cap_011
		14112	416	Order_On_Book_CI_012
		14212	417	Top_Of_Quote_CI_012
224.0.68.116	224.0.69.116	14312	418	Trade_CI_012
		14412	419	Depth_Of_Market_CI_012
		14512	420	Pre_Open_CI_Cap_012
224.0.68.117	224.0.69.117	14113	511	Order_On_Book_CI_013
		14213	512	Top_Of_Quote_CI_013
		14313	513	Trade_CI_013
224.0.68.118	224.0.69.118	14413	514	Depth_Of_Market_CI_013
		14513	515	Pre_Open_CI_Cap_013

Spread Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	FeedName
		14114	516	Order_On_Book_CI_014
224.0.68.119	224.0.69.119	14214	517	Top_Of_Quote_CI_014
		14314	518	Trade_CI_014
		14414	519	Depth_Of_Market_CI_014
224.0.68.120	224.0.69.120	14514	520	Pre_Open_CI_Cap_014
		14115	521	Order_On_Book_CI_015
		14215	522	Top_Of_Quote_CI_015
224.0.68.121	224.0.69.121	14315	523	Trade_CI_015
		14415	524	Depth_Of_Market_CI_015
		14515	525	Pre_Open_CI_Cap_015

Table 45: Pre-Open Feed Addresses

Pre-Open Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
224.0.68.64/27	224.0.69.64/27			
224.0.68.65	224.0.69.65	15001	181	Pre_Open_SI_Cap_001
		15002	182	Pre_Open_SI_Cap_002
		15003	183	Pre_Open_SI_Cap_003
224.0.68.66	224.0.69.66	15004	184	Pre_Open_SI_Cap_004
		15005	185	Pre_Open_SI_Cap_005
		15006	186	Pre_Open_SI_Cap_006
224.0.68.67	224.0.69.67	15007	187	Pre_Open_SI_Cap_007
		15008	188	Pre_Open_SI_Cap_008
		15009	189	Pre_Open_SI_Cap_009
224.0.68.68	224.0.69.68	15010	190	Pre_Open_SI_Cap_010
		15011	191	Pre_Open_SI_Cap_011
		15012	192	Pre_Open_SI_Cap_012
224.0.68.69	224.0.69.69	15013	193	Pre_Open_SI_Cap_013
		15014	194	Pre_Open_SI_Cap_014
		15015	195	Pre_Open_SI_Cap_015
224.0.68.70	224.0.69.70	15016	196	Pre_Open_SI_Cap_016
		15017	197	Pre_Open_SI_Cap_017
		15018	198	Pre_Open_SI_Cap_018
224.0.68.71	224.0.69.71	15019	199	Pre_Open_SI_Cap_019
		15020	200	Pre_Open_SI_Cap_020

Pre-Open Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
		15021	201	Pre_Open_SI_Cap_021
224.0.68.72	224.0.69.72	15022	202	Pre_Open_SI_Cap_022
		15023	203	Pre_Open_SI_Cap_023
		15024	204	Pre_Open_SI_Cap_024
224.0.68.73	224.0.69.73	15025	205	Pre_Open_SI_Cap_025
		15026	206	Pre_Open_SI_Cap_026
		15027	207	Pre_Open_SI_Cap_027
224.0.68.74	224.0.69.74	15028	208	Pre_Open_SI_Cap_028
		15029	209	Pre_Open_SI_Cap_029
		15030	210	Pre_Open_SI_Cap_030
224.0.68.75	224.0.69.75	15031	211	Pre_Open_SI_Cap_031
		15032	212	Pre_Open_SI_Cap_032
		15033	213	Pre_Open_SI_Cap_033
224.0.68.76	224.0.69.76	15034	214	Pre_Open_SI_Cap_034
		15035	215	Pre_Open_SI_Cap_035
		15036	216	Pre_Open_SI_Cap_036
224.0.68.77	224.0.69.77	15037	217	Pre_Open_SI_Cap_037
		15038	218	Pre_Open_SI_Cap_038
		15039	219	Pre_Open_SI_Cap_039
224.0.68.78	224.0.69.78	15040	220	Pre_Open_SI_Cap_040
		15041	221	Pre_Open_SI_Cap_041
		15042	222	Pre_Open_SI_Cap_042
224.0.68.79	224.0.69.79	15043	223	Pre_Open_SI_Cap_043
		15044	224	Pre_Open_SI_Cap_044
		15045	225	Pre_Open_SI_Cap_045
224.0.68.80	224.0.69.80	15046	226	Pre_Open_SI_Cap_046
		15047	227	Pre_Open_SI_Cap_047
		15048	228	Pre_Open_SI_Cap_048
224.0.68.81	224.0.69.81	15049	229	Pre_Open_SI_Cap_049
		15050	230	Pre_Open_SI_Cap_050
		15051	231	Pre_Open_SI_Cap_051
224.0.68.82	224.0.69.82	15052	232	Pre_Open_SI_Cap_052
		15053	233	Pre_Open_SI_Cap_053
		15054	234	Pre_Open_SI_Cap_054
224.0.68.83	224.0.69.83	15055	235	Pre_Open_SI_Cap_055
		15056	236	Pre_Open_SI_Cap_056
		15057	237	Pre_Open_SI_Cap_057
224.0.68.84	224.0.69.84	15058	238	Pre_Open_SI_Cap_058

Pre-Open Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
		15059	239	Pre_Open_SI_Cap_059
		15060	240	Pre_Open_SI_Cap_060
224.0.68.85	224.0.69.85	15101	387	Pre_Open_SI_Cap101
		15111	388	Pre_Open_SI_Cap111
		15121	389	Pre_Open_SI_Cap121
224.0.68.86	224.0.69.86	15131	390	Pre_Open_SI_Cap131
		15141	391	Pre_Open_SI_Cap141
		15151	392	Pre_Open_SI_Cap151
224.0.68.87	224.0.69.87	15102	393	Pre_Open_SI_Cap102
		15112	394	Pre_Open_SI_Cap112
		15122	395	Pre_Open_SI_Cap122
224.0.68.88	224.0.69.88	15132	396	Pre_Open_SI_Cap132
		15142	397	Pre_Open_SI_Cap142
		15152	398	Pre_Open_SI_Cap152
224.0.68.89	224.0.69.89	15103	475	Pre_Open_SI_Cap103
		15113	476	Pre_Open_SI_Cap113
		15123	477	Pre_Open_SI_Cap123
224.0.68.90	224.0.69.90	15133	478	Pre_Open_SI_Cap133
		15143	479	Pre_Open_SI_Cap143
		15153	480	Pre_Open_SI_Cap153
224.0.68.91	224.0.69.91	15104	481	Pre_Open_SI_Cap104
		15114	482	Pre_Open_SI_Cap114
		15124	483	Pre_Open_SI_Cap124
224.0.68.92	224.0.69.92	15134	484	Pre_Open_SI_Cap134
		15144	485	Pre_Open_SI_Cap144
		15154	486	Pre_Open_SI_Cap154
224.0.68.93	224.0.69.93	15105	487	Pre_Open_SI_Cap105
		15115	488	Pre_Open_SI_Cap115
		15125	489	Pre_Open_SI_Cap125
224.0.68.94	224.0.69.94	15135	490	Pre_Open_SI_Cap135
		15145	491	Pre_Open_SI_Cap145
		15155	492	Pre_Open_SI_Cap155

Table 46: Trade Feed Addresses

Trade Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
224.0.68.128/29	224.0.69.128/29			
224.0.68.129	224.0.69.129	16001	241	Trade_SI_Cap_001
		16002	242	Trade_SI_Cap_002
		16003	243	Trade_SI_Cap_003
		16004	244	Trade_SI_Cap_004
		16005	245	Trade_SI_Cap_005
		16006	246	Trade_SI_Cap_006
		16007	247	Trade_SI_Cap_007
		16008	248	Trade_SI_Cap_008
		16009	249	Trade_SI_Cap_009
		16010	250	Trade_SI_Cap_010
		16011	251	Trade_SI_Cap_011
		16012	252	Trade_SI_Cap_012
224.0.68.130	224.0.69.130	16013	253	Trade_SI_Cap_013
		16014	254	Trade_SI_Cap_014
		16015	255	Trade_SI_Cap_015
		16016	256	Trade_SI_Cap_016
		16017	257	Trade_SI_Cap_017
		16018	258	Trade_SI_Cap_018
		16019	259	Trade_SI_Cap_019
		16020	260	Trade_SI_Cap_020
		16021	261	Trade_SI_Cap_021
		16022	262	Trade_SI_Cap_022
		16023	263	Trade_SI_Cap_023
		16024	264	Trade_SI_Cap_024
224.0.68.131	224.0.69.131	16025	265	Trade_SI_Cap_025
		16026	266	Trade_SI_Cap_026
		16027	267	Trade_SI_Cap_027
		16028	268	Trade_SI_Cap_028
		16029	269	Trade_SI_Cap_029
		16030	270	Trade_SI_Cap_030
		16031	271	Trade_SI_Cap_031
		16032	272	Trade_SI_Cap_032
		16033	273	Trade_SI_Cap_033
		16034	274	Trade_SI_Cap_034
		16035	275	Trade_SI_Cap_035
		16036	276	Trade_SI_Cap_036

Trade Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
224.0.68.132	224.0.69.132	16037	277	Trade_SI_Cap_037
		16038	278	Trade_SI_Cap_038
		16039	279	Trade_SI_Cap_039
		16040	280	Trade_SI_Cap_040
		16041	281	Trade_SI_Cap_041
		16042	282	Trade_SI_Cap_042
		16043	283	Trade_SI_Cap_043
		16044	284	Trade_SI_Cap_044
		16045	285	Trade_SI_Cap_045
		16046	286	Trade_SI_Cap_046
		16047	287	Trade_SI_Cap_047
		16048	288	Trade_SI_Cap_048
224.0.68.133	224.0.69.133	16049	289	Trade_SI_Cap_049
		16050	290	Trade_SI_Cap_050
		16051	291	Trade_SI_Cap_051
		16052	292	Trade_SI_Cap_052
		16053	293	Trade_SI_Cap_053
		16054	294	Trade_SI_Cap_054
		16055	295	Trade_SI_Cap_055
		16056	296	Trade_SI_Cap_056
		16057	297	Trade_SI_Cap_057
		16058	298	Trade_SI_Cap_058
		16059	299	Trade_SI_Cap_059
		16060	300	Trade_SI_Cap_060
224.0.68.134	224.0.69.134	16101	399	Trade_SI_Cap101
		16111	400	Trade_SI_Cap111
		16121	401	Trade_SI_Cap121
		16131	402	Trade_SI_Cap131
		16141	403	Trade_SI_Cap141
		16151	404	Trade_SI_Cap151
		16102	405	Trade_SI_Cap102
		16112	406	Trade_SI_Cap112
		16122	407	Trade_SI_Cap122
		16132	408	Trade_SI_Cap132
		16142	409	Trade_SI_Cap142
		16152	410	Trade_SI_Cap152

Trade Feed Addresses				
A Groups	B Groups	Ports	FeedInstanceID	Feed Name
224.0.68.135	224.0.69.135	16103	493	Trade_SI_Cap103
		16113	494	Trade_SI_Cap113
		16123	495	Trade_SI_Cap123
		16133	496	Trade_SI_Cap133
		16143	497	Trade_SI_Cap143
		16153	498	Trade_SI_Cap153
		16104	499	Trade_SI_Cap104
		16114	500	Trade_SI_Cap114
		16124	501	Trade_SI_Cap124
		16134	502	Trade_SI_Cap134
		16144	503	Trade_SI_Cap144
		16154	504	Trade_SI_Cap154
		16105	505	Trade_SI_Cap105
		16115	506	Trade_SI_Cap115
		16125	507	Trade_SI_Cap125
		16135	508	Trade_SI_Cap135
		16145	509	Trade_SI_Cap145
		16155	510	Trade_SI_Cap155

Table 47: Reference Data Feed Addresses

Reference Data Feed Addresses		
A Groups	B Groups	Ports
224.0.68.248/29	224.0.69.248/29	
224.0.68.249-Snapshot	224.0.69.249-Snapshot	17001
224.0.68.250-Incremental	224.0.69.250-Incremental	17004

Document Revision Table

Version	Date	Change	Section	Comments
1.0	May 11, 2010	Original Version		
1.0.1	July 20, 2010	Please see version 1.0.1 for revision details.		
1.0.2	Aug 16, 2010	Please see version 1.0.2 for revision details.		
1.0.3	Sep 8, 2010	Please see version 1.0.3 for revision details.		
1.0.4	Sep 17, 2010	Please see version 1.0.4 for revision details.		
1.0.5	Nov 1, 2010	Please see version 1.0.5 for revision details.		
1.0.5.1	Nov. 22, 2010	Please see version 1.0.5.1 for revision details.		
1.0.6	December, 2010	Please see version 1.0.6 for revision details.		
1.1.0	January 2011	Please see version 1.1.0 for revision details.		
1.1.1	January 2011	Please see version 1.1.1 for revision details.		
1.2.0	February 2011	Please see version 1.2 for revision details.		
1.2.1/2/3	February 2011	Please see version 1.2.1, 1.2.2, 1.2.3 for revision details.		
1.2.4	February 2011	Please see version 1.2.4 for revision details.		
1.2.5	March 2011	Please see version 1.2.5 for revision details.		
1.2.8	March 2011	Please see version 1.2.8 for revision details.		
1.2.9	May 2011	Please see version 1.2.9 for revision details.		
1.3.0	May 2011	Please see version 1.3.0 for revision details.		
1.4.0	June 2011	Please see version 1.4.0 for revision details.		
1.4.1	June 2011	Please see version 1.4.1 for revision details.		
1.4.2	June 2011	Please see version 1.4.2 for revision details.		
1.4.3	July 2011	Please see version 1.4.3 for revision details.		
1.4.4	July 2011	Added IP addresses for Partitions 13, 14, and 15 to Appendix A: Production Multicast IP Addresses on page 64 tables (highlighted in pale blue/grey).	Appendix A	
1.4.5	July 2011	Updated byte offsets in Table 25 on Page 52 .	5.3.2	
1.4.6	August 2011	Minor update to tag 276 comment, Table 19	3.6.5.1	
1.5	August 2011	Release version update		
1.5.1	August 2011	Updated Trade Feed IP address from 53250 to 53251. Updated Top Quote and Pre-Open Feed bandwidth requirements in Table 30.	Table 38 and Table 39 Table 30	
1.5.2	September 2011	Corrected various message layouts to correspond to template.		
1.6.0	September 2011	Release version update		
1.6.1, 1.6.2	October 2011	Minor revisions to connectivity tables		