

OPRA

**OPTIONS PRICE REPORTING
AUTHORITY**

**BINARY
DATA RECIPIENT INTERFACE
SPECIFICATION**

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ADDENDUMS

1. **COMMON IP MULTICAST DISTRIBUTION NETWORK RECIPIENT INTERFACE SPECIFICATION**
2. **AUTOMATED RETRANSMISSIONS (Enhanced Autolink Facility User guide)**

THE ADDENDUMS ARE AVAILABLE FROM WWW.OPRADATA.COM/ UNDER OUTPUT SPECIFICATIONS-BINARY.

DOCUMENT HISTORY

Version	Date	Description
1.0	4/17/2012	New OPRA Binary Formats
1.1	7/24/2012	Appendix 'B' updated with new Symbol Rebalance Appendix 'C' updated with new Participant Nasdaq BX
1.2	4/15/2013	Clarification to Section 3.05, Block Timestamp description
1.3	8/26/13	Added ISE Gemini
1.4	12/2/2013	7.13 Denominator Code – Added Field limits Appendix 'B' updated with new Symbol Rebalance Appendix 'D': Revised "Value Limit" for 'q' messages to 65,535

1.0 INTRODUCTION

The Securities Industry Automation Corporation (SIAC) serves as the Processor for the Options Price Reporting Authority (OPRA). In fulfilling its role as the Processor, SIAC plans, develops, operates and maintains the OPRA system.

1.01 BACKGROUND

OPRA is a computer system that disseminates, on a current and continuous basis, information about transactions that occurred on the options markets.

OPRA receives options transactions generated by participating U.S. Options Markets. In addition, OPRA calculates and identifies the “Best Bid and Best Offer” (BBO – highest bid and lowest offer). OPRA consolidates this information and disseminates it via computer-to-computer linkages to the financial community in the U.S. and abroad.

Essential in ensuring the timely reporting of option equity/index transactions are the OPRA IP Multicast data streams. OPRA has a unique set of IP Multicast addresses assigned to each of its data “lines”. Options market data generated by each Participant is assembled in prescribed message formats and transmitted to the appropriate TCP/IP Processor address via the Participants’ private communications facility. As each message is received, it is merged with messages received from all Participants, and the consolidated message stream is transmitted simultaneously to all data recipients via their private communications facilities. Approved data recipients of the OPRA service can redistribute OPRA data worldwide to their customers as part of their individual services or use the data for their own purposes.

Computer systems that support the processing and dissemination of option transactions are operational at primary and backup sites. The backup site provides recovery capability in the event of a disaster at the primary site. Through computerized communications equipment, OPRA transaction data is disseminated from either the primary or backup site. An OPRA site configuration is illustrated in **Appendix A**.

1.02 SCOPE

This specification defines the interface specification and message format requirements for data recipients (vendors, broker/dealers or others who receive the data feed) connecting to the National Market System (NMS) IP Multicast distribution network.

2.0 GENERAL DESIGN OF DATA DISTRIBUTION NETWORK

The NMS IP Multicast distribution network disseminates all market data and Time Beacon information in the form of multicast addressed IP datagrams.

Data available via the NMS IP Multicast distribution network includes:

OPRA Real-Time Production Data

A copy of each OPRA real-time production message is available from SIAC's production/primary site. These redundant copies are delivered via two distinct multicast data streams.

OPRA Real-Time Retransmission Data

The retransmission data streams are available from SIAC's production/primary site, but are **not** delivered via redundant data streams.

OPRA After-Hours Playback Data

There are two sets of IP Multicast data feeds dedicated for after hours playback test data. One set of IP Multicast data feeds supports the playback of production messages and the other set supports the playback of test messages. This playback data is made available via a single set of multicast data feeds.

Time Beacon

Selected nodes that source multicast data within the NMS IP Multicast distribution network generate a single Time Beacon packet every six seconds. Each node will issue a Time Beacon packet to the same multicast group.

IP MULTICAST NETWORK INTERFACE

The requirements for the NMS IP Multicast distribution network interface are defined in the addendum to this document, "**Common IP Multicast Distribution Network Recipient Interface Specification**". This is available from WWW.OPRADATA.COM.

3.0 TRANSMISSION CHARACTERISTICS

3.01 TRANSMISSION BLOCK STRUCTURE

Encapsulated within each IP Multicast packet is a transmission block. One type of transmission block is used for all types of messages.

Block Structure	
Block Header	21
Block Data	Variable
Block Pad Byte (optional)	1

A block can have a maximum of 1,000 characters inclusive of header, data, and pad byte.

3.02 BLOCK DATA

The block data consists of one or more messages.

A message consists of a Message Header, which is of fixed length and format and message data, which is variable in length and format.

Message categories C (Administrative) and H (Control) are each sent in their own individual block.

The block data structure is depicted below:

Block Data Structure
Message 1 Data
Message 2 Data
~~~
Message N Data

#### 3.03 BLOCK PAD BYTE

**1 Byte**, unsigned integer contains binary zero (Hex 0x00). Only used when the length of a block consists of an odd number of bytes. It is then added to the block to ensure the block is an even number of bytes.

### **3.04 DATA FORMAT**

1. All Numeric values will be 1, 2, 4 or 8 byte binary integers and will be sent in network order (big-endian)
2. Any numeric value that is unused or does not apply to a given message type has a value of Hex 0x00.
3. All prices and index values are represented as either 2 byte unsigned integers in Short Quotes (category q), or 4 byte signed integers in all other message categories, except where noted. Price and index values will be restricted to 8 digits and will be non-negative.
4. All other numeric fields (sizes, volumes, fields in the block header) will be represented as 1, 2, or 4 byte unsigned integers, except where noted. Price and index values will be restricted to 8 digits and will be non-negative.
5. All ASCII characters are either digits ('0'-'9'), upper or lower case letters ('A'-'Z', 'a'-'z') or space (' ').
6. All negative values will be represented as 2's compliment.

### 3.05 BLOCK HEADER

Field Name	Length (bytes)
Version	1
Block Size	2
Data Feed Indicator	1
Retransmission Indicator	1
Reserved	1
Block Sequence Number	4
Messages In Block	1
Block Timestamp	8
Block CheckSum	2
<b>Total Length:</b>	<b>21</b>

#### VERSION

**1 Byte**, unsigned integer. (Hex 0x03) for current version. Designates the OPRA binary version

#### BLOCK SIZE

**2 Bytes**, unsigned integer. Size in bytes of entire transmission block (as described in 3.01)

#### DATA FEED INDICATOR

**1 Byte**, ASCII character. Value is ‘O’ for OPRA.

#### RETRANSMISSION INDICATOR

**1 Byte**, ASCII character. Contains either a space ‘ ’ (not a retransmitted message) or ‘V’ (indicating a retransmission of the block).

#### RESERVED

**1 Byte**, unsigned integer. Value is binary zero (Hex 0x00). Reserved for future use.

## BLOCK SEQUENCE NUMBER

**4 Bytes**, unsigned integer. All transmission blocks are assigned a sequential Block Sequence Number. Currently, it rolls over after 1,999,999,999. On a per line basis, the Block Sequence Number on the lines are set to Zero at the start of each day, and incremented by one each time a block is transmitted, with the following exceptions:

1. Retransmitted blocks contain the Block Sequence Number of the original block.
2. The Block Sequence Number field in the Block Header of a **Category H, Type K (Reset Block Sequence Number)** message contains the number to which the Block Sequence Number counter is to be reset. This number is either one (1) in the event the sequence numbers rolls over from 1,999,999,999 or a number greater than the highest number previously transmitted.
3. The **Category H, Type C (Start of Day)** message contains a Zero Block Sequence Number.

Should OPRA experience a line failure and recovery, the block sequence number for the recovered line(s) is reset to a greater number than the last number transmitted and message transmission is resumed.

Administrative and other messages may precede SOD messages, therefore the Block Sequence Number (BSN) field of the SOD messages is incremented accordingly.

## MESSAGES IN BLOCK

**1 byte**, unsigned integer. The number of messages contained in the block data of the transmission block.

## BLOCK TIMESTAMP

**8 Bytes**, contains the block timestamp. The first 4 bytes (Seconds) contains the number seconds from epoch 1/1/1970, 00:00:00 UTC. The next 4 bytes contain the nanosecond portion of the time currently rounded to the nearest microsecond (e.g., 972402000). Indicates the time that processing a block of messages is completed.

SIAC recommends to represent this time in HH:MM:SS.mmmmmm format EST/EDT when communicating with OPRA.

For Retransmissions, the Block Timestamp will contain the original time that processing the block of messages was completed.

## BLOCK CHECKSUM

**2 Bytes**, Unsigned Integer. Lower 16 bits of the 32 bit sum of all bytes in the block, excluding the Block Checksum field.

### 3.06 RETRANSMISSION CAPABILITY

If data recipients do not receive a block(s), a retransmission of a block(s) can be requested. The following Message Category and Types are **not** included in retransmissions:

MESSAGE IDENTIFICATION CATEGORY	MESSAGE IDENTIFICATION TYPE	DESCRIPTION
H	A	Start of Test Cycle
H	B	End of Test Cycle
H	C	Start of Day
H	N	Line Integrity
Cycles of test messages are <b><u>not</u></b> available for retransmissions.		

The Enhanced AutoLink Facility is utilized for automatically receiving and processing OPRA message retransmission requests.

The Enhanced AutoLink Facility works in conjunction with the Retransmission and Playback System (RAPS), a server associated with the OPRA host, which supports OPRA retransmissions. In addition, RAPS provides data playback capability facilitating test requirements to IP Multicast data recipients.

A data recipient may request automated retransmission(s) by connecting directly through SFTI to the Enhanced Autolink Facility via TCP/IP addresses and ports. A Data Recipient is required to enter their assigned user ID and password along with system, line, and sequence number information. The request will be forwarded to the Enhanced AutoLink Facility, then to a RAPS server associated with the OPRA host, and out to the proper IP Multicast groups. An **Enhanced AutoLink Facility Users Guide** for automated retransmission requests is provided as an addendum to this document.

All retransmitted OPRA blocks contain **only** the alphabetic upper case character ‘V’ in the Retransmission Indicator field of the Block Header.

The Block Sequence Number field in the Block Header of each message retransmitted contains the original block sequence number.

Retransmissions requested by a multicast customer will be generated over dedicated retransmission lines. Retransmissions generated by the OPRA host will be retransmitted over the production lines.

## **RETRANSMISSION CAPABILITY (continued)**

Retransmissions are sent at a lower message rate in order **not** to delay transmission of current messages.

Retransmitted messages are never combined with original messages in the same block.

Retransmission requests are accepted after the period following transmission of the Category H, Type C (Start of Day) message.

An **Enhanced AutoLink Facility Users Guide** for automated retransmission requests is provided as an addendum to this document. This is available from [www.opradata.com](http://www.opradata.com).

<b>Note: It is the responsibility of the data recipient to ignore retransmitted messages <u>not</u> requested by them.</b>
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### **3.07 OPRA TRAFFIC DISTRIBUTION**

OPRA messages are disseminated over multiple IP Multicast lines designated as OPRA 1 through 48. For current distribution of traffic, refer to **Appendix B**.

## 4.0 MESSAGE HEADER

The Message Header supplied on each message contains a total of **4 Bytes** and conforms in all cases to the following data fields:

Field Name	Length (bytes)
Participant ID	1
Message Category	1
Message Type	1
Message Indicator	1
<b>Total Length:</b>	<b>4</b>

All messages, except for categories ‘C’ & ‘H’, have a fixed length, which is determined by reading the Message Header. The combination of Message Category and Message Indicator indicate the length of the message. For categories ‘a’, ‘d’, ‘f’ and ‘Y’, only the Message Category is used; the Message Indicator is reserved. For quotes, categories ‘k’ and ‘q’, the base message length is determined from the Category; the Message Indicator contains the “BBO Indicator” information, and is used to determine the appendage type (None, Single, or Double). See the Long Equity and Index Quote (category ‘k’) section for details on the Message Indicator.

### 4.01 MESSAGE HEADER FIELD DESCRIPTIONS

#### PARTICIPANT ID

The Participant ID field is a **1 Byte**, ASCII character that identifies the Participant or Processor that initiated the message (* = application pending):

CODE	VALUE
<b>A</b>	NYSE AMEX
<b>B</b>	Boston Options Exchange
<b>C</b>	Chicago Board Options Exchange
<b>H</b>	ISE GEMINI
<b>I</b>	International Securities Exchange
<b>M</b>	Miami International Securities Exchange
<b>N</b>	NYSE ARCA
<b>O</b>	Options Price Reporting Authority
<b>Q</b>	NASDAQ Stock Market
<b>T</b>	NASDAQ OMX BX Options*
<b>W</b>	C2
<b>X</b>	NASDAQ OMX PHLX
<b>Z</b>	BATS

**Note: Messages with Participant ID Code O (Options Price Reporting Authority - OPRA) are sent by SIAC on behalf of OPRA.**

## MESSAGE CATEGORY

The Message Category field is a 1 **Byte**, ASCII character, either an upper or lower case letter.

LOWER CASE CODE	VALUE
a	EQUITY AND INDEX LAST SALE
d	OPEN INTEREST
f	EQUITY AND INDEX END OF DAY SUMMARY
k	LONG EQUITY AND INDEX QUOTE
q	SHORT EQUITY AND INDEX QUOTE
UPPER CASE CODE	VALUE
C	ADMINISTRATIVE
H	CONTROL
Y	UNDERLYING VALUE MESSAGE

## MESSAGE TYPE

The Message Type field is a 1 **Byte**, ASCII character, either an upper or lower case letter, or a space. The Message Type character is space filled to either indicate a specific value, or that a Message Type is not applicable to a specified Message Category.

The following **Message Types**, all mutually exclusive, apply to **Category a (Equity and Index Last Sale)** messages.

**Chart on following page.**



**MESSAGE TYPE, continued**

<b>MESSAGE TYPES</b>		
<b>CODE</b>	<b>VALUE</b>	
<b>Space Filled</b>	REG-ULAR	Indicates that the transaction was a regular sale and was made without stated conditions.
<b>A</b>	CANC	Transaction previously reported (other than as the <b>last</b> or <b>opening</b> report for the particular option contract) is now to be cancelled.
<b>B</b>	OSEQ	Transaction is being reported late <b>and</b> is out of sequence; i.e., later transactions have been reported for the particular option contract.
<b>C</b>	CNCL	Transaction is the last reported for the particular option contract and is now cancelled.
<b>D</b>	LATE	Transaction is being reported late, but is in the correct sequence; i.e., no later transactions have been reported for the particular option contract.
<b>E</b>	CNCO	Transaction was the first one (opening) reported this day for the particular option contract. Although later transactions have been reported, this transaction is now to be cancelled.
<b>F</b>	OPEN	Transaction is a late report of the opening trade and is out of sequence; i.e., other transactions have been reported for the particular option contract.
<b>G</b>	CNOL	Transaction was the only one reported this day for the particular option contract and is now to be cancelled.
<b>H</b>	OPNL	Transaction is a late report of the opening trade, but is in the correct sequence; i.e., no other transactions have been reported for the particular option contract.
<b>I</b>	AUTO	Transaction was executed electronically. Prefix appears solely for information; process as a regular transaction.
<b>J</b>	REOP	Transaction is a reopening of an option contract in which trading has been previously halted. Prefix appears solely for information; process as a regular transaction.
<b>K</b>	AJST	Transaction is an option contract for which the terms have been adjusted to reflect a stock dividend, stock split, or similar event. Prefix appears solely for information; process as a regular transaction.
<b>L</b>	SPRD	Transaction represents a trade in two options in the same class (a buy and a sell in the same class). Prefix appears solely for information; process as a regular transaction.
<b>M</b>	STDL	Transaction represents a trade in two options in the same class (a buy and a sell in a put and a call). Prefix appears solely for information; process as a regular transaction.
<b>N</b>	STPD	Transaction is the execution of a sale at a price agreed upon by the floor personnel involved, where a condition of the trade is that it reported following a non-stopped trade of the same series at the same price.
<b>O</b>	CSTP	Cancel stopped transaction.
<b>P</b>	BWRT	Transaction represents the option portion of an order involving a single option leg (buy or sell of a call or put) and stock. Prefix appears solely for information; process as a regular transaction.
<b>Q</b>	CMBO	Transaction represents the buying of a call and the selling of a put for the same underlying stock or index. Prefix appears solely for information; process as a regular transaction.
<b>R</b>	SPIM	Transaction was the execution of an order which was “stopped” at a price that did not constitute a Trade-Through on another market at the time of the stop. Process like a normal transaction except don’t update “last”.
<b>S</b>	ISOI	Transaction was the execution of an order identified as an Intermarket Sweep Order. Process like normal
<b>T</b>	BNMT	Transaction reflects the execution of a “benchmark trade”. A “Benchmark Trade” is a trade resulting from the matching of “Benchmark Orders”. A “Benchmark Order” is an order for which the price is not based, directly or indirectly, on the quote price of the option at the time of the order’s execution and for which the material terms were not reasonably determinable at the time a commitment to trade the order was made. Process like a normal transaction except don’t update “last”.
<b>X</b>	XMPT	Transaction is Trade Through Exempt. The transaction should be treated like a regular sale.

**MESSAGE TYPE, continued**

The **Message Type** character for the **Category C (Administrative)**, **Category f (Equity and Index End of Day Summary)**, and **Category d (Open Interest)** messages are **Space filled**.

The following **Message Types** apply to **Category H (Control)** messages. Refer to Control Message Descriptions section for definition of values:

CODE	VALUE
<b>A</b>	Start of Test Cycle
<b>B</b>	End of Test Cycle
<b>C</b>	Start of Day
<b>D</b>	Good Morning
<b>E</b>	Start of Summary
<b>F</b>	End of Summary
<b>G</b>	Early Market Close
<b>H</b>	End of Transaction Reporting
<b>I</b>	Good Night
<b>J</b>	End of Day
<b>K</b>	Reset Block Sequence Number
<b>L</b>	Start of Open Interest
<b>M</b>	End of Open Interest
<b>N</b>	Line Integrity

The following **Message Types** apply to **Category k (Long Equity and Index Quote)** and **Category q (Short Equity and Index Quote)**:

CODE	VALUE
<b>Space</b>	Regular Trading
<b>F</b>	Non-Firm Quote
<b>R</b>	Rotation
<b>T</b>	Trading Halted
<b>A</b>	Eligible for Automatic Execution
<b>B</b>	Bid contains Customer Trading Interest
<b>O</b>	Offer contains Customer Trading Interest
<b>C</b>	Both Bid and Offer contain Customer Trading Interest
<b>X</b>	Offer side of Quote Not Firm; Bid Side Firm
<b>Y</b>	Bid Side of Quote Not Firm; Offer Side Firm

**MESSAGE TYPE, continued**

The following **Message Types** apply to the **Category Y (Underlying Value)** message:

CODE	VALUE
Space	Index based on Last Sale
I	Index based on Bid and Offer

**Note: Additional Message Category(s) and Message Type(s) will be implemented as required. If data recipients are not prepared to process new Message Category(s) and/or new Message Type(s) when implemented, they should be able to handle them to the extent that they do not impact their normal data processing.**

**MESSAGE INDICATOR**

For all message categories except quotes (categories ‘k’ and ‘q’), this field is reserved, and contains a space. For quotes, this field contains the BBO Indicator, reference section 7.01.

The combination of Message Category and Message Indicator give the length of the message with the exception of the Control (category H) and Administrative messages (category C, which includes the length within itself).

## **5.0 MESSAGE FORMATS**

Each message transmitted by OPRA consists of a Message Header and Message Data. The particular Message Category, Message Type, and Message Indicator determines the format of the text and the message length. Administrative and Control messages contain an additional field with the data length.

Message formats are fixed field formats (with the exception of Administrative messages which have unformatted text). Control messages can consist of the standard Message Header only, or the standard Message Header immediately followed by text or binary data. The textual portion of the message is a variable field (free form). If the control message contains binary data, its format depends on the message type.

### **5.01 MESSAGE FORMAT FIELD DESCRIPTIONS**

Detailed information on each field specified in every message format is contained in alphabetical order in the **Field Descriptions** section of this document.

### **5.02 SCHEDULE OF DAILY OPRA MESSAGES**

A schedule of daily OPRA messages transmitted over the OPRA IP Multicast data streams is provided in **Appendix C**.

### **5.03 BEST BID AND BEST OFFER (BBO) OVERVIEW**

A Best Bid and Best Offer (BBO) Overview is provided in **Appendix D**.

**6.0 SUMMARY OF MESSAGE CATEGORIES AND TYPES**

CATEGORY(S)	TYPE(S)	MESSAGE DESCRIPTION
a	Space filled	REGULAR SALE
a	A	CANC
a	B	OSEQ
a	C	CNCL
a	D	LATE
a	E	CNCO
a	F	OPEN
a	G	CNOL
a	H	OPNL
a	I	AUTO
a	J	REOP
a	K	AJST
a	L	SPRD
a	M	STD L
a	N	STPD
a	O	CSTP
a	P	BWRT
a	Q	CMBO
a	R	SPIM
a	S	ISOI
a	T	BNMT
a	X	XMPT
C	Space filled	Administrative
d	Space filled	Open Interest
f	Space filled	Equity and Index End of Day Summary
H	A	Start of Test Cycle
H	B	End of Test Cycle
H	C	Start of Day
H	D	Good Morning
H	E	Start of Summary
H	F	End of Summary
H	G	Early Market Close
H	H	End of Transaction Reporting
H	I	Good Night
H	J	End of Day
H	K	Reset Block Sequence Number
H	L	Start of Open Interest
H	M	End of Open Interest
H	N	Line Integrity

**SUMMARY OF MESSAGE CATEGORIES AND TYPES (continued)**

<b>CATEGORY(S)</b>	<b>TYPE(S)</b>	<b>MESSAGE DESCRIPTION</b>
<b>k, q</b>	<b>Space filled</b>	Regular Trading
<b>k, q</b>	<b>F</b>	Non-Firm Quote
<b>k, q</b>	<b>R</b>	Rotation
<b>k, q</b>	<b>T</b>	Trading Halted
<b>k, q</b>	<b>A</b>	Eligible for Automatic Execution
<b>k, q</b>	<b>B</b>	Bid contains Customer Trading Interest
<b>k, q</b>	<b>O</b>	Offer contains Customer Trading Interest
<b>k, q</b>	<b>C</b>	Both Bid and Offer contain Customer Trading Interest
<b>k, q</b>	<b>X</b>	Offer Side of Quote Not Firm; Bid Side Firm
<b>k, q</b>	<b>Y</b>	Bid Side of Quote Not Firm; Offer Side Firm
<b>Y</b>	<b>Space filled</b>	Index based on Last Sale
<b>Y</b>	<b>I</b>	Index based on Bid and Offer

**6.01 EQUITY AND INDEX LAST SALE****35 BYTES**

**The Equity and Index Last Sale message is used to report equity and index options last sale information.**

Category	Type	Message Indicator
a	Space filled,	Space filled
	A, B, C, D, E	
	F, G, H, I, J,	
	K, L, M, N, O,	
	P, Q, R, S, T, X	

Field Name	Length (bytes)	OPRA FAST/ ASCII Conversion Limit
Message Header	4	
Security Symbol	5	
Reserved	1	
Expiration Block	3	
Strike Price Denominator Code	1	
Strike Price	4	6
Volume	4	6
Premium Price Denominator Code	1	
Premium Price	4	8
Trade Identifier	4	
Reserved	4	
<b>Total Length:</b>	<b>35</b>	

**6.02 OPEN INTEREST****22 BYTES**

**The Open Interest message is used to report contract volume on current options that have not been exercised and have not yet reached expiration. Open Interest messages are sent by SIAC on behalf of OPRA, however, they contain the Participant ID code of the Participant associated with the Open Interest message.**

Message Category	Type	Message Indicator
d	Space filled	Space filled

Field Name	Length (bytes)	OPRA FAST/ ASCII Conversion Limit
Message Header	4	
Security Symbol	5	
Reserved	1	
Expiration Block	3	
Strike Price Denominator Code	1	
Strike Price	4	6
Open Interest Volume	4	7
<b>Total Length:</b>	<b>22</b>	



**6.03 EQUITY AND INDEX END OF DAY SUMMARY****64 BYTES**

**The Equity and Index End of Day Summary messages are transmitted shortly before the Good Night messages. It provides by symbol, a Participant's open, high, low, last, net change and underlying information. NOTE: If no quote or last sale occurred for a security, no Equity and Index End of Day Summary is generated for that security.**

Message Category	Type	Message Indicator
f	Space filled	Space filled

Field Name	Length (bytes)	OPRA FAST/ ASCII Conversion
Message Header	4	
Security Symbol	5	
Reserved	1	
Expiration Block	3	
Strike Price Denominator Code	1	
Strike Price	4	6
Volume	4	6
Open Interest Volume	4	7
Premium Price Denominator Code	1	
Open Price	4	8
High Price	4	8
Low Price	4	8
Last Price	4	8
Net Change	4	8
Underlying Price Denominator Code	1	
Underlying Price	8	8
Bid Price	4	8
Offer Price	4	8
<b>Total Length:</b>	<b>64</b>	

**6.04 LONG EQUITY AND INDEX QUOTE**

**NO APPENDAGE: 35 Bytes (Minimum)**  
**SINGLE APPENDAGE: 45 Bytes**  
**DOUBLE APPENDAGE: 55 Bytes (Maximum)**

**The Long Equity and Index Quote message is used to report equity and index options quote and Best Bid and Best Offer information. Reference appendage information in Sections 6.06 & 6.07.**

/

Message Category	Type	Message Indicator
k	Space filled,	Contains the BBO Indicator – See Section 7.01
	A, B, C, F, O,	
	R, T, X, Y	

Field Name	Length (bytes)
Message Header	4
Security Symbol	5
Reserved	1
Expiration Block	3
Strike Price Denominator Code	1
Strike Price	4
Premium Price Denominator Code	1
Bid Price	4
Bid Size	4
Offer Price	4
Offer Size	4
<b>Total Length:</b>	<b>35</b>

**6.05 SHORT EQUITY AND INDEX QUOTE**

**NO APPENDAGE: 21 Bytes (Minimum)**  
**SINGLE APPENDAGE: 31 Bytes**  
**DOUBLE APPENDAGE: 41 Bytes (Maximum)**

**The Short Equity and Index Quote message is used to report equity and index options quote and Best Bid and Best Offer information. For the Short Quote type, all numeric values must fit into two (2) byte integers and the symbol must not exceed four (4) characters. Any quote message not meeting the Short Quote requirements must use the Long Quote format. Reference appendage information in Sections 6.06 & 6.07.**

Message Category	Type	Message Indicator
q	Space filled,	Contains the BBO Indicator – See Section 7.01
	A, B, C, F, O,	
	R, T, X, Y	

Field Name	Length (bytes)
Message Header	4
Security Symbol	4
Expiration Block	3
Strike Price	2
Bid Price	2
Bid Size	2
Offer Price	2
Offer Size	2
<b>Total Length:</b>	<b>21</b>

- Strike Price, Bid Price, Bid Size, Offer Price and Offer Size are 2 Byte unsigned integers.
  - Any message with a Security Symbol greater than 4 characters must use a Long Quote (category ‘k’)
  - Strike Price Denominator Code is implied to be ‘A’ (1 digit to the right of the decimal point). *
  - Premium Price Denominator Code is implied to be ‘B’ (2 digits to the right of the decimal point). *
- * Any message whose values cannot fit in 2 byte unsigned integers with the given Denominator Code restrictions must use a Long Quote.*
- Appendages are the same as for the Short Quotes and Long Quotes.

**6.06 SINGLE APPENDAGE****10 BYTES**

**The Best Bid or Offer Appendage is generated whenever a new quote causes a new Best Bid/Offer. If it is determined that a new Best Bid or Offer Appendage is required, the appropriate Best Bid or Offer information is appended to either the Short Equity and Index Quote (Category q) or Long Equity and Index Quote message (Category k).**

**Refer to Appendix D for the Best Bid and Best Offer Overview.**

Field Name	Length (bytes)
Participant ID	1
Denominator Code	1
Price	4
Size	4
Total Length:	10

The presence of an appendage is determined by the BBO Indicator (contained in the Message Indicator field of the Message Header). Indicators of 'C', 'G', 'K' indicate a single Best Offer appendage. Values of 'M', 'N' & 'P' indicate a single Best Bid appendage. Reference section 7.01 for BBO Indicators.

**6.07 DOUBLE APPENDAGE****20 BYTES**

**The Best Bid and Offer Appendage is generated whenever a new quote causes a new Best Bid and Offer. If it is determined that a new Best Bid and Offer Appendage is required, the appropriate Best Bid and Offer information is appended to the Long Equity and Index Quote message (Category k).**

**Refer to Appendix D for the Best Bid and Best Offer Overview.**

Field Name	Length (bytes)
Best Bid Participant ID	1
Best Bid Denominator Code	1
Best Bid Price	4
Best Bid Size	4
Best Offer Participant ID	1
Best Offer Denominator Code	1
Best Offer Price	4
Best Offer Size	4
Total Length:	20

The presence of an appendage is determined by the BBO Indicator (contained in the Message Indicator field of the Message Header). A BBO Indicator of 'O' indicates a double appendage, containing both the Best Bid and Best Offer. Reference section 7.01 for BBO Indicators.

**6.08 ADMINISTRATIVE**

Message Category	Type	Message Indicator
C	Space filled	Space filled

Field Name	Length (bytes)
Message Header	4
Message Data Length	2
Message Data (Free-Form ASCII Text <u>or</u> Binary Data)	Variable (Max 450)

- Message Data Length is a 2 Byte unsigned integer which represents the length of the Message Data field. Message Data Length can be zero if there is no message data.
- ‘C’ messages will be sent singly, one to a block
- Message Data Length: Variable (6 Bytes + Message Data length)

**6.09 CONTROL**

Category	Type	Message Indicator
H	A, B, C, D, E	Space filled
	F, G, H, I, J,	
	K, L, M, N	

Field Name	Length (bytes)
Message Header	4
Message Data Length	2
Message Data (Free-Form ASCII Text <u>or</u> Binary Data)	Variable (Max 450)

- Message Data Length is a 2 Byte unsigned integer which represents the length of the Message Data field. Message Data Length can be zero if there is no message data.
- ‘H’ messages will be sent singly, one to a block
- Message Data Length: Variable (6 Bytes + Message Data length)

**6.10 UNDERLYING VALUE – LAST SALE****19 BYTES**

**The Underlying Value – Last Sale message (Message Type ‘ ’) is a fixed length record containing the Last Sale Index Value of a stock index.**

Message Category	Type	Message Indicator
Y	Space filled	Space filled

Field Name	Length (bytes)
Message Header	4
Security Symbol	5
Reserved	1
Index Value Denominator Code	1
Index Value	4
Reserved	4
<b>Total Length:</b>	<b>19</b>



**6.11 UNDERLYING VALUE – BID AND OFFER****19 BYTES**

**The Underlying Value – Bid and Offer message (Message Type ‘I’) is a fixed length record containing the Bid/Offer Index Value of a stock index.**

Message Category	Type	Message Indicator
Y	I	Space filled

Field Name	Length (bytes)
Message Header	4
Security Symbol	5
Reserved	1
Index Value Denominator Code	1
Bid Index Value	4
Offer Index Value	4
<b>Total Length:</b>	<b>19</b>

## 7.0 FIELD DESCRIPTIONS

ASCII code characters are defined as follows:

TERMINOLOGY	DESCRIPTION
Alphabetic	ASCII characters: upper case <b>A – Z</b> <u>or</u> lower case <b>a – z</b>
Numeric	ASCII characters numeric <b>0 – 9</b>
Alphanumeric	Any combination of Alphabetic and Numeric as defined above
Space	A space character ‘ ’

**Note 1: Reference Section 3.02 Data Format for ASCII filler character rules.**

**Note 2: Certain fields that appear in quotes have two (2) sizes: the first for Long quotes (Category k) and the second for Short quotes (Category q).**

**FIELD DESCRIPTIONS, continued****- B -****7.01 BBO INDICATOR (BEST BID AND BEST OFFER INDICATOR)**

**1 Byte**, alphabetic or space. Indicates the effect the new quote has on the Best Bid and/or the Best Offer. If it is determined that a BBO appendage or appendages are required, the appropriate Best Bid and/or Best Offer information is appended following the Short or Long Equity and Index Quote message. If it is determined that the new quote is the new Best Bid and/or Best Offer, there is no change, or there is no Best Bid and/or Best Offer, an appendage is not present.

**BBO INDICATOR**

<u><b>CODE</b></u>	<u><b>VALUE</b></u>
<b>A</b>	<b>No Best Bid change, No Best Offer change</b> New quote does not affect the Best Bid or Best Offer. No appendage is required.
<b>B</b>	<b>No Best Bid change, Quote contains Best Offer</b> New quote does not affect the Best Bid, but is the Best Offer. No appendage is required.
<b>C</b>	<b>No Best Bid Change, Best Offer Appendage</b> New quote does not affect the Best Bid, a new Best Offer is generated and the new Best Offer information is contained in the Best Offer Appendage.
<b>D</b>	<b>No Best Bid Change, No Best Offer</b> New quote does not affect the Best Bid, and there is no Best Offer. No appendage is required.
<b>E</b>	<b>Quote contains Best Bid, No Best Offer Change</b> New quote is itself the Best Bid, but does not affect the Best Offer. No appendage is required.
<b>F</b>	<b>Quote contains Best Bid, Quote contains Best Offer</b> New quote is itself the Best Bid and Best Offer. No appendage is required.
<b>G</b>	<b>Quote contains Best Bid, Best Offer Appendage</b> New quote is itself the Best Bid, a new Best Offer is generated and the new Best Offer information is contained in the Best Offer Appendage.
<b>H</b>	<b>Quote contains Best Bid, No Best Offer</b> New quote is itself the Best Bid, and there is no Best Offer. No appendage is required.

**BBO INDICATOR, continued**

<b><u>CODE</u></b>	<b><u>VALUE</u></b>
<b>I</b>	<b>No Best Bid, No Best Offer Change</b> There is no Best Bid, and the quote does not affect the Best Offer. No appendage is required.
<b>J</b>	<b>No Best Bid, Quote contains Best Offer</b> There is no Best Bid, and the quote is itself the Best Offer. No appendage is required.
<b>K</b>	<b>No Best Bid, Best Offer Appendage</b> There is no Best Bid, a new Best Offer is generated and the new Best Offer is contained in the Best Offer Appendage.
<b>L</b>	<b>No Best Bid, No Best Offer</b> There is no Best Bid, and no Best Offer. No appendage is required.
<b>M</b>	<b>Best Bid Appendage, No Best Offer Change</b> A new Best Bid is generated and the new Best Bid information is contained in the Best Bid Appendage, but the quote does not affect the Best Offer.
<b>N</b>	<b>Best Bid Appendage, Quote contains Best Offer</b> A new Best Bid is generated and the new Best Bid information is contained in the Best Bid Appendage, and the quote is the Best Offer.
<b>O</b>	<b>Best Bid Appendage, Best Offer Appendage</b> A new Best Bid is generated and the new Best Bid information is contained in the Best Bid Appendage, a new Best Offer is generated and the new Best Offer information is contained in the Best Offer Appendage.
<b>P</b>	<b>Best Bid Appendage, No Best Offer</b> A new Best Bid is generated and the new Best Bid information is contained in the Best Bid Appendage, and there is no Best Offer.
<b>Space</b>	Indicates that the new quote did not meet the BBO requirements. This quote is not included in the BBO.

**FIELD DESCRIPTIONS, continued**

<b>- B -</b>
--------------

**7.02 BEST BID PARTICIPANT ID**

**1 Byte**, alphabetic. Identifies the Participant that entered the Best Bid.

**7.03 BEST OFFER PARTICIPANT ID**

**1 Byte**, alphabetic. Identifies the Participant that entered the Best Offer.

**7.04 BEST BID PRICE DENOMINATOR CODE**

**1 Byte**, alphabetic. The Best Bid Price Denominator Code field indicates the position of the floating decimal point within the Best Bid Price field.

**Reference Denominator Code description for codes table**

**7.05 BEST OFFER PRICE DENOMINATOR CODE**

**1 Byte**, alphabetic. The Best Offer Price Denominator Code field indicates the position of the floating decimal point within the Best Offer Price field.

**Reference Denominator Code description for codes table.**

**7.06 BEST BID PRICE**

**4 Bytes**, signed integer. A zero value in this field represents a valid Best Bid Price, regardless of size.

The Best Bid Price is the whole and decimal portion of the Best Bid Price information with the Best Bid Price Denominator Code determining the location of the decimal point.

Represents the best price at which a buyer is willing to buy an option.

**Reference Appendix D for Best Bid/Offer rules.**

**FIELD DESCRIPTIONS, continued**

<b>- B -</b>
--------------

**7.07 BEST BID SIZE**

**4 Bytes**, unsigned integer.

The Best Bid Size identifies the number of contracts being bought for an option at the Best Bid price.

**Reference Appendix D for Best Bid/Offer rules.**

**7.08 BEST OFFER PRICE**

**4 Bytes**, signed integer.

The Best Offer Price is the whole and decimal portion of the Best Offer Price information with the Best Offer Price Denominator Code determining the location of the decimal point.

Represents the best price at which a seller is offering to sell an option.

**Reference Appendix D for Best Bid/Offer rules.**

**7.09 BEST OFFER SIZE**

**4 Bytes**, unsigned integer.

The Best Offer Size identifies the number of contracts for sale for an option at the Best Offer price.

**Reference Appendix D for Best Bid/Offer rules.**

**7.10 BID INDEX VALUE**

**4 Bytes**, signed integer.

The Bid Index Value is the whole and decimal portion of the Bid Index Value information with the Premium Price Denominator Code determining the location of the decimal point.

The Bid Index Value represents the value of the index's calculation formula using the current bid values of the component securities.

**FIELD DESCRIPTIONS, continued**

<b>- B -</b>
--------------

**7.11 BID PRICE**

**4 Byte** signed integer (for Categories f and k), 2 byte unsigned integer (for Category q). A Zero in this field represents a valid Bid Price.

The Bid Price is the whole and decimal portion of the Bid Price information with the Premium Price Denominator Code determining the location of the decimal point.

Represents the price at which a buyer is willing to buy an option.

**7.12 BID SIZE**

**2 or 4 Bytes**, unsigned integer. When there is no Bid Size, this value is Zero.

The Bid Size identifies the number of contracts being bought for an option at the Bid Price.

When the Bid Size and the Bid Price are both zero, it represents a cancel of a previous quote.

**FIELD DESCRIPTIONS, continued****- D -****7.13 DENOMINATOR CODE(s)****1 Byte**, alphabetic.

The following Denominator Codes are used for all Denominator Code fields. These are Best Bid Price Denominator Code, Best Offer Price Denominator Code, Index Value Denominator Code, Premium Price Denominator Code, Strike Price Denominator Code, and Underlying Price Denominator Code.

Denominator		Numerator	Field Limit			
Code	Value	(number of decimal places)	Index Value Denom	Premium Price Denom	Strike Price Denom	Underlying Price Denom
A	10	1	YES	YES	YES	YES
B	100	2	YES	YES	YES	YES
C	1,000	3	YES	YES	YES	YES
D	10,000	4	YES	YES	YES	YES
E	100,000	5	YES	YES	YES	YES
F	1,000,000	6	YES	YES	NO	YES
G	10,000,000	7	YES	YES	NO	YES
H	100,000,000	8	NO	NO	NO	YES
I	No Fraction	0	YES	YES	YES	YES

**Field Limits:**

- Index Value Denominator Code supports denominator code 'A' thru 'G' and 'I'
- Premium Price Denominator Code supports denominator code 'A' thru 'G' and 'I'
- Strike Price Denominator Code supports denominator code 'A' thru 'E' and 'I'
- Underlying Price Denominator Code supports ALL denominator codes



**FIELD DESCRIPTIONS, continued**

- E -

**7.14 EXPIRATION BLOCK**

Expiration Block is a three byte field which represents the expiration month, day, and year of the option, and is used in Message Categories a, d, f, k and q.

Field Name	Length (bytes)
Expiration Month	1
Expiration Day	1
Expiration Year	1
<b>Total Length:</b>	<b>3</b>

- **Expiration Month: 1 Byte**, alphabetic. Indicates the expiration month and identifies the option as a Call or a Put.

CALL OPTIONS		PUT OPTIONS	
CODE	VALUE	CODE	VALUE
A	JANUARY	M	JANUARY
B	FEBRUARY	N	FEBRUARY
C	MARCH	O	MARCH
D	APRIL	P	APRIL
E	MAY	Q	MAY
F	JUNE	R	JUNE
G	JULY	S	JULY
H	AUGUST	T	AUGUST
I	SEPTEMBER	U	SEPTEMBER
J	OCTOBER	V	OCTOBER
K	NOVEMBER	W	NOVEMBER
L	DECEMBER	X	DECEMBER

- **Expiration Day: 1 Byte**, unsigned integer. Contains Hex 0x01 to 0x1F (decimal 1 to 31), indicating the day of the month the series expires. This date falls on a Saturday for Standard expirations, a Friday for Weekly expirations and the last business day of the appropriate month for Quarterly expirations. For accelerated options, the original date continues to be sent.
- **Expiration Year: 1 Byte**, unsigned integer. Contains Hex 0x00 to 0x63 (decimal 0 to 99). Represents the year, starting with year 2000.

## FIELD DESCRIPTIONS, continued

### - H -

#### 7.15 HIGH PRICE

**4 Bytes**, signed integer.

The High Price is the whole and decimal portion of the High Price information with the Premium Price Denominator Code determining the location of the decimal point.

Represents the highest price paid for an option during the trading day.

### - I -

#### 7.16 INDEX VALUE

**4 Bytes**, signed integer.

The Index Value is the whole and decimal portion of the Index Value information with the Premium Price Denominator Code determining the location of the decimal point.

Contains the index value using last sale values of index components.

#### 7.17 INDEX VALUE DENOMINATOR CODE

**1 Byte**, alphabetic.

The Index Value Denominator Code field indicates the position of the floating decimal point within either the Index Value, Bid Index Value, or Offer Index Value fields.

**Reference Denominator Code description for codes table.**

**FIELD DESCRIPTIONS, continued**

**- L -**

**7.18 LAST PRICE**

**4 Bytes**, signed integer.

The Last Price is the whole and decimal portion of the Last Price information with the Premium Price Denominator Code determining the location of the decimal point.

Represents the last price paid for an option during the trading day.

**7.19 LOW PRICE**

**4 Bytes**, signed integer.

The Low Price is the whole and decimal portion of the Low Price information with the Premium Price Denominator Code determining the location of the decimal point.

Represents the lowest price paid for an option during the trading day.

**- N -**

**7.20 NET CHANGE**

**4 Bytes**, signed integer.

The Net Change is the whole and decimal portion of the Net Change information with the Premium Price Denominator Code determining the location of the decimal point.

Represents the change in the price of an option from the closing price of one day to the closing price on the next day on which the option is traded.

This value can be positive, negative or zero.

## FIELD DESCRIPTIONS, continued

- O -
-------

### 7.21 OFFER INDEX VALUE

**4 Bytes**, signed integer.

The Offer Index Value is the whole and decimal portion of the Offer Index Value information with the Premium Price Denominator Code determining the location of the decimal point.

The Offer Index Value represents the value of the index's calculation formula using the current Offer(ed) values of the component securities.

### 7.22 OFFER PRICE

**4 Bytes**, signed integer (for Categories f and k), 2 byte unsigned integer (for Category q). A Zero in this field represents an invalid Offer Price.

The Offer Price is the whole and decimal portion of the Offer Price information with the Premium Price Denominator Code determining the location of the decimal point.

Represents the price at which a seller is offering to sell an option.

### 7.23 OFFER SIZE

**2 or 4 Bytes**, unsigned integer. When there is no Offer Size, this value is zero.

The Offer Size identifies the number of contracts for sale for an option at the Offer Price.

### 7.24 OPEN INTEREST VOLUME

**4 Bytes**, unsigned integer.

Represents the total number of outstanding option contracts that have not been exercised and have not yet reached expiration.

### 7.25 OPEN PRICE

**4 Bytes**, signed integer.

The Open Price is the whole and decimal portion of the Open Price information with the Premium Price Denominator Code determining the location of the decimal point.

Represents the first price paid for an option during the trading day.

**FIELD DESCRIPTIONS, continued**

**- P -**

**7.26 PREMIUM PRICE**

**4 Bytes**, signed integer.

The Premium Price is the whole and decimal portion of the Premium Price information with the Premium Price Denominator Code determining the location of the decimal point.

Represents the price of an option contract, determined in the competitive marketplace, which the buyer of the option pays to the option writer for the rights conveyed by the option contract.

**7.27 PREMIUM PRICE DENOMINATOR CODE**

**1 Byte**, alphabetic.

The Premium Price Denominator Code field indicates the position of the floating decimal point within either the Premium Price, Bid Price, Offer Price, Open Price, High Price, Low Price, or Last Price fields.

**Reference Denominator Code description for codes table.**

**- R -**

**7.28 RESERVED**

**Variable (V) Bytes**, unsigned integer. Reserved fields filled with Hex 0x00.

Fields reserved for future use.

**Note: Reserved fields will be redefined and implemented as required. If data recipients are not prepared to process new field(s) when implemented, they should be able to handle them to the extent that they do not impact normal data processing.**

## FIELD DESCRIPTIONS, continued

### - S -

#### 7.29 SECURITY SYMBOL

**4 or 5 Bytes**, Alphanumeric. Left Justified, Space filled.

The security symbol is used for Equity and Index options.

Identifies the unique symbol assigned to the underlying security.

#### 7.30 STRIKE PRICE

**4 Byte**, signed integer (for Categories a, d, f and k), 2 byte unsigned integer (for Category q).

The Strike Price is the whole and decimal portion of the Strike Price information with the Strike Price Denominator Code determining the location of the decimal point.

Represents the stated price per share for which the underlying security may be purchased (in the case of a call) or sold (in the case of a put) by the option holder upon exercise of the option contract.

#### 7.31 STRIKE PRICE DENOMINATOR CODE

**1 Byte**, alphabetic.

The Strike Price Denominator Code field indicates the position of the floating decimal point within the Strike Price field.

**Reference Denominator Code description for codes table.**

### - T -

#### 7.32 TRADE IDENTIFIER

**4 Bytes**, unsigned integer.

FOR FUTURE USE. Filled with Hex 0x00.

## FIELD DESCRIPTIONS, continued

- U -

### 7.33 UNDERLYING PRICE DENOMINATOR CODE

**1 Byte**, alphabetic.

The Underlying Price Denominator Code field indicates the position of the floating decimal point within the Underlying Price field.

**Reference Denominator Code description for codes table.**

### 7.34 UNDERLYING PRICE

**8 Bytes**, signed integer.

The Underlying Stock Price is the whole and decimal portion of the Underlying Stock Price information with the Underlying Stock Price Denominator Code determining the location of the decimal point.

Represents the price of the underlying security.

- V -

### 7.35 VOLUME

**4 Bytes**, unsigned integer.

The volume is used for Equity and Index options.

Represents the total number of contracts traded for an option in one trade, or the total number of contracts traded for an option for the entire trading day.

**8.0 FIELD APPEARANCES WITHIN MESSAGES**

<b>FIELD NAME</b>	<b>MESSAGE APPEARANCE</b>	<b>NUMBER OF APPEARANCES/ MESSAGES</b>
<b>- B -</b>		
BBO Indicator (Best Bid and Best Offer Indicator)	Long and Short Equity and Index Quote	<b>1</b>
Best Bid Participant ID	Best Bid Appendage	<b>1</b>
Best Bid Price	Best Bid Appendage	<b>1</b>
Best Bid Price Denominator Code	Best Bid Appendage	<b>1</b>
Best Bid Size	Best Bid Appendage	<b>1</b>
Best Offer Participant ID	Best Offer Appendage	<b>1</b>
Best Offer Price	Best Offer Appendage	<b>1</b>
Best Offer Price Denominator Code	Best Offer Appendage	<b>1</b>
Best Offer Size	Best Offer Appendage	<b>1</b>



**FIELD APPEARANCES WITHIN MESSAGES, continued**

<b>FIELD NAME</b>	<b>MESSAGE APPEARANCE</b>	<b>NUMBER OF APPEARANCES/ MESSAGES</b>
<b>- B -</b>		
Bid Index Value	Underlying Value – Bid and Offer	<b>1</b>
Bid Price	Long and Short Equity and Index Quote	<b>1</b>
	Equity and Index End of Day Summary	<b>1</b>
Bid Size	Equity and Index Quote	<b>1</b>
<b>- E -</b>		
Expiration	Equity and Index Last Sale	<b>1</b>
	Long and Short Equity and Index Quote	<b>1</b>
	Open Interest	
	Equity and Index End of Day	<b>1</b>
	Summary	<b>1</b>

**FIELD APPEARANCES WITHIN MESSAGES, continued**

<b>FIELD NAME</b>	<b>MESSAGE APPEARANCE</b>	<b>NUMBER OF APPEARANCES/MESSAGES</b>
<b>- H -</b>		
High Price	Equity and Index End of Day Summary	<b>1</b>
<b>- I -</b>		
Index Value	Underlying Value – Last Sale	<b>1</b>
Index Value Denom Code	Underlying Value – Last Sale	<b>1</b>
	Underlying Value – Bid and Offer	<b>1</b>

**FIELD APPEARANCES WITHIN MESSAGES, continued**

<b>FIELD NAME</b>	<b>MESSAGE APPEARANCE</b>	<b>NUMBER OF APPEARANCES/ MESSAGES</b>
<b>- L -</b>		
Last Price	Equity and Index End of Day Summary	<b>1</b>
Low Price	Equity and Index End of Day Summary	<b>1</b>
<b>- N -</b>		
Net Change	Equity and Index End of Day Summary	<b>1</b>

**FIELD APPEARANCES WITHIN MESSAGES, continued**

<b>FIELD NAME</b>	<b>MESSAGE APPEARANCE</b>	<b>NUMBER OF APPEARANCES/ MESSAGES</b>
<b>- O -</b>		
Offer Index Value	Underlying Value – Bid and Offer	<b>1</b>
Offer Price	Long and Short Equity and Index Quote	<b>1</b>
	Equity and Index End of Day Summary	<b>1</b>
Offer Size	Long and Short Equity and Index Quote	<b>1</b>
Open Interest Volume	Open Interest	<b>1</b>
	Equity and Index End of Day Summary	<b>1</b>
Open Price	Equity and Index End of Day Summary	<b>1</b>
<b>- P -</b>		
Premium Price	Equity and Index Last Sale	<b>1</b>
Premium Price Denominator Code	Equity and Index Last Sale	<b>1</b>
	Long and Short Equity and Index Quote	<b>1</b>
	Equity and Index End of Day Summary	<b>1</b>

**FIELD APPEARANCES WITHIN MESSAGES, continued**

<b>FIELD NAME</b>	<b>MESSAGE APPEARANCE</b>	<b>NUMBER OF APPEARANCES/ MESSAGES</b>
<b>- R -</b>		
Reserved	Equity and Index Last Sale	<b>2</b>
	Long Equity and Index Quote	
	Open Interest	<b>1</b>
	Equity and Index End of Day	
	Summary	<b>1</b>
	Underlying Value – Last Sale	<b>1</b>
	Underlying Value – Bid and Offer	<b>2</b>
		<b>1</b>
<b>- S -</b>		
Security Symbol	Equity and Index Last Sale	<b>1</b>
	Long and Short Equity and Index	
	Quote	<b>1</b>
	Open Interest	
	Equity and Index End of Day	<b>1</b>
	Summary	<b>1</b>
	Underlying Value – Last Sale	<b>1</b>
	Underlying Value – Bid and Offer	<b>1</b>

**FIELD APPEARANCES WITHIN MESSAGES. continued**

<b>FIELD NAME</b>	<b>MESSAGE APPEARANCE</b>	<b>NUMBER OF APPEARANCES/ MESSAGES</b>
<b>- S -</b>		
Strike Price	Equity and Index Last Sale	<b>1</b>
	Long and Short Equity and Index	
	Quote	<b>1</b>
	Open Interest	
	Equity and Index End of Day	
	Summary	<b>1</b>
		<b>1</b>
Strike Price Denominator Code	Equity and Index Last Sale	<b>1</b>
	Long and Short Equity and Index	
	Quote	<b>1</b>
	Open Interest	
	Equity and Index End of Day	
	Summary	<b>1</b>
		<b>1</b>
<b>- T -</b>		
Trade Identifier	Equity and Index Last Sale	<b>1</b>

**FIELD APPEARANCES WITHIN MESSAGES, continued**

<b>FIELD NAME</b>	<b>MESSAGE APPEARANCE</b>	<b>NUMBER OF APPEARANCES/ MESSAGES</b>
<b>- U -</b>		
Underlying Price Denominator Code	Equity and Index End of Day Summary	<b>1</b>
Underlying Price	Equity and Index End of Day Summary	<b>1</b>
<b>- V -</b>		
Volume	Equity and Index Last Sale	<b>1</b>
	Equity and Index End of Day Summary	<b>1</b>

## **9.0 ADMINISTRATIVE MESSAGES**

### **9.01 Administrative Message**

Category C, Type = (Space filled); Unformatted

Administrative (unformatted) messages (called admins) are those messages that, because of the nature of the information they contain, cannot be readily arranged in a fixed format.

Equity and Index administrative messages are disseminated over **OPRA HSL 4**.

Administrative messages are **not** blocked with any other messages. They will be sent singly, one to a block.

### **9.02 Administrative Message Length**

The length of an administrative message is variable. The total length of the entire message **cannot** exceed **450** characters, including the Message Header, Message Data Length, and the message text.

### **9.03 Administrative Message Text**

For most administrative messages, the text section of the Administrative message is transmitted in free format.

### **9.04 ALERT ALERT ALERT Administrative Message**

Should OPRA and/or a Participant experience a failure, SIAC, at the request of OPRA and/or a Participant, will disseminate an administrative message which will always begin with the text: **ALERT ALERT ALERT** and will be followed by free form text indicating the situation being encountered.

### **9.05 Administrative Equity and Index FLEX Message Standards**

Participants use **Category C, Type = (Space filled)** Administrative messages to transmit market data on nonstandard options that do not fit normal formats.

The following standards have been adopted by the Participants to transmit **FLEX** (equity and index options) information. The formatted text immediately follows the last character in the Message Header.



**9.05 Administrative Message Standards, continued**

<b>EQUITY AND INDEX OPTIONS</b>			
<b>Field Descriptions</b>	<b>Bytes</b>	<b>Character</b>	<b>Details</b>
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I – Index E – Equity
Filler	1	Space	
Security Symbol	5	Alphanumeric Left Justified Space filled	
Filler	1	Space	
Message Type	3	Alphabetic	RFQ - Request for Quote QTE - Quote LST - Last Sale CXL - Cancel ADM - Admin Message IND - Indicative Quote
Filler	1	Space	
Request Identifier	5	Alphanumeric Left Justified Space filled	
Filler	1	Space	
Text	V	Alphanumeric	Variable text up to 425 character free form

<b>EQUITY INDICATIVE QUOTE (IND)</b>			
<b>Field Descriptions</b>	<b>Bytes</b>	<b>Character</b>	<b>Details</b>
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	E – Equity
Filler	1	Space	
Security Symbol	5	Alphanumeric Left Justified Space filled	MSFT(Space)
Filler	1	Space	
Message Type	3	Alphabetic	IND - Indicative Quote
Filler	1	Space	
Text	V	Alphanumeric	2 YR ATMC 1.55-1.63
This message is an Equity FLEX Indicative Quote MSFT 2 Year at-the-money call. 1.55% bid, offered at 1.63%.			

**Administrative Message, continued**

<b>EQUITY ADMINISTRATIVE MESSAGE (ADM)</b>			
<b>Field Descriptions</b>	<b>Bytes</b>	<b>Character</b>	<b>Details</b>
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	E – Equity
Filler	1	Space	
Security Symbol	5	Alphanumeric Left Justified Space filled	MSFT(Space)
Filler	1	Space	
Message Type	3	Alphabetic	ADM – Admin Message
Filler	1	Space	
Text	V	Alphanumeric	RFQ MSFT1 Market Closed
This message is an Equity FLEX Administrative Message that RFQ MSFT1 has been closed.			

<b>INDEX OPTIONS REQUEST FOR QUOTE (RFQ)</b>			
<b>Field Descriptions</b>	<b>Bytes</b>	<b>Character</b>	<b>Details</b>
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I - Index
Filler	1	Space	
Security Symbol	5	Alphanumeric Left Justified Space filled	OEX
Filler	1	Space	
Message Type	3	Alphabetic	RFQ - Request for Quote
Filler	1	Space	
Request Identifier	5	Alphanumeric Left Justified Space filled	1
Filler	1	Space	
Text	V	Alphanumeric	Call 12/31/01 105% EUR CL \$20M QUOTE IN % BY 1030 CST
This message is an Index FLEX Request for Quote for OEX call, Expiration date 12/31/01, Strike Price 5% out of the money (calculated at the close), European Expiration, settled on the close \$20,000,000. Quotes must be made in percentages of the closing index value and must be in by 10:30 central standard time.			

**Administrative Message, continued**

INDEX OPTIONS QUOTE (QTE)			
Field Descriptions	Bytes	Character	Details
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I - Index
Filler	1	Space	
Security Symbol	5	Alphanumeric Left Justified Space filled	XMI
Filler	1	Space	
Message Type	3	Alphabetic	QTE - Quote
Filler	1	Space	
Request Identifier	5	Alphanumeric Left Justified Space filled	12
Filler	1	Space	
Text	V	Alphanumeric	4 ½%-5% \$10Mx\$10M
This message is an Index FLEX Quote for XMI, according to the terms of the request assigned identifier RFQ12. Bid 4/12%-Offer 5%, size \$10,000,000 up.			

INDEX OPTIONS LAST SALE (LST)			
Field Descriptions	Bytes	Character	Details
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I - Index
Filler	1	Space	
Security Symbol	5	Alphanumeric Left Justified Space filled	SPX
Filler	1	Space	
Message Type	3	Alphabetic	LST – LAST SALE
Filler	1	Space	
Request Identifier	5	Alphanumeric Left Justified Space filled	2
Filler	1	Space	
Text	V	Alphanumeric	250 @ 23.75 5NSX
This message is an Index FLEX Last Sale for SPX Request for Quote number 2. 250 contracts traded at 23.75; clearing symbol is 5NSX.			

**9.05 Administrative Message Standards, continued**

<b>EQUITY OPTIONS LAST SALE (LST)</b>			
<b>Field Descriptions</b>	<b>Bytes</b>	<b>Character</b>	<b>Details</b>
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	E - Equity
Filler	1	Space	
Security Symbol	5	Alphanumeric Left Justified Space filled	IBM
Filler	1	Space	
Message Type	3	Alphabetic	LST – LAST SALE
Filler	1	Space	
Request Identifier	5	Alphanumeric Left Justified Space filled	2
Filler	1	Space	
Strike Price	1-9	Alphanumeric	125.125
Filler	1	Space	
Type (call or put)	1	Alphabetic	C
Filler	1	Space	
Exercise Style (Amer, Eur)	3-4	Alphanumeric	AMER
Filler	1	Space	
Expiration Date	10	Alphanumeric	01.02.09
Filler	1	Space	
Volume	5	Alphanumeric	500
Filler	1	Space	
Premium	1-9	Alphanumeric	3.57
Filler	1	Space	
Clearing Symbol	6	Alphanumeric	1IBM
This message is an Equity FLEX Last Sale for IBM, 125.125 Call. American exercise, expiring 01/02/09. 500 sold at 3.57			

## 10.0 CONTROL MESSAGES

### 10.01 CONTROL MESSAGE SUMMARY

Control messages perform specified system advisory and control functions.

The following represents all Control messages that are sent to all lines:

MESSAGE IDENTIFICATION		CONTROL MESSAGE
CATEGORY	TYPE	
H	A	Start of Test Cycle
H	B	End of Test Cycle
H	C	Start of Day
H	D	Good Morning
H	E	Start of Summary
H	F	End of Summary
H	G	Early Market Close
H	H	End of Transaction Reporting
H	I	Good Night
H	J	End of Day
H	K	Reset Block Sequence Number
H	L	Start of Open Interest
H	M	End of Open Interest
H	N	Line Integrity

In the following discussion of Control Messages, Message Header means both the Message Header fields and the Message Data Length fields.

Control messages can consist of the standard Message Header only, or the standard Message Header immediately followed by text. The textual portion of the message is in variable field (free form).

Control messages are **not** blocked with any other messages. They will be sent singly, one to a block.

Message Length: Variable (6 Bytes + Message Data length)

The length of a Control Message is variable. The total length of the entire message **cannot** exceed **450** characters, including the Message Header, Message Data Length, and the message text.

**CONTROL MESSAGE SUMMARY, continued**

For all Control messages, the **Participant ID** field in the **Message Header** will contain a character identifying OPRA or the Participant originating the message as follows (* = application pending):

CODE	VALUE
<b>A</b>	NYSE AMEX
<b>B</b>	Boston Options Exchange
<b>C</b>	Chicago Board Options Exchange
<b>H</b>	ISE GEMINI
<b>I</b>	International Securities Exchange
<b>M</b>	Miami International Securities Exchange
<b>N</b>	NYSE ARCA
<b>O</b>	Options Price Reporting Authority
<b>Q</b>	NASDAQ Stock Market
<b>W</b>	C2
<b>T</b>	NASDAQ OMX BX Options
<b>X</b>	NASDAQ OMX PHLX
<b>Z</b>	BATS

A Participant, SIAC on behalf of OPRA, or both can originate Control messages as follows:

PARTICIPANT ID CODE	CONTROL MESSAGE
<b>O</b>	Start of Test Cycle
<b>O</b>	End of Test Cycle
<b>O</b>	Start of Day
<b>Any valid code except 'O'</b>	Good Morning
<b>Any valid code except 'O'</b>	Start of Summary
<b>Any valid code except 'O'</b>	End of Summary
<b>Any valid code except 'O'</b>	Early Market Close
<b>Any valid code except 'O'</b>	End of Transaction Reporting
<b>Any valid code except 'O'</b>	Good Night
<b>O</b>	End of Day
<b>O</b>	Reset Block Sequence Number
<b>O</b>	Start of Open Interest
<b>O</b>	End of Open Interest
<b>O</b>	Line Integrity

**CONTROL MESSAGE SUMMARY, continued**

In textual portions of Control messages, the Participant Identification identifies the abbreviated name of the originating Participant as follows (* = application pending):

<b>PARTICIPANT/PROCESSOR IDENTIFICATION ABBREVIATION</b>	<b>PARTICIPANT/PROCESSOR</b>
<b>AMEX</b>	NYSE AMEX
<b>BATS</b>	BATS
<b>BOX</b>	Boston Options Exchange
<b>BX</b>	NASDAQ OMX BX Options
<b>CBOE</b>	Chicago Board Options Exchange
<b>C2</b>	C2
<b>ISE</b>	International Securities Exchange
<b>ISE GEMINI</b>	ISE GEMINI
<b>MIAX</b>	Miami International Securities Exchange
<b>NYSE</b>	NYSE ARCA
<b>OPRA</b>	Options Price Reporting Authority
<b>NASD</b>	NASDAQ Stock Market
<b>PHLX</b>	NASDAQ OMX PHLX

**NOTE:** In the free form textual portions of Control messages, where specified, MM=Month, DD=Day, hh=hour, mm=minute and ss=second (The time is reflected in 24 hour clock Eastern Time).

## **10.02 CONTROL MESSAGE DESCRIPTIONS**

### **10.03 Test Cycle Comments**

OPRA may transmit the Start of Test Cycle message after the lines are started and before the Category H, Type C Start of Day message is sent out. Its function is to exercise the line to verify transmission integrity. A Test Cycle consists of:

- A Start of Test Cycle message
- Any number of other OPRA messages of any Category and Type
- An End of Test Cycle message

Each Test Cycle message is initiated by transmission of the Start of Test Cycle message and is terminated by transmission of an End of Test Cycle message. In between, any valid OPRA message(s) may appear. The Test Cycle can be repeated until shortly before transmission of the Start of Day message. Refer to **Appendix F** for a sample listing of Test Cycle messages.

The Block Sequence Number in Start of Test Cycle messages will **not** be checked by OPRA.

### **10.04 Start of Test Cycle – Category H, Type A**

The Start of Test Cycle message is transmitted to signal the start of the transmission of a Test Cycle.

The Start of Test Cycle message will consist of the standard Message Header immediately followed by the textual message:

**“START OF TEST CYCLE”**

The Block Sequence Number of any Start of Test Cycle message is set to Zero.



## **CONTROL MESSAGE DESCRIPTIONS, continued**

### **10.05 End of Test Cycle - Category H, Type B**

The End of Test Cycle message is transmitted to signal the end of the transmission of a Test Cycle message.

The End of Test Cycle message will consist of the standard Message Header immediately followed by the textual message:

**“END OF TEST CYCLE”**

### **10.06 Start of Day – Category H, Type C**

The Start of Day message signals the start of normal data recipient processing of messages received over a line.

The Start of Day message will consist of the standard Message Header immediately followed by the textual message:

**“START OF DAY”**

Administrative and other messages may precede SOD messages, therefore the Block Sequence Number (BSN) field of the SOD messages is incremented accordingly.

### **10.07 Good Morning - Category H, Type D**

The Good Morning message is transmitted by a Participant to signal the beginning of transaction processing by that Participant.

The Good Morning message will consist of the standard Message Header immediately followed by the textual message:

**“ (PARTICIPANT IDENTIFICATION) GOOD MORNING – MMDD hhmm”**

example: **“CBOE GOOD MORNING – 0102 0930”**

## **CONTROL MESSAGE DESCRIPTIONS, continued**

### **10.08 Start of Summary - Category H, Type E**

The Start of Summary message is transmitted by a Participant to signal the beginning of transmission of one or more End of Day Summary messages by that Participant.

The Start of Summary message will consist of the standard Message Header immediately followed by the textual message:

**“(PARTICIPANT IDENTIFICATION) START OF SUMMARY – MMDD hhmm”**

example: **“CBOE START OF SUMMARY – 0102 1000”**

### **10.09 End of Summary - Category H, Type F**

The End of Summary message is transmitted by a Participant to signal the end of transmission of one or more End of Day Summary messages by that Participant.

The End of Summary message will consist of the standard Message Header immediately followed by the textual message:

**“(PARTICIPANT IDENTIFICATION) END OF SUMMARY – MMDD hhmm”**

example: **“CBOE END OF SUMMARY – 0102 1530”**

### **10.10 Early Market Close - Category H, Type G**

The Early Market Close message is transmitted by a Participant to signal that the Participant originating the message is closing prior to normal market close time.

The Early Market Close message will consist of the standard Message Header immediately followed by the textual message:

**“(PARTICIPANT IDENTIFICATION) MARKET CLOSED EARLY – MMDD hhmm”**

example: **“CBOE MARKET CLOSED EARLY – 0102 1500”**

## **CONTROL MESSAGE DESCRIPTIONS, continued**

### **10.11 End of Transaction Reporting - Category H, Type H**

The End of Transaction Reporting message is transmitted by a Participant to signify that the Participant has terminated reporting of transactions.

The End of Transaction Reporting message will consist of the standard Message Header immediately followed by the textual message:

**“END OF (PARTICIPANT IDENTIFICATION) REPORTING – MMDD hhmm”**

example: **“END OF CBOE REPORTING – 0102 1600”**

### **10.12 Good Night - Category H, Type I**

The Good Night message is transmitted by a Participant to advise all data recipients that there are no further messages of any type transmitted for the day by that Participant.

The Good Night message will consist of the standard Message Header immediately followed by the textual message:

**“(PARTICIPANT IDENTIFICATION) GOOD NIGHT – MMDD hhmm”**

example: **“CBOE GOOD NIGHT – 0102 1630”**

### **10.13 End of Day - Category H, Type J**

The End of Day message signals the end of transmission of original data over the lines.

The End of Day message will consist of the standard Message Header immediately followed by the textual message:

**“OPRA END OF DAY”**

**Note: Under normal conditions, upon receiving the Category H, Type J (End of Day) message, it is the data recipient’s responsibility to terminate their production OPRA output feeds from SIAC.**

**Data traffic intended for testing purposes only is disseminated on the production network during non-production hours. Data recipients should ensure they process required input only.**

## **CONTROL MESSAGE DESCRIPTIONS, continued**

### **10.14 Reset Block Sequence Number - Category H, Type K**

The Reset Block Sequence Number message is transmitted when the block sequence number requires resetting.

The Reset Block Sequence Number message will consist of the block header (3.06) and message header (4.0) followed by an empty body with a size of zero.

The Block Sequence Number field contains the number to which the Block Sequence Number counter is to be reset.

## **CONTROL MESSAGE DESCRIPTIONS, continued**

### **10.15 Start of Open Interest - Category H, Type L**

The Start of Open Interest message signals the beginning of transmission of a series of one or more Open Interest messages.

The Start of Open Interest message will consist of the standard Message Header immediately followed by the textual message:

**“(PARTICIPANT IDENTIFICATION) START OF OPEN INTEREST – MMDD hhmm”**

example: **“CBOE START OF OPEN INTEREST – 0102 1100”**

**Note:** The Start of Open Interest control message is followed by transmission of Open Interest messages for each Participant and is ended by an End of Open Interest control message. During this cycle, Open Interest messages are sent by SIAC on behalf of OPRA. The individual Open Interest messages contain the Participant ID code of the Participant associated with the Open Interest message while the control messages contain an “O” as the Participant ID code in the Message Header.

If a Participant initiates Open Interest messages, the Start and End of Open Interest control messages as well as the individual Open Interest messages contain the Participant ID code in the Message Header of the Participant initiating the messages.

## **CONTROL MESSAGE DESCRIPTIONS, continued**

### **10.16 End of Open Interest - Category H, Type M**

The End of Open Interest message signals the end of transmission of a series of one or more Open Interest messages.

The End of Open Interest message will consist of the standard Message Header immediately followed by the textual message:

**“(PARTICIPANT IDENTIFICATION) END OF OPEN INTEREST – MMDD hhmm”**

example:       **“CBOE END OF OPEN INTEREST – 0102 1545”**

## **CONTROL MESSAGE DESCRIPTIONS**

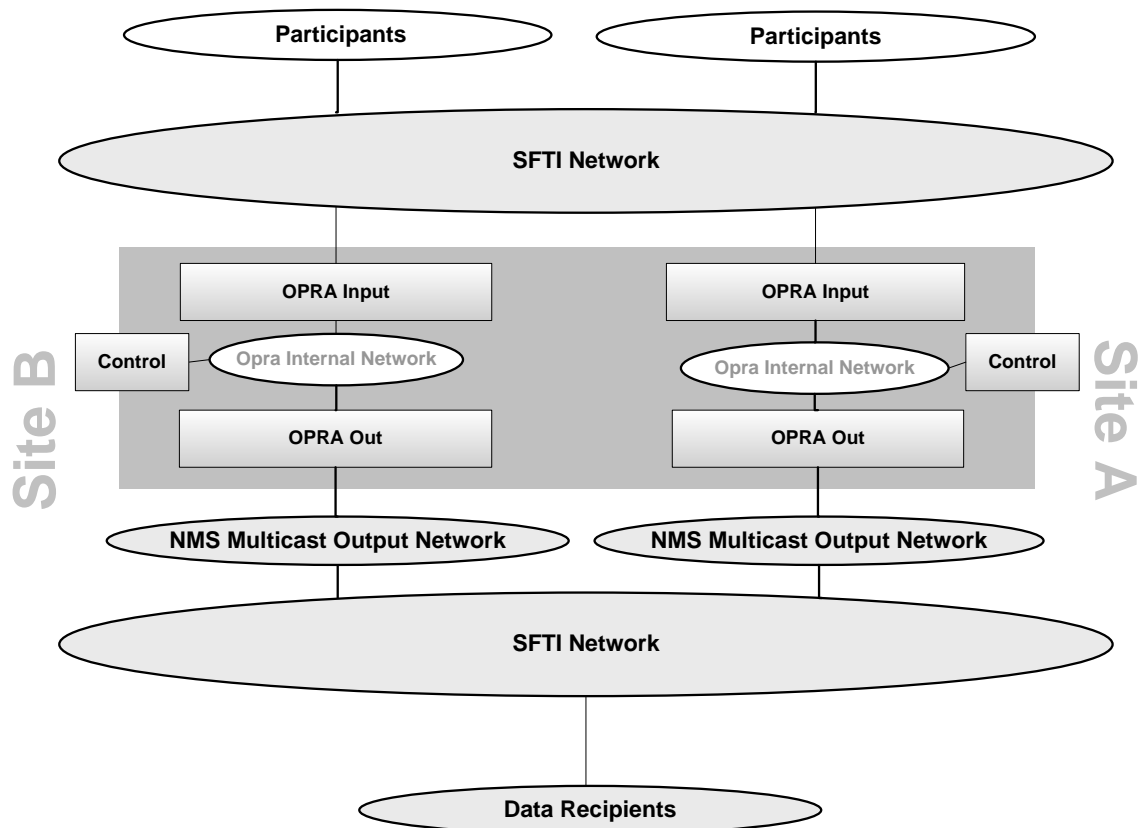
### **10.17 Line Integrity Message - Category H, Type N**

The Line Integrity message will consist of the standard Message Header and is generated automatically at intervals of approximately one minute to verify continued integrity of multicast transmission.

The Line Integrity message transmission does not interrupt a transmission in progress, but is transmitted whether or not additional messages are queued for transmission.

## APPENDIX A: OPRA CONFIGURATION

### OPRA CONFIGURATION



## **APPENDIX B: OPRA TRAFFIC DISTRIBUTION**

**OPRA** messages are disseminated over multiple IP Multicast lines. Equity and index options traffic will be on OPRA 1 through 48.

Traffic will be routed over the IP Multicast lines as follows on 48 line network:

### **OPRA 4:**

- All Equity and Index Administrative messages, including Flex messages
- Any symbol with a numeric in first character

### **ALL Lines:**

- All Control messages
1. For Equity and Index Last Sale, Long and Short Equity and Index Quote, Open Interest, Equity and Index End of Day Summary and Underlying Value messages, traffic is routed by the Security Symbol to assigned lines, according to the following routing rules:



## Options Price Reporting Authority (OPRA) – Binary Data Recipient Interface Specification

Revised Symbol Distribution - Effective: November 25th													
Line	Security Symbol					Exp Mo		Security Symbol					Exp Mo
1	A							A	A	P	L		L
2	A	A	P	L		M		A	C	D	Z	Z	X
3	A	C	E					A	L	Z	Z	Z	X
4	A	M						A	P	C	Z	Z	X
5	A	P	D					B	D	Z	Z	Z	X
6	B	E						B	Z	Z	Z	Z	X
7	C							C	D	Z	Z	Z	X
8	C	E						C	M	F	Z	Z	X
9	C	M	G					C	S	B	Z	Z	X
10	C	S	C					D	F	Z	Z	Z	X
11	D	G						D	I	A	Z	Z	X
12	D	I	B					E	D	M	Z	Z	X
13	E	D	N					E	R	Z	Z	Z	X
14	E	S						F	A	S	Z	Z	X
15	F	A	T					F	S	Z	Z	Z	X
16	F	T						G	D	Z	Z	Z	X
17	G	E						G	L	D			L
18	G	L	D			M		G	N	Z	Z	Z	X
19	G	O						G	O	O	G		L
20	G	O	O	G		M		G	Z	Z	Z	Z	X
21	H							I	B	L	Z	Z	X
22	I	B	M					I	U	Z	Z	Z	X
23	I	V						J	B	Z	Z	Z	X
24	J	C						K	O	Z	Z	Z	X
25	K	P						M					X
26	M	A						M	D	Z	Z	Z	X
27	M	E						M	S	F	Z	Z	X
28	M	S	G					N	F	L	X		L
29	N	F	L	X		M		O	H	Z	Z	Z	X
30	O	I						P	C	L	N		L
31	P	C	L	N		M		P	O	D	Z	Z	X
32	P	O	E					Q	Q	Q			L
33	Q	Q	Q			M		R	L	Z	Z	Z	X
34	R	M						S	C	Z	Z	Z	X
35	S	D						S	L	V			L
36	S	L	V			M		S	P	X	Z	Z	X
37	S	P	Y					S	P	Y			L
38	S	P	Y			M		S	P	Y	Z	Z	X
39	S	P	Z					S	Y	Z	Z	Z	X
40	S	Z						T	L	T	Z	Z	X
41	T	L	U					T	T	Z	Z	Z	X
42	T	U						U	R	Z	Z	Z	X
43	U	S						V	B	Z	Z	Z	X
44	V	C						V	X	Z	Z	Z	X
45	V	Y						W	L	Z	Z	Z	X
46	W	M						X	L	E			L
47	X	L	E			M		X	L	X	Z	Z	X
48	X	L	Y					Z	Z	Z	Z	Z	X

## **APPENDIX B: Traffic Distribution, continued**

2. Symbols containing only alpha characters will be routed according to the distribution table.
3. Symbols containing numerics will be routed based upon the alpha characters preceding the first numeric, e.g.,:

Non-Standard symbol 'STD1' will be routed to the line containing 'STD'

4. If a numeric is received in the first character, e.g., '1RSTU' it will be routed to Multicast Line 4
5. If an Index message is generated for a symbol that is split by call/put it will be generated over the line designated for calls.

e.g., Index message for GLD will be sent over the line for calls

### **Selectively sent to Any Line:**

- Reset Sequence Number message (dependent upon line that requires the block sequence number to be reset)

**Note:** Data recipients are responsible for handling any symbol over any line.  
Redistribution of traffic will not occur intraday but can occur on a next day basis.  
Notification may not be sent to the data recipients regarding redistribution of traffic.

**APPENDIX C: SCHEDULE OF DAILY OPRA MESSAGES****Note:** Time ranges shown have approximate times indicated, are dependent on daily traffic volume, and are subject to change based on a Participant's hours of operation. The Times are Eastern time.

<b><u>TIME</u></b>	<b><u>TRANSMISSION</u></b>
1:20 a.m.	Start all output lines
1:25 a.m.	Start of Test Cycle message (followed by Equity/Index test cycle messages)
2:05 a.m.	End of Test Cycle message
6:10 a.m.	Start of Day message on lines 1-48 (Equity/Index)
6:15 – 7:00 a.m.	NASDAQ, BX, PHLX Good Morning
6:30 a.m.	Equity/Index Open Interest messages
6:45-7:15 a.m.	Equity/Index Good Morning message from AMEX, BATS, BOX, CBOE, C2, ISE, ISE GEMINI, MIAX
7:30 a.m.	ISE FX Options trading begins
8:20 a.m.	CBOE Interest Rate Options trading begins
8:30 a.m.	Equity/Index Good Morning message from NYSE

**APPENDIX C: SCHEDULE OF DAILY OPRA MESSAGES**

<b><u>TIME</u></b>	<b><u>TRANSMISSION</u></b>
9:30 a.m.	Equity/Index Options trading begins*
9:30 a.m.	PHLX World Currency Options trading begins
3:00 p.m.	CBOE Interest Rate Options trading ends
4:00 p.m.	Equity Options trading ends
4:00 p.m.	PHLX World Currency Options trading ends
4:15 p.m.	Index Options trading ends
4:15 p.m.	ISE FX Options trading ends
4:25 – 5:30 p.m.	Equity/Index End of Day Summary message
5:02 p.m.	End of Transaction Reporting message from each Participant
5:15 – 5:25 p.m.	Good Night message from each Participant
6:30 p.m.	End of Day message. System brought down.

***Some Index Options have non-standard trading hours (e.g., EUR trades 9:30 – 11:30).**

**Note: OPRA Multicast Data Recipients that test (including test Start of Day messages) data dissemination over the OPRA multicast data feeds can commence as early as 6:45 P.M. (ET) and terminate as late as 6:05 A.M. (ET) during business weekdays. This test period is accommodated to allow testing opportunities for Participants and Data Recipients as well as to provide test time to rectify any production problems that may have occurred the prior business day. Multicast data feed Recipients should take the necessary precautions to protect their systems against any adverse impact (e.g., database corruption) if processing data throughout the test data dissemination period. During the test period, note that test data can be disseminated over all OPRA multicast IP channels (e.g., Production, Retransmission or Playback Test Group IP addresses).**

## **APPENDIX D: BEST BID AND BEST OFFER (BBO) OVERVIEW**

Best Bid and Best Offer (BBO) calculations are performed whenever a new qualifying quote is received. If it is determined that a new quote has caused a new Best Bid, a new Best Offer, or both and the BBO information is not contained in the new quote, the appropriate Best Bid, Best Offer or both, information is appended to the new quote. If it is determined that the new quote does **not** affect the Best Bid or the Best Offer, appendages are **not** added.

A new quote can be the entire new Best Bid and/or Best Offer quote. In addition, the Best Bid and/or Best Offer appendages can indicate a Crossed Market where the Bid price is higher than the Offer price, or a Locked Market where both the Bid and the Offer prices are the same.

OPRA generates a Best Bid and/or Best Offer based on the following criteria in this order:

**Price:** Participants with highest Bid and lowest Offer have overall priority. Minimum Price increments must be at least **5 cents**, higher or lower than previous. (**See Note**)

**Size:** Largest size takes precedence when multiple Participants submit the same Bid and/or Offer price. There are no initial minimum size requirements. **Size increments must be 10 contracts or better than previous.** (**See Note**)

**Time:** Earliest time takes precedence when multiple Participants submit the same Bid and/or Offer price with the same size.

**Note 1:** Price and Size criteria may change at any time in the future. All Data Recipients should plan for modifiable parameters on Price and Size requirements. In preparation for potential trading in options with premiums expressed in pennies, a quote that improves the current quote by one cent will be considered part of the OPRA BBO.

**Note 2:** To avoid dissemination of duplicate Best Bid and/or Best Offer calculations: if a quote is received from a Participant who is currently part or all of the BBO, and the Best Bid and/or Offer are identical, then the Best Bid and/or Best Offer is **not** updated with a later time, and appendages are **not** added.

## **APPENDIX D: BEST BID AND BEST OFFER OVERVIEW, continued**

### **BBO Considerations (continued)**

Each quote message contains a Message Type, which describes the nature of the quote. The Message Types may be viewed as belonging to two classes:

1. Those that qualify for inclusion (eligible) in the Best Bid and/or Best Offer (BBO) calculations.
2. Those that **do not** qualify for inclusion (ineligible) in the Best Bid and/or Best Offer (BBO) calculations.

### **BBO-Eligible Message Types**

#### **Space Filled – Regular Trading**

##### **Type A – Eligible for Automation Execution**

##### **Type B – Bid contains Customer trading interest**

##### **Type O – Offer contains Customer trading interest**

##### **Type C – Both Bid and Offer contain Customer trading interest**

### **BBO-Ineligible Message Types**

##### **Type F – Non-Firm Quote**

##### **Type R – Rotation**

##### **Type T – Trading Halted**

##### **Type X – Firm Bid, Non-Firm Offer (Offer Side Only BBO-Ineligible)**

##### **Type Y – Firm Offer, Non-Firm Bid (Bid Side Only BBO-Ineligible)**

## **APPENDIX D: BEST BID AND BEST OFFER OVERVIEW, continued**

### **ZERO PRICE RULES FOR BEST BID AND BEST OFFER CALCULATIONS**

#### **1. Zero Bid Price and Non Zero Offer:**

If a quote with a zero Bid Price and zero Bid Size is received by OPRA, the Bid Price is eligible to be included in the BBO calculation. The priorities are then Price and Time (i.e., if multiple Participants enter a Zero Bid Price, the one received first is the Best). A size other than zero with a zero Bid Price is not valid and the Bid is ineligible to be included in the BBO calculation. The non zero offer is included in the BBO calculation.

#### **2. Zero Offer Price and Non Zero Bid:**

If a quote with a zero Offer Price is received by OPRA, the Offer is not considered valid and is ineligible to be included in the BBO calculation. The non zero Bid is included in the BBO calculation.

#### **3. Zero Bid Price and Zero Offer Price:**

If a quote with a zero Bid Price and zero Offer Price is received by OPRA, neither the Bid Price nor the Offer Price are eligible to be included in the BBO calculation. If the entering Participant's previous quote was part or all of the BBO, the BBO is re-calculated excluding the Participant's quote. If a Bid and/or Offer size is included in a Participant's quote, the quote is not valid and is ineligible to be included in the BBO calculations.

## **APPENDIX D: BEST BID AND BEST OFFER OVERVIEW, continued**

### **ZERO PRICE RULES FOR BEST BID AND BEST OFFER CALCULATIONS**

#### **4. Kill:**

The entry of the kill command by SIAC Operations for a Participant will result in OPRA generating quotes with zero Bid and Offer prices and zero Bid and Offer sizes and no Type code for either a series, a range of series or all series for which that Participant entered a valid quote.

<p><b>Note:</b> If a Participant informs SIAC Operations that they are experiencing system or other problems resulting in the unreliability of their quotes, upon the request of that Participant, SIAC Operations can execute a “KILL” procedure, whereby a zero quote is generated for an options series, a range of series or all series for which that Participant had entered a quote. When a Participant is in a “KILLED” state, their trades and administrative messages <u>will continue</u> to be processed normally.</p>
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## **APPENDIX E:                      SAMPLE TEST CYCLE MESSAGES**

<b>Note:</b> New binary sample cycle test messages to be provided in a future version of the specification.
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