Options Price Reporting Authority
400 South LaSalle
Chicago, IL 60605

OPRA

OPTIONS PRICE REPORTING AUTHORITY

BINARY DATA RECIPIENT INTERFACE SPECIFICATION

December 6, 2024

Version 6.2j

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ADDENDUMS

1. **COMMON IP MULTICAST DISTRIBUTION NETWORK SPECIFICATION**

2. **AUTOMATED RETRANSMISSONS (Retransmission User guide)**

THE ADDENDUMS ARE AVAILABLE FROM HTTPS://WWW.OPRAPLAN.COM/ UNDER OUTPUT SPECIFICATIONS BINARY.

DOCUMENT HISTORY

Version	Date	Description
2.2	5/18/2015	- Section 4.01. 10.01 & Appendix 'C': Added new exchange: EDGX Options
2.3	7/1/2016	- Section 3.05: Block Header – Removed old version - Section 4.0: Message Header – Removed old format - Message Formats (throughout): updated to remove old format - Appendix B – Updated with new Symbol Rebalance
2.4	10/21/2016	- Added new Participant MIAX PEARL
2.5	5/11/2017 & 8/21	- 4.01, 6.00 & Appendix 'D' - Added new Indicative Value Message Type 'I'
2.6	7/12/2017	- Updated NYSE AMEX to NYSE American
2.7	2/2/2018	- Updated Traffic distribution with new symbol distribution
2.8	9/21/18	- Updated Traffic distribution with new symbol distribution
2.9	10/24/2018	- Added new Participant MIAX EMERALD
3.0	2/25/2019	Changed www.opradata.com to www.opraplan.com
3.1	3/4/2019	- Message Types: Added future new trade message types table (Activation November 4, 2019), page 20 - 21 - Verbiage added for Block Sequence Number Reset after Disaster Recovery site activation, page 73 & 75
3.2	3/27/2019	- Added trade code "d" to New Message Types table, page 21
3.3	4/5/2019	- Message Types: Updated new trade messages type table as per the OPRA committee's agreed revisions, page 20 - 21
3.4	6/6/2019	- Added the new symbol distribution chart to launch July 15th 2019, page 79
3.5	6/26/2019	- Updated the new symbol distribution chart to reflect new launch date: August 26th, 2019, page 79
3.6	8/7/2019	- Added notation on Trade Type Codes that will be removed on November 4, 2019, on pages 19 - 23, pending fallback - Updated Nasdaq Participant ID's: pages 17, 69, 70
3.7	9/17/2019	- Updated list of Trade Type codes that will continue/obsolete after November 4, 2019, page 21 & 23
3.8	10/3/2019	- Added references of 4B -1 for Block Sequence Rollover - Added to Appendix B (page 81) the 4-line split symbol table
3.9	12/5/2019	- Updated headers of the Revised Symbol Distribution table, pg 81
4.0	1/17/2020	- Minor update to the Revised Symbol Distribution table
4.1	3/19/2020	- Appendix B: New distribution table
4.2	5/22/2020	- Added: Delta at Close fields under Administrative Flex messages - Deleted: obsolete Last Sale message types
4.3	8/6/2020	- Removed Time Beacon from all sections.

DOCUMENT HISTORY

Version	Date	Description
5.0	12/16/2020	Added: - Section 'Dual Site Redundancy' to describe redundancy for data dissemination Modified: - Block version from 5 to 6 - Block Sequence Number limit to rollover occur after 4,294,967,295 - Block Sequence Number to contain the Message Sequence Number in the Output Block - Block Sequence number on retransmitted blocks - Included redundant data stream for Retransmitted messages - Control (Category H) message structure to make it fixed length (Message Header Only) - Maximum allowed length for Administrative (Category C) message - Line Integrity publication interval from 60 seconds to 10 seconds - Start of Day Message transmission time - Minor edits and clarifications throughout document - Appendix B to include additional lines for regular session symbol distribution Eliminated: - Test Cycles scheduled prior to SOD - Control (Category H) message types A, B, D, G, h, I
5.0a	01/11/2021	Corrected: - Description of Block Sequence Number to clarify it contain the Message Sequence Number
5.0b	01/22/2021	Modified: - End of Day time from 7:00 pm to 6:05 pm
5.0c	02/5/2021	- Eliminated Open Interest publication scheduled for Extended Lines - Added schedule for Indicative Quote (Message Type I) under Appendix C - Corrected Summary of Message Category & Type table to include missing message type S - Updated Traffic distribution for regular session lines 49-96
5.0d	02/19/2021	- Updated section 3.05.6 - Block Sequence Number resets to 1 upon DR activation or failure recovery - Updated section 6.06 verbiage for Block Sequence Number Reset after Disaster Recovery site activation
5.0e	4/26/2021	- Added code 'u' and 'v' to the list of Message Types supported for Equity and Index Last Sale message
5.0f	5/3/2021	- Updated description for Trade Codes 'u' and 'v' for Equity and Index Last Sale message

DOCUMENT HISTORY

Version	Date	Description
6.0	06/15/2021	- Extended Session naming convention replaced with Global Trading Hours along with an updated trading schedule, effective November 21, 2021
6.1	06/25/2021	- Updated Session Indicator for OPRA generated messages - Removed reference of inactive GTH lines
6.1a	7/30/2021	- Clarified Message Sequence Number in Line Integrity messages - Clarified Message Sequence Number following Reset Block Sequence Number message - Added list of OPRA Test Symbols
6.1b	11/10/2021	- Added Test Window details for OPRA GTH under Appendix C
6.1c	03/25/2022	- Updated Appendix B: Added New Traffic distribution table (effective May 7, 2022)
6.1d	05/13/2022	- Updated Appendix B: Removed old Traffic distribution table
6.1e	03/06/2023	- Updated Appendix B: Added New Traffic distribution table (effective March 27, 2023)
6.2	03/10/2023	- Updated Appendix B: Added Traffic distribution details for 96 Lines
6.2a	04/10/2023	- Added new Participant MEMX
6.2b	05/03/2023	- Updated Appendix B: Traffic distribution details
6.2c	06/09/2023	- Updated Appendix B: Traffic distribution details to add clarification for Index routing
6.2d	07/07/2023	- Added section 1.03 to clarify system behavior during Failure Recovery
6.2e	11/22/2023	- Added Participant Code for new Participant MIAX Sapphire
6.2f	01/29/2024	- Removed Test Symbol 'ZZZ' and ‘IBO’ under Security Symbol Field Description
6.2g	02/09/2024	- Updated Appendix B to cleanup obsolete 48-Line OPRA Traffic Distribution details
6.2h	06/12/2024	- Updated OPRA Configuration diagram under Appendix A to remove reference to 'ICE Global Network’
6.2i	07/25/2024	- Updated Global Trading Hour (GTH) session end time from 9:15 am to 9:25 am
6.2j	12/05/2024	- Updated Line Integrity publication interval to clarify that these can be published more frequently than every 10 seconds

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 Dual Site Redundancy

OPRA systems that support the processing and dissemination of Trade and Quote data are operational at primary and backup sites. The backup site provides recovery capability in the event of a disaster at the primary site. OPRA transaction data is disseminated from either the primary or backup site. The dual-site configuration provides system fold-over for a limited site disaster (system failure) or full site disaster (loss of facility).

In the event of a Primary Data Center failover to the Disaster Recovery site (Backup Data Center), data will be sourced via the Backup Data Center source addresses

1.03 Failure Recovery

1.03.1 Input Gateway Failure and Recovery

- In the event the Primary input Gateway connection encounters an unexpected state, Input Participants can reconnect to the Secondary (backup) input connection

- In the event the Input Gateway encounters an unexpected state affecting both the Primary and Secondary Input Connections for all the Data Participants, a restart of the Input Gateway can be initiated on the Primary Data Center.
    - Both Primary and Secondary Input connections are temporarily unavailable, affecting all Participants and Data Subscribers from inputting any data or requesting any retransmissions
    - Zero Quotes (Quote messages with Zero Price and Size) are published on the output lines on behalf of all participants across all symbols
    - Upon recovery, Input Block Sequence Number are recovered for each input line. Data Participants can reestablish connection and start submitting data. Data publication resumes.
    - There is no loss of data, all messages can be requested for retransmission.

1.03.2 Primary Data Center Failure Recovery

In the event that the Primary Data Center becomes unavailable, failover to the Disaster Recovery site (Backup Data Center) is initiated. However, if the DR site is also unavailable, then a Session Cold Restart on the Primary Data Center can be performed.

In case of a Session Cold Restart on the Primary Data Center:

- Both Primary and Secondary Input connections are temporarily unavailable, affecting all Participants and Data Subscribers from inputting any data or requesting any retransmissions

- Upon restart:
    - Output block sequence for all the lines is reset to one (1) and System transmits the Reset Block Sequence Number (Category H Type K) message
    - Zero Quotes (Quote messages with Zero Price and Size) are published on behalf of all participants across all symbols, and NBBO is not persisted.
    - Input Lines are enabled and Data Publication Resumes
    - Messages prior to the Restart cannot be requested for Retransmission

1.04 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 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 and are delivered via two redundant retransmission multicast data streams.

OPRA After-Hours Playback Data
There is a separate IP Multicast data feed dedicated for after-hour playback test data. The playback data is made available via a single set of multicast data feeds.

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.OPRAPLAN.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.

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)	Modification
Version	1	Version 6
Block Size	2	
Data Feed Indicator	1	
Retransmission Indicator	1	
Session Indicator	1	
Block Sequence Number	4	
Messages In Block	1	
Block Timestamp	8	
Block Checksum	2	
Total Length:	**21**	

3.05.1 VERSION

1 Byte, unsigned integer. Indicates the OPRA binary protocol version. Version value is set to 6 (Hex 0x06) for current version.

3.05.2 BLOCK SIZE

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

3.05.3 DATA FEED INDICATOR

1 Byte, ASCII character. Value is 'O' for OPRA.

3.05.4 RETRANSMISSION INDICATOR

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

3.05.5 SESSION INDICATOR

1 Byte, unsigned integer.

- For Regular Trading Hours OPRA Session: Hex 0x00
- For Global Trading Hours (GTH) OPRA Session:
  - ASCII 'X' on any messages generated by OPRA e.g. Control (Category H) messages or any 'Zero Quote' messages generated by OPRA if a Participant or OPRA are experiencing an issue will have Sesion Indicator of 'X'
  - Hex 0x01 to Hex 0x05 for any other message as received from a Participant

- OPRA GTH Participants will use Session Indicator values 1-5 where each value indicates the day of the week (Monday to Friday) to which the message belongs to, since GTH session spans across more than one calendar day.

Trade Day	GTH Session Duration	Session Indicator Value
Monday	**Sunday into Monday**	**1**
Tuesday	**Monday into Tuesday**	**2**
Wednesday	**Tuesday into Wednesday**	**3**
Thursday	**Wednesday into Thursday**	**4**
Friday	**Thursday into Friday**	**5**

- For example, GTH Trading Session for Monday starts on Sunday (8:15 pm) and ends on Monday morning. The Session Indicator on all messages received from the Participant for that session would be set to '1' indicating that messages belong to Trade Date of Monday.

- The Session Indicator may be affected by US Holidays. For example, if Friday is a US holiday, the Session Indicator on all messages for the GTH sessions starting on the preceding Thursday as well as the GTH session starting on the following Sunday will be set to '1', indicating that the messages from both the sessions belong to the trade date of Monday.

3.05.6 BLOCK SEQUENCE NUMBER

4 Bytes, unsigned integer. The Block Sequence Number denotes the sequence number of the first message in the block. If a Block contains more than one message, any messages following the first message are implicitly numbered sequentially. As such, the Block Sequence Number in the next Block is incremented by the number of messages published in the previous Block.

Block Sequence Number rolls over after 4,294,967,295 to 1. On a per line basis, the Block Sequence Number on the lines are set to Zero at the start of each day, and increments each time a block is transmitted, with the following exceptions:

1. The Block Sequence Number in retransmitted blocks contain the Message Sequence Number of the first message in the retransmitted 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 a number greater than the highest number previously transmitted, or reset to one (1) in the following circumstances -

    - in the event the sequence numbers rolls over from 4,294,967,295
    - in case OPRA experience a site failure and recovery at the same site
    - upon Disaster Recovery site activation

3. The **Category H, Type C (Start of Day)** message contains a Zero Block Sequence Number.

4. The block containing a Category H Type N (Line Integrity) message contains the message Sequence Number of the last transmitted message.

3.05.7 MESSAGES IN BLOCK

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

3.05.8 BLOCK TIMESTAMP

8 Bytes, contains the block timestamp. The first 4 bytes (Seconds) contains the number of seconds from epoch 1/1/1970, 00:00:00 UTC. The next 4 bytes contain the nanosecond portion of the time. Field 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 timestamp representing when the first message in the retransmitted block was originally processed by OPRA.

3.05.9 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 IDENTIFCATION CATEGORY	MESSAGE IDENTIFICATION TYPE	DESCRIPTION
H	**C**	Start of Day
H	**N**	Line Integrity

The Automated Retransmission Facility is utilized for automatically receiving and processing OPRA message retransmission requests.

A data recipient may request automated retransmission(s) by connecting directly through IGN, formerly known as SFTI, to the Automated Retransmission 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 message sequence number information. The requested message(s) are re-published over the dedicated Retransmission multicast streams. **A Retransmission Users Guide** for automated retransmission requests is provided as an addendum to this document, which is available from www.opraplan.com.

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 retransmitted message contains the Message Sequence Number of the first message in the retransmitted block.

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

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

Note: **It is the responsibility of the data recipient to ignore retransmitted messages not requested by them.**

3.07 OPRA TRAFFIC DISTRIBUTION

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

4.0 MESSAGE HEADER

The Message Header supplied on each message contains the following bytes and conforms in all cases to the following data fields:

MESSAGE HEADER FORMAT	
Field Name	**Length**
Participant ID	1
Message Category	1
Message Type	1
Message Indicator	1
Transaction ID	4
Participant Reference Number	4
Total Bytes	**12**

All messages, except for Administrative (Category C) have a fixed length, which is determined by reading the Message Header. Administrative messages contain additional 2 byte field 'Message Data Length' in 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.

- For category C, the message length is included within the message through additional 2 byte field "Message Data Length"

4.01 MESSAGE HEADER FIELD DESCRIPTIONS

4.01.1 PARTICIPANT ID

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

CODE	PARTICIPANT/PROCESSOR IDENTIFICATION ABBREVIATION	VALUE
A	AMEX	NYSE American
B	BOX	Boston Options Exchange
C	CBOE	Cboe Options Exchange
D	EMERALD	MIAX Emerald
E	EDGX	Cboe EDGX Options Exchange
H	GEMX	Nasdaq GMEX
I	ISE	Nasdaq ISE
J	MRX	Nasdaq MRX
M	MIAX	Miami International Securities
N	NYSE	NYSE ARCA
O	OPRA	Options Price Reporting Authority
P	PEARL	MIAX PEARL
Q	NASD	NASDAQ Options Market
S	SPHR	MIAX Sapphire
T	BX	NASDAQ BX Options
U	MEMX	Members Options Exchange
W	C2	Cboe C2 Options Exchange
X	PHLX	NASDAQ PHLX
Z	BATS	Cboe BZX Options Exchange

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

4.01.2 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

4.01.3 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.

Refer to section 'SUMMARY OF MESSAGE CATEGORIES AND TYPES' for list of Message Types supported for each Message Category

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.**

4.01.4 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 Administrative messages (category C), which includes the length within itself.

4.01.5 TRANSACTION ID

The Transaction ID field is 4 Bytes, unsigned integer Reserved for Internal Use only.

Note: Data Recipients should ignore/disregard this field to the extent that it does not impact their normal data processing.

4.01.6 PARTICIPANT REFERENCE NUMBER (PRN)

4 Byte, unsigned integer, optionally set to Zero. The PRN is for optional use by the Participant

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 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. The textual portion of the Administrative messages is a variable length field which can contain any printable ASCII characters (code 32 - 126).

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	**A, B, C, D, E, F, G**	CANC, OSEQ, CNCL, LATE, CNCO, OPEN, CNOL
a	**H, I, J, S**	OPNL, AUTO, REOP, ISOI
a	**a, b, c, d e, f, g, h**	SLAN, SLAI, SLCN, SCLI, SLFT, MLET, MLAT, MLCT,
a	**i, j, k, l, m, n, o**	MLFT, MESL, TLAT, MASL, MFSL, TLET, TLCT,
a	**p, q, r, s, t, u, v**	TLFT, TESL, TASL, TFSL, CBMO, MCTP, EXHT
C	**Space filled**	Administrative
d	**Space filled**	Open Interest
f	**Space filled**	Equity and Index End of Day Summary
H	**C**	Start of Day
H	**E**	Start of Summary
H	**F**	End of Summary
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
H	**P**	Disaster Recovery Data Center Activation

SUMMARY OF MESSAGE CATEGORIES AND TYPES (continued)

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

6.01 EQUITY AND INDEX LAST SALE

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

Message Category	Type	Message Indicator
a	A-J, S	Space filled
	a-v	

Field Name	Length (bytes)
Message Header	12
Security Symbol	5
Reserved	1
Expiration Block	3
Strike Price Denominator Code	1
Strike Price	4
Volume	4
Premium Price Denominator Code	1
Premium Price	4
Trade Identifier	4
Reserved	4
Total Length:	**43**

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

CHARACTER TYPES AND DESCRIPTIONS		
CODE	**VALUE**	
A	CANC	Transaction previously reported (other than as the **last** or **opening** report for the particular option contract) is now to be cancelled.
B	OSEQ	Transaction is being reported late **and** is out of sequence; i.e., later transactions have been reported for the particular option contract.
C	CNCL	Transaction is the last reported for the particular option contract and is now cancelled.
D	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.
E	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.
F	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.
G	CNOL	Transaction was the only one reported this day for the particular option contract and is now to be cancelled.
H	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.
I	AUTO	Transaction was executed electronically. Prefix appears solely for information; process as a regular transaction.
J	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.
S	ISOI	Transaction was the execution of an order identified as an Intermarket Sweep Order. Process like normal transaction.

Message Type Description - Category a, continued

CHARACTER TYPES AND DESCRIPTIONS			
Type	**Type Descrip-tion**	**VALUE**	**DESCRIPTION**
a	SLAN	Single Leg Auction Non ISO	Transaction was the execution of an electronic order which was "stopped" at a price and traded in a two sided auction mechanism that goes through an exposure period. Such auctions mechanisms include and not limited to Price Improvement, Facilitation or Solicitation Mechanism.
b	SLAI	Single Leg Auction ISO	Transaction was the execution of an Intermarket Sweep electronic order which was "stopped" at a price and traded in a two sided auction mechanism that goes through an exposure period. Such auctions mechanisms include and not limited to Price Improvement, Facilitation or Solicitation Mechanism marked as ISO.
c	SLCN	Single Leg Cross Non ISO	Transaction was the execution of an electronic order which was "stopped" at a price and traded in a two sided crossing mechanism that does not go through an exposure period. Such crossing mechanisms include and not limited to Customer to Customer Cross and QCC with a single option leg.
d	SCLI	Single Leg Cross ISO	Transaction was the execution of an Intermarket Sweep electronic order which was "stopped" at a price and traded in a two sided crossing mechanism that does not go through an exposure period. Such crossing mechanisms include and not limited to Customer to Customer Cross.
e	SLFT	Single Leg Floor Trade	Transaction represents a non-electronic trade executed on a trading floor. Execution of Paired and Non-Paired Auctions and Cross orders on an exchange floor are also included in this category.
f	MLET	Multi Leg auto-electronic trade	Transaction represents an electronic execution of a multi leg order traded in a complex order book.
g	MLAT	Multi Leg Auction	Transaction was the execution of an electronic multi leg order which was "stopped" at a price and traded in a two sided auction mechanism that goes through an exposure period in a complex order book. Such auctions mechanisms include and not limited to Price Improvement, Facilitation or Solicitation Mechanism.
h	MLCT	Multi Leg Cross	Transaction was the execution of an electronic multi leg order which was "stopped" at a price and traded in a two sided crossing mechanism that does not go through an exposure period. Such crossing mechanisms include and not limited to Customer to Customer Cross and QCC with two or more options legs.
i	MLFT	Multi Leg floor trade	Transaction represents a non-electronic multi leg order trade executed against other multi-leg order(s) on a trading floor. Execution of Paired and Non-Paired Auctions and Cross orders on an exchange floor are also included in this category.
j	MESL	Multi Leg auto-electronic trade against single leg(s)	Transaction represents an electronic execution of a multi Leg order traded against single leg orders/ quotes.
k	TLAT	Stock Options Auction	Transaction was the execution of an electronic multi leg stock/options order which was "stopped" at a price and traded in a two sided auction mechanism that goes through an exposure period in a complex order book. Such auctions mechanisms include and not limited to Price Improvement, Facilitation or Solicitation Mechanism.
l	MASL	Multi Leg Auction against single leg(s)	Transaction was the execution of an electronic multi leg order which was "stopped" at a price and traded in a two sided auction mechanism that goes through an exposure period and trades against single leg orders/ quotes. Such auctions mechanisms include and not limited to Price Improvement, Facilitation or Solicitation Mechanism.

Message Type Description - Category a, continued

CHARACTER TYPES AND DESCRIPTIONS			
Type	**Type Descrip-tion**	**VALUE**	**DESCRIPTION**
m	MFSL	Multi Leg floor trade against single leg(s)	Transaction represents a non-electronic multi leg order trade executed on a trading floor against single leg orders/ quotes. Execution of Paired and Non-Paired Auctions on an exchange floor are also included in this category.
n	TLET	Stock Options auto-electronic trade	Transaction represents an electronic execution of a multi leg stock/options order traded in a complex order book.
o	TLCT	Stock Options Cross	Transaction was the execution of an electronic multi leg stock/options order which was "stopped" at a price and traded in a two sided crossing mechanism that does not go through an exposure period. Such crossing mechanisms include and not limited to Customer to Customer Cross.
p	TLFT	Stock Options floor trade	Transaction represents a non-electronic multi leg order stock/options trade executed on a trading floor in a Complex order book. Execution of Paired and Non-Paired Auctions and Cross orders on an exchange floor are also included in this category.
q	TESL	Stock Options auto-electronic trade against single leg(s)	Transaction represents an electronic execution of a multi Leg stock/options order traded against single leg orders/ quotes.
r	TASL	Stock Options Auction against single leg(s)	Transaction was the execution of an electronic multi leg stock/options order which was "stopped" at a price and traded in a two sided auction mechanism that goes through an exposure period and trades against single leg orders/ quotes. Such auctions mechanisms include and not limited to Price Improvement, Facilitation or Solicitation Mechanism.
s	TFSL	Stock Options floor trade against single leg(s)	Transaction represents a non-electronic multi leg stock/options order trade executed on a trading floor against single leg orders/ quotes. Execution of Paired and Non-Paired Auctions on an exchange floor are also included in this category.
t	CBMO	Multi Leg Floor Trade of Proprietary Products	Transaction represents execution of a proprietary product non-electronic multi leg order with at least 3 legs. The trade price may be outside the current NBBO.
u	MCTP	Multilateral Compression Trade of Proprietary Products	Transaction represents an execution in a proprietary product done as part of a multilateral compression. Trades are executed outside of regular trading hours at prices derived from end of day markets. Trades do not update Open, High, Low, and Closing Prices.
v	EXHT	Extended Hours Trade	Transaction represents a trade that was executed outside of regular market hours. Trades do not update Open, High, Low, and Closing Prices.

6.02 OPEN INTEREST

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)
Message Header	12
Security Symbol	5
Reserved	1
Expiration Block	3
Strike Price Denominator Code	1
Strike Price	4
Open Interest Volume	4
Total Length:	**30**

6.03 EQUITY AND INDEX END OF DAY SUMMARY

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)
Message Header	12
Security Symbol	5
Reserved	1
Expiration Block	3
Strike Price Denominator Code	1
Strike Price	4
Volume	4
Open Interest Volume	4
Premium Price Denominator Code	1
Open Price	4
High Price	4
Low Price	4
Last Price	4
Net Change	4
Underlying Price Denominator Code	1
Underlying Price	8
Bid Price	4
Offer Price	4
Total Length:	**72**

6.04 EQUITY AND INDEX QUOTE MESSAGES

For bandwidth efficiencies, there are two Equity and Index Quote Message formats:

1) Long Equity and Index Quote (Category k) – Contains a full quote, using four byte integers for all prices and sizes.

2) Short Equity and Index Quotes (Category q) – Contains a "short" quote, using two byte unsigned integers for prices and sizes.

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

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

6.04.1 LONG EQUITY AND INDEX QUOTE

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, A, B, C, F, I, O, R, T, X, Y	Contains the BBO Indicator – See Section 7.01

Field Name	Length (bytes)
Message Header	12
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
Total Length:	**43**

6.04.2 SHORT EQUITY AND INDEX QUOTE

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, A, B, C, F, I, O, R, T, X, Y	Contains the BBO Indicator – See Section 7.01

Field Name	Length (bytes)
Message Header	12
Security Symbol	4
Expiration Block	3
Strike Price	2
Bid Price	2
Bid Size	2
Offer Price	2
Offer Size	2
Total Length:	**29**

- 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 the 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 all Quotes.

6.04.3 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.

6.04.4 DOUBLE APPENDAGE

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.

6.05 ADMINISTRATIVE

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.

Message Category	Type	Message Indicator
C	Space filled	Space filled

Field Name	Length (bytes)
Message Header	12
Message Data Length	2
Message Data (Printable ASCII character codes 32 - 126)	Variable (Max 200)

- 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.
- Administrative messages are not blocked with any other messages. These will be sent individually, one to a block
- Total Message Length: 12 Byte Message Header + 2 Byte Message Data Length + Variable Length Message Data
- Equity and Index administrative messages are disseminated as follows:
  1) over **OPRA HSL 4 (Regular OPRA Session)**
  2) over **OPRA HSL 204 (Global Trading Hours OPRA Session)**

6.05.1 Administrative Message Length

The length of an administrative message is variable. The total length of the variable length message data field cannot exceed 200 characters.

6.05.2 Administrative Message Text

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

6.05.3 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.

Administrative Message Standards, continued

EQUITY AND INDEX OPTIONS			
Field Descriptions	**Bytes**	**Character**	**Details**
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I – Index (optional) E – Equity (optional)
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 175 character (ASCII code 32 - 126)

EQUITY INDICATIVE QUOTE (IND)			
Field Descriptions	**Bytes**	**Character**	**Details**
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	E – Equity (optional)
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 Standards, continued

EQUITY ADMINISTRATIVE MESSAGE (ADM)			
Field Descriptions	**Bytes**	**Character**	**Details**
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	E – Equity (optional)
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.			

INDEX OPTIONS REQUEST FOR QUOTE (RFQ)			
Field Descriptions	**Bytes**	**Character**	**Details**
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I – Index (optional)
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 Standards, continued

INDEX OPTIONS QUOTE (QTE)			
Field Descriptions	**Bytes**	**Character**	**Details**
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I – Index (optional)
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 (optional)
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.			

Administrative Message Standards, continued

EQUITY OPTIONS LAST SALE (LST)			
Field Descriptions	**Bytes**	**Character**	**Details**
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	E – Equity (optional)
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			

Administrative Message Standards, continued

FLEX OPTIONS DELTA ADJUSTED AT CLOSE TRADE (Initial)			
Field Descriptions	**Bytes**	**Character**	**Details**
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I - Index (optional)
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	
Strike Price	1-9	Alphanumeric	3521.65
Filler	1	Space	
Type (call or put)	1	Alphabetic	C
Filler	1	Space	
Settlement Type	2	Alphanumeric	PM
Filler	1	Space	
Exercise Style	3-4	Alphanumeric	EUR
Filler	1	Space	
Expiration Date	10	Alphanumeric	02.05.20
Filler	1	Space	
Volume	5	Alphanumeric	75
Filler	1	Space	
Premium Price	1-9	Alphanumeric	9.63
Filler	1	Space	
Clearing Symbol	6	Alphanumeric	4SPX
Price Type	1-9	Alphanumeric	DAC
Filler	1	Space	
Delta	1-9	Alphanumeric	.50
Filler	1	Space	
Reference Price	1-9	Alphanumeric	3345.75
This message is an Equity Delta Adjusted at Close Trade FLEX Last Sale for SPX, 3521.65 PM/Eur Call. expiring 02/05/20, 5 sold at 9.63, Price Type DAC, Delta .50, Reference Price 3345.75			

Administrative Message Standards, continued

FLEX OPTIONS DELTA ADJUSTED AT CLOSE TRADE (Adjusted)			
Field Descriptions	**Bytes**	**Character**	**Details**
Product Type	4	Alphabetic	FLEX
Filler	1	Space	
FLEX Type	3	Alphabetic	I - Index (optional)
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	
Strike Price	1-9	Alphanumeric	3521.65
Filler	1	Space	
Type (call or put)	1	Alphabetic	C
Filler	1	Space	
Settlement Type	2	Alphanumeric	PM
Filler	1	Space	
Exercise Style	3-4	Alphanumeric	EUR
Filler	1	Space	
Expiration Date	10	Alphanumeric	02.05.20
Filler	1	Space	
Volume	5	Alphanumeric	75
Filler	1	Space	
Premium Price	1-9	Alphanumeric	12.38
Filler	1	Space	
Clearing Symbol	6	Alphanumeric	4SPX
Price Type	1-9	Alphanumeric	ADJ
Filler	1	Space	
Delta	1-9	Alphanumeric	.50
Filler	1	Space	
Reference Price	1-9	Alphanumeric	3345.75
Filler	1	Space	
Closing Price	1-9	Alphanumeric	3351.25
This message is an Equity Delta Adjusted at Close Trade FLEX Last Sale for SPX, 3521.65 PM/Eur Call. expiring 02/05/20, 5 sold at 12.38, Price Type ADJ, Delta .50, Reference Price 3345.75, Closing Price 3351.25			

6.06 CONTROL

Control messages perform specified control functions, for example "Start of Day" message.

Category	Type	Message Indicator
H	C, E, F	Space filled
	J, K, L	
	M, N, P	

- Control messages consist of standard Message Header Only
- Control messages are not blocked with any other messages. These will be sent individually, one to a block
- For all Control messages, the Participant ID field in the Message Header will contain a character identifying OPRA or the Participant originating the message (refer section 4.01.1 for list of Participant ID codes)

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

CODE	PARTICIPANT ID CODE	VALUE
C	O	Start of Day
E	Any valid code except 'O'	Start of Summary
F	Any valid code except 'O'	End of Summary
J	O	End of Day
K	O	Reset Block Sequence Number
L	O	Start of Open Interest
M	O	End of Open Interest
N	O	Line Integrity
P	O	Disaster Recovery Data Center Activation

CONTROL MESSAGE DESCRIPTIONS, continued

6.06.1 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. Start of Day message is sent with the Block Sequence Number field set to zero

6.06.2 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.

6.06.3 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.

6.06.4 End of Day - Category H, Type J

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

The Block Sequence Number field of the End of Day message contains a number one greater than the highest Block Sequence Number previously transmitted.

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.

6.06.5 Reset Block Sequence Number - Category H, Type K

The Reset Block Sequence Number message is transmitted when the block sequence number on an output multicast line requires resetting.

The Block Sequence Number field contains the number to which the Block Sequence Number counter is to be reset. The subsequent block following it will have the Block Sequence Number incremented by 1.

Note: Upon Disaster Recovery site activation, a Reset Block Sequence Number message will be generated, resetting the multicast lines' block sequence number to one (1). Additional Reset Block Sequence Number messages may be generated upon DR site activation, each incrementing the sequence number by 1, before any data publication resumes.

CONTROL MESSAGE DESCRIPTIONS, continued

6.06.6 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.

6.06.7 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.

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.**

CONTROL MESSAGE DESCRIPTIONS, continued

6.06.8 Line Integrity Message - Category H, Type N

The Line Integrity message consists of the standard Message Header and is transmitted over the multicast lines at frequent intervals, with at least one message published no later than every ten (10) seconds to verify continued integrity of multicast transmission.

The Line Integrity message transmission does not interrupt a transmission in progress.

The message sequence number (MSN) is not incremented for Line Integrity messages, it contains the Sequence Number of the last transmitted message.

6.06.9 Disaster Recovery Data Center Activation - Category H, Type P

The Disaster Recovery Center Activation control message will be disseminated from the Disaster Recovery site to signify that OPRA has switched processing from the Primary Data Center to the Disaster Recovery Center.

Note: Upon Disaster Recovery site activation, a Reset Block Sequence Number message will be generated, resetting the multicast lines' block sequence number to one (1). Additional Reset Block Sequence Number messages may be generated upon DR site activation, each incrementing the sequence number by 1, followed by OPRA disseminating Disaster Recovery Data Center Activation message.

6.07 UNDERLYING VALUE

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

6.07.1 UNDERLYING VALUE – LAST SALE

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	12
Security Symbol	5
Reserved	1
Index Value Denominator Code	1
Index Value	4
Reserved	4
Total Length:	**27**

6.07.2 UNDERLYING VALUE – BID AND OFFER

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	12
Security Symbol	5
Reserved	1
Index Value Denominator Code	1
Bid Index Value	4
Offer Index Value	4
Total Length:	**27**

7.0 FIELD DESCRIPTIONS

ASCII code characters are defined as follows:

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

Note: Price and size fields in equity quotes have two sizes and message formats:

1) **Long quotes (Category k), Four Bytes**
2) **Short quotes (Category q), Two Bytes**

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

CODE	VALUE
A	**No Best Bid change, No Best Offer change** New quote does not affect the Best Bid or Best Offer. No appendage is required.
B	**No Best Bid change, Quote contains Best Offer** New quote does not affect the Best Bid, but is the Best Offer. No appendage is required.
C	**No Best Bid Change, Best Offer Appendage** 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.
D	**No Best Bid Change, No Best Offer** New quote does not affect the Best Bid, and there is no Best Offer. No appendage is required.
E	**Quote contains Best Bid, No Best Offer Change** New quote is itself the Best Bid, but does not affect the Best Offer. No appendage is required.
F	**Quote contains Best Bid, Quote contains Best Offer** New quote is itself the Best Bid and Best Offer. No appendage is required.
G	**Quote contains Best Bid, Best Offer Appendage** 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.
H	**Quote contains Best Bid, No Best Offer** New quote is itself the Best Bid, and there is no Best Offer. No appendage is required.

BBO INDICATOR, continued

CODE	VALUE
I	**No Best Bid, No Best Offer Change** There is no Best Bid, and the quote does not affect the Best Offer. No appendage is required.
J	**No Best Bid, Quote contains Best Offer** There is no Best Bid, and the quote is itself the Best Offer. No appendage is required.
K	**No Best Bid, Best Offer Appendage** There is no Best Bid, a new Best Offer is generated and the new Best Offer is contained in the Best Offer Appendage.
L	**No Best Bid, No Best Offer** There is no Best Bid, and no Best Offer. No appendage is required.
M	**Best Bid Appendage, No Best Offer Change** 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.
N	**Best Bid Appendage, Quote contains Best Offer** 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.
O	**Best Bid Appendage, Best Offer Appendage** 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.
P	**Best Bid Appendage, No Best Offer** 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.
Space*	Indicates that the new quote did not meet the BBO requirements and the quote is not included in the BBO. This indicator is currently not in use.

FIELD DESCRIPTIONS, continued

- 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 –

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 –

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

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
Total Length:	**3**

- **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). When there is no Offer Price, this value is zero.

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

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 Bytes (short quote (Category 'q') only) or
5 Bytes (for all message categories except for short quotes (Category 'q'))

Alphanumeric. Left Justified, Space filled.

The security symbol is used for Equity and Index options. It identifies the unique symbol assigned to the underlying security.

Identification of Test Data:
The purpose of a Test Message is to have a mechanism whereby end-to-end connectivity and functionality between the OPRA Participant and Data Recipient can be tested prior to the opening or during the trading day. Alphanumeric Test Symbols are Reserved for future use.

CTA Test Symbol	NASDAQ Test Symbol
ATEST	ZAZZT
CBO	ZBZZT
CBX	ZCZZT
CTEST	ZJZZT
IGZ	ZVZZC
MTEST	ZVZZT
NTEST	ZWZZT
PTEST	ZXZZT
ZBZX	
ZEXIT	
ZIEXT	
ZTEST	
ZTST	
ZVV	
ZXIET	
ZZK	
01A thru 12A	
01N thru 12N	
01P thru 12P	
01V thru 12V	
01Z thru 12Z	

7.30 SESSION INDICATOR

1 Byte, unsigned integer.

- For Regular Trading Hours OPRA Session: Hex 0x00
- For Global Trading Hours (GTH) OPRA Session:
  - ASCII 'X' on any messages generated by OPRA e.g. Control (Category H) messages or any 'Zero Quote' messages generated by OPRA if a Participant or OPRA are experiencing an issue will have Sesion Indicator of 'X'
  - Hex 0x01 to Hex 0x05 for any other message as received from a Participant
    - OPRA GTH Participants will use Session Indicator values 1-5 where each value indicates the day of the week (Monday to Friday) to which the message belongs to, since GTH session spans across more than one calendar day.

Trade Day	GTH Session Duration	Session Indicator Value
Monday	**Sunday into Monday**	**1**
Tuesday	**Monday into Tuesday**	**2**
Wednesday	**Tuesday into Wednesday**	**3**
Thursday	**Wednesday into Thursday**	**4**
Friday	**Thursday into Friday**	**5**

    - For example, GTH Trading Session for Monday starts on Sunday (8:15 pm) and ends on Monday morning. The Session Indicator on all messages received from the Participant for that session would be set to '1' indicating that messages belong to Trade Date of Monday.
    - The Session Indicator may be affected by US Holidays. For example, if Friday is a US holiday, the Session Indicator on all messages for the GTH sessions starting on the preceding Thursday as well as the GTH session starting on the following Sunday will be set to '1', indicating that the messages from both the sessions belong to the trade date of Monday.

7.31 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.

7.32 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.

FIELD DESCRIPTIONS, continued

- T –

7.33 TRADE IDENTIFIER

4 Bytes, unsigned integer.

FOR FUTURE USE. Filled with Hex 0x00.

- U –

7.34 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.

7.35 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 –

7.36 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

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

FIELD APPEARANCES WITHIN MESSAGES, continued

FIELD NAME	MESSAGE APPEARANCE	NUMBER OF APPEARANCES/ MESSAGES
	- B -	
Bid Index Value	Underlying Value – Bid and Offer	**1**
Bid Price	Long and Short Equity and Index Quote	**1**
	Equity and Index End of Day Summary	**1**
Bid Size	Equity and Index Quote	**1**
	- D -	
Data Feed Indicator	Block Header	1
	- E -	
Expiration Block	Equity and Index Last Sale	**1**
	Long and Short Equity and Index Quote	**1**
	Open Interest	**1**
	Equity and Index End of Day Summary	**1**

FIELD APPEARANCES WITHIN MESSAGES, continued

FIELD NAME	MESSAGE APPEARANCE	NUMBER OF APPEARANCES/ MESSAGES
- H -		
High Price	Equity and Index End of Day Summary	**1**
- I -		
Index Value	Underlying Value – Last Sale	**1**
Index Value Denom Code	Underlying Value – Last Sale Underlying Value – Bid and Offer	**1** **1**
- L -		
Last Price	Equity and Index End of Day Summary	**1**
Low Price	Equity and Index End of Day Summary	**1**
- N -		
Net Change	Equity and Index End of Day Summary	**1**

FIELD APPEARANCES WITHIN MESSAGES, continued

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

FIELD APPEARANCES WITHIN MESSAGES, continued

FIELD NAME	MESSAGE APPEARANCE	NUMBER OF APPEARANCES/ MESSAGES
- R -		
Retransmission Indicator	Block Header	**1**
Reserved	Underlying Value – Last Sale	**1**
	Underlying Value – Bid and Offer	**1**
- S -		
Security Symbol	Equity and Index Last Sale	**1**
	Long, Short Equity and Index Quote	
	Open Interest	**1**
	Equity and Index End of Day Summary	**1**
	Underlying Value – Last Sale	**1**
	Underlying Value – Bid and Offer	**1**
		1
Session Indicator	Block Header	**1**

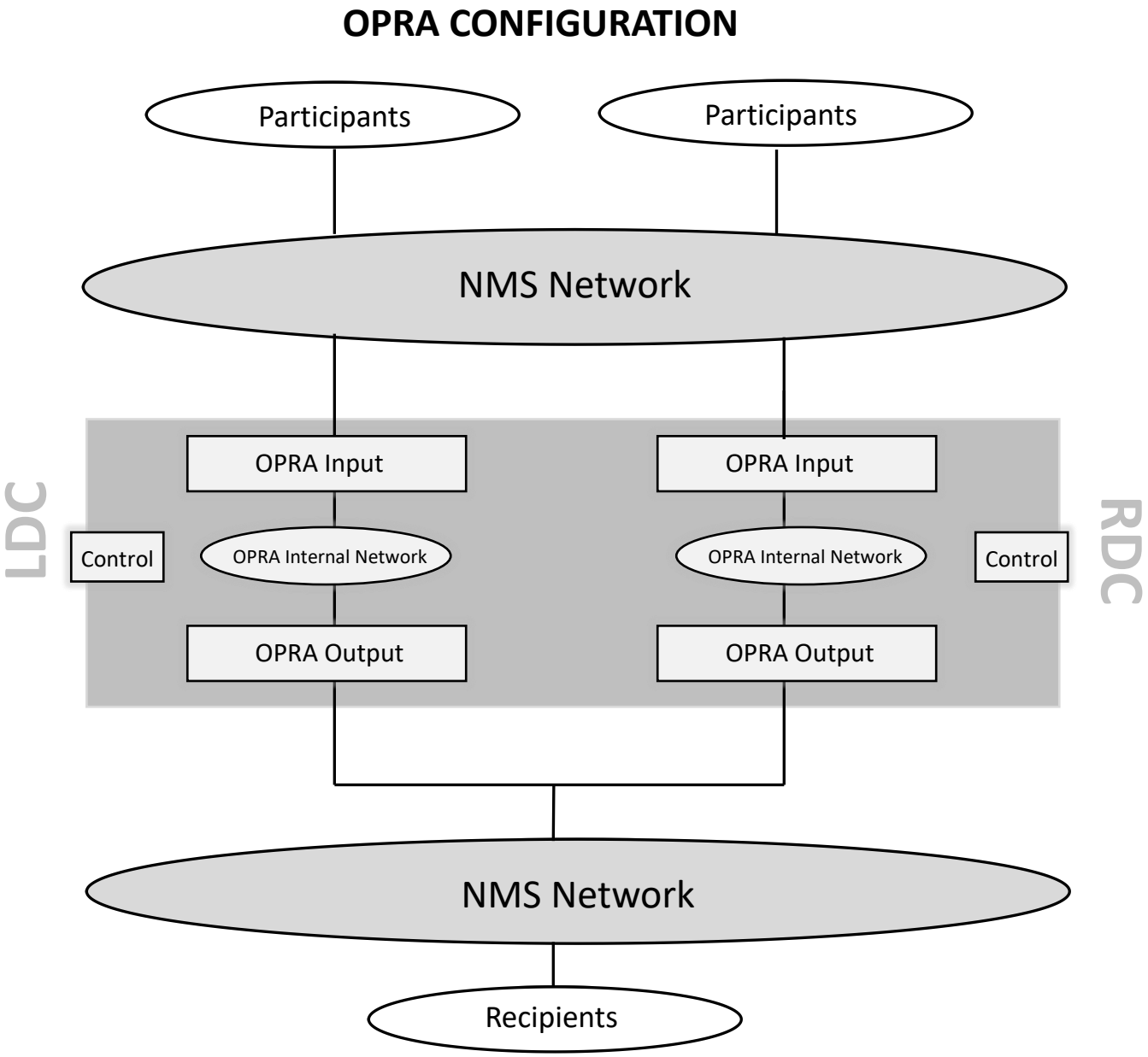
FIELD APPEARANCES WITHIN MESSAGES. Continued

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

FIELD APPEARANCES WITHIN MESSAGES, continued

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

APPENDIX A: OPRA CONFIGURATION



APPENDIX B: OPRA TRAFFIC DISTRIBUTION

OPRA messages are disseminated over multiple IP Multicast lines as follows:

- **REGULAR OPRA SESSION:** Equity and index options traffic will be on OPRA **1 through 96.**

- **GLOBAL TRADING HOURS OPRA SESSION:** Equity and index options traffic will be on **Global Trading Hours OPRA Session 201 through 204**

Traffic is routed over the IP Multicast lines as follows:

1. <u>REGULAR SESSION</u>: Generated on **96 line network**:

OPRA 4:

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

OPRA 1-96:

- All Control messages
- For Equity and Index Last Sale, Long, 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 routing rules as per OPRA Regular Symbol Distribution table.

The Symbol Distribution table for the 96 line traffic distribution for regular session can be found in the Document Library on the OPRA Plan website under the Specifications section.

APPENDIX B: OPRA TRAFFIC DISTRIBUTION, continued

2. <u>GLOBAL TRADING HOURS OPRA SESSION:</u> Generated on a **4 line* network**:

OPRA 204:

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

ALL 4 Lines (201-204):

- All Control messages
- For Equity and Index Last Sale, Long, 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:

	OPRA Global Trading Hours Symbol Distribution												
Line	**Security Symbol**					**Expiration Month**		**Security Symbol**					**Expiration Month**
201	A							S	P	X			L
202	S	P	X			M		T	Z	Z	Z	Z	X
203	U							V	I	X			L
204	V	I	X			M		Z	Z	Z	Z	Z	X

APPENDIX B: OPRA TRAFFIC DISTRIBUTION, continued

3. The following applies to **both the REGULAR AND GLOBAL TRADING HOURS OPRA SESSIONS**

- Symbols containing only alpha characters will be routed according to the distribution table.

- Symbols containing numeric 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'

- If a numeric is received in the first character, e.g.,'1RSTU' it will be routed to Multicast Line as follows:

  - REGULAR SESSION: Line 4
  - GLOBAL TRADING HOURS OPRA SESSION: Line 204

- Index message will be generated over the first even day line for calls.

  e.g., Index message for symbol IWM will be sent over the line for calls with even days

Selectively sent to Any Line:

- Reset Block 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.

SCHEDULE FOR REGULAR OPRA SESSION

1:30 a.m.	Start of Day message
6:30 a.m.	Equity/Index Open Interest messages
7:30 a.m.	ISE FX Options trading begins
9:30 a.m.	Equity/Index Options trading begins*
9:30 a.m.	PHLX World Currency Options trading begins
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
4:15 p.m.	Quotes with Indicative Value (Message Type I) allowed
4:25 – 6:05 p.m.	Equity/Index End of Day Summary message
6:05 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 are reminded that test data (including test Start of Day messages) dissemination over the Regular OPRA multicast data feeds (for line 1 - 96) can commence as early as **6:15 P.M. (ET)** and terminate as late as **11:00 P.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 C: Schedule of Daily OPRA Messages, continued

SCHEDULE FOR GLOBAL TRADING HOURS (GTH) OPRA SESSION

7:45 p.m.*	Start of Day message
8:15 p.m.*	GTH Session Begins
9:25 a.m.	GTH Session Ends
11:35 a.m.	End of Day message

* Represents time from previous business day prior to midnight. Global Trading Hours for current business day start on previous day 8:15 P.M. and continue till 9:25 a.m. current day (or till 11:30 AM if current day is a US holiday)

Note - Global Trading Hours Regular schedule begins at 8:15 PM, ET, Sunday and ends at 9:25 AM on Monday the next calendar day. Trading resumes daily at 8:15 PM ending Friday 9:25 AM. There is no trading from Friday 9:25 AM until Sunday 8:15 PM

Note: OPRA GTH Multicast Data Recipients are reminded that test data (including test Start of Day messages) dissemination over the OPRA GTH multicast data feeds (for line 201 - 204) can commence as early as **4:30 P.M. (ET)** and terminate as late as **6:30 P.M. (ET)** during business weekdays. This test period is accommodated to provide test window 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.

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 **1 cent**, 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:	**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, the Best Bid and/or Best Offer is updated with a later time, and appendages are added, as needed.**

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 I – Indicative Value

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.

Note: 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 will continue to be processed normally, however any subsequent quote messages will be rejected until the "Kill" state is removed for the trading day.