CBOE Financial Network

Index Market Data Dissemination

Vendor Interface Specification

Version 1.2
January 14, 2010

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Change Notice

Date	Version	Description of Change
Aug 01, 2006	V1.0	Initial version to support the dissemination of underlying index values to CFN customers.

Date	Version	Description of Change
Feb 15, 2007	V1.1	Reference: to message type “Y” category “C” (closing spot) removed from document. The message is not implemented.

Date	Version	Description of Change
Jan 14, 2010	V1.2	2.0 removed TCP reference which is incorrect for multicast. Add .7.3 Line Integrity Message documentation added.

1.0 INTRODUCTION

The Chicago Board Options Exchange (CBOE) disseminates all of its own cash index values and some for other index providers such as S&P, Goldman Sachs, and Morgan Stanley. CBOE will provide dissemination services for all CBOE index values in the timeliest fashion available. The infrastructure to support the market data distribution will be known as the CBOE Financial Network (CFN).

This document describes the required formats for communications and output messages to effectively interface with the CFN facilities.

2.0 GENERAL DESIGN OF DATA DISTRIBUTION NETWORK

CFN will utilize an IP multicast protocol for the dissemination of Index information. CFN transmits variable length blocks having maximum lengths of 1000 characters. The length includes a Block Length Header, text and control characters. The number of messages contained in a block is variable and the end of each message is delimited by a Unit Separator character (US), except for the last record in the block, which ends with an End of Text (ETX) character.

Data available via the CFN IP multicast distribution network includes:

Real-Time Production Data
A copy of each Index real-time production message is available from each connection to the CFN facility delivered via two distinct multicast data streams.

Time Beacon and Retransmission facility
CFN does not anticipate implementing either of these facilities initially. The evolution of market data networks over the past several years has dramatically reduced the number of retransmission requests made by vendors. As the network and user community of CFN expands, a needs analysis will be performed to determine the importance of providing these features.

3.0 TRANSMISSION CHARACTERISTICS

3.01 TRANSMISSION BLOCK

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

|<------ TRANSMISSION BLOCK ------->|

A block can have a maximum of 1,000 characters inclusive of text.

3.02 SOH AND ETX

The Start of Header (SOH) control character (x01) indicates the beginning of the block, whereas an End of Text (ETX) control character (x03) signifies the end of the block.

3.03 US

The Unit Separator (US) control character (x1F) is needed in multiple message blocks to signify the end of the preceding message but not the end of the block.

3.04 BLOCK TEXT

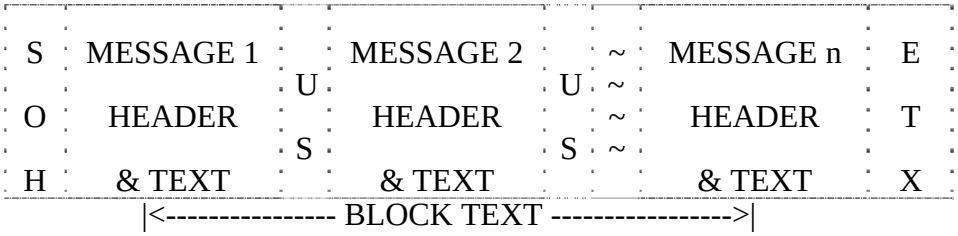
The block text can consist of multiple messages. A message is a unit of data that can be processed by the receiving station independently of other data. A message may not span a block boundary.

A message consists of a Message Header, which is of fixed length and format, and a Message Text segment that is variable in length and format. A US character delimits each message, while an ETX character delimits the last message in the block.

3.05 BLOCK TEXT FORMAT

The block text consists of multiple messages with each message consisting of a Message Header and, with the exception of certain control messages, message text.

The block text is depicted below:



3.06 DATA FORMAT

ASCII filler characters are inserted, as required, in accordance with the following rules:

1. Zeros (hex 30) are inserted in Numeric fields. All Numeric fields are right justified, as required.

2. Spaces (hex 20) are inserted in Alphabetic fields. All Alphabetic fields are left justified, as required.

3. Spaces (hex 20) are inserted in Alphanumeric fields, except Strike and Premium Price Denominator Code fields, which are Zero filled. All Alphanumeric fields are right or left justified, as required.

4. Reserved fields will be space filled.

3.07 CHARACTER SET

All transmissions are in standard 8-bit ASCII code.

4.0 MESSAGE HEADER

The Message Header supplied on each message contains a total of **18 Bytes** and conforms in all cases to the following data fields:

EXCHANGE ID	Reserved	MESSAGE IDENTIFICATION	MESSAGE SEQUENCE NUMBER	TIME
1	**1**	**2**	**8**	**6**

|←---------- 18 BYTES ----------→|

4.01 MESSAGE HEADER FIELD DESCRIPTIONS

4.02 EXCHANGE ID

The Exchange ID field is a **1 Byte**, Alphabetic character that identifies the CBOE as the initiator of the message:

CODE	VALUE
C	CBOE

4.03 RESERVED

The Reserved field is a **1 Byte**, Alphanumeric character, ASCII space filled field. Field is reserved for future use.

4.04 MESSAGE IDENTIFICATION

The Message Identification field is a **2 Byte**, Alphabetic upper or lower case character, Space filled field. The first character entered in the Message Identification field identifies the **Message Category**. The second character entered in the Message Identification field identifies the **Message Type**. 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.

Valid Message Categories

LOWER CASE CODE	VALUE
UPPER CASE CODE	**VALUE**
C	ADMINISTRATIVE
H	CONTROL
Y	UNDERLYING VALUE MESSAGE

MESSAGE IDENTIFICATION- Message Type (second alpha character):

The **Message Type** character for **Category "C" Administrative** messages are **Space filled**.

CODE	VALUE
Space filled	Default

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

CODE	VALUE
C	Start of Day
J	End of Day
K	Reset Sequence Number

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

CODE	VALUE
Space filled	Index based on Last Sale
I	Index based on Bid and Ask

Note: **Additional Message Category(s) and Message Type(s) will be implemented as required. If Vendors 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.**

4.05 MESSAGE SEQUENCE NUMBER (MSN)

The Message Sequence Number (MSN) is an **8 Byte**, Numeric, Right Justified, Zero filled field. All messages are assigned a sequence number. On a per line basis, the MSN on the lines are set to Zero at the start of each day and are incremented by one each time a message (other than a Retransmission or Reset Message Sequence Number message) is transmitted. The following exceptions or special considerations should be noted:

1. Retransmitted messages contain the MSN of the original message.

2. The MSN field in the Message Header of a **Category H Type K Reset Sequence Number** message contains the number to which the MSN counter is to be reset. This number is either Zero or a number greater than the highest number previously transmitted.

3. The **Category H Type C, Start of Day** message contains a Zero message sequence number.

Should CFN experience a line failure and recovery, the message sequence number for the recovered line(s) is reset to a sequence number greater than the last number transmitted. A sequence-reset message will be transmitted prior to resumption of data transmission and will indicate the new sequence number that the receiver should expect.

4.06 TIME

The Time (Central Time) field is a **6 Byte**, Numeric Character, Zero filled field. Format is (Military) HHMMSS where HH=Hour, MM=Minute and SS=Second. Indicates the Time that a transaction is disseminated. For Retransmissions, the Time will contain the original Time that the transaction was disseminated.

5.0 MESSAGE FORMATS

Each message transmitted by CFN consists of a Message Header and Message Text. The particular Message Category and Message Type entered in the Message Identification field of the Message Header determines the format of the text. Message formats are fixed field formats (with the exception of Administrative and some Control messages which have unformatted text). Detailed information on each field specified in every message format is contained in alphabetical order in the **Field Descriptions** section **(section 6.0)** of this document.

5.01 UNDERLYING VALUE – LAST SALE

MAXIMUM 67 BYTES

The Underlying Value message is a variable length record and can accommodate a maximum number of 5 Index groups. Each group contains the Last Sale Index Value of a security based index. One ticker symbol will be used for each Index.

CATEGORY	TYPE
Y	Space filled

NUMBER OF INDICES IN GROUP
2

|← 2BYTES →|

INDEX GROUP #1

INDEX SYMBOL #1	INDEX VALUE
6	**7**

|←----- TOTAL OF 13 BYTES -------→|

(CAN INCLUDE UP TO 5 INDEX GROUPS)

↓

INDEX GROUP #5

INDEX SYMBOL #5	INDEX VALUE
6	**7**

|←----- TOTAL OF 13 BYTES -------→|

5.02 UNDERLYING VALUE – BID AND ASK

MAXIMUM 107 BYTES

The Underlying Value – Bid and Ask message is a variable length record and can accommodate a maximum number of 5 Index groups. Each group contains the Bid Index Value and Ask Index Value of a stock index. One ticker symbol will be used for each Index.

CATEGORY	TYPE
Y	I

NUMBER OF INDICES IN GROUP
2

|← 2 BYTES →|

INDEX GROUP #1

INDEX SYMBOL #1	RESERVED	BID INDEX VALUE	ASK INDEX VALUE
6	**1**	**7**	**7**

|←---------- TOTAL OF 21 BYTES ----------→|

(CAN INCLUDE UP TO 5 INDEX GROUPS)

↓

INDEX GROUP #5

INDEX SYMBOL #5	RESERVED	BID INDEX VALUE	ASK INDEX VALUE
6	**1**	**7**	**7**

|←---------- TOTAL OF 21 BYTES ----------→|

6.0 FIELD DESCRIPTIONS

ASCII code characters are defined as follows:

TERMINOLOGY	DESCRIPTION
Alphabetic	ASCII characters "A" – "Z" or "a" – "z"
Numeric	ASCII characters "0" – "9"
Alphanumeric	Any combination of Alphabetic and Numeric as defined above
Special and Punctuation	Any printable ASCII character **except** Alphanumeric as defined above, i.e.; White Space

- A -

6.01 ASK INDEX VALUE

7 Bytes, Numeric. Right Justified, Zero filled. When there is no Ask Index Value, this field is Zero filled. The digits to the right of the decimal point represent the numerator of a fraction. The denominator is always represented in 100ths (e.g., 99.99). It may represent a value of Zero or greater.

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

- B -

6.02 BID INDEX VALUE

7 Bytes, Numeric. Right Justified, Zero filled. When there is no Bid Index Value, this field is Zero filled. The digits to the right of the decimal point represent the numerator of a fraction. The denominator is always represented in 100ths (e.g., 99.99). It may represent a value of Zero or greater.

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

- I -

6.03 INDEX SYMBOL

6 Bytes, Alphabetic. Left Justified, Space filled.

Identifies the unique symbol assigned to an index.

6.04 INDEX VALUE

7 Bytes, Numeric. Right Justified, Zero filled. When there is no Index Value, this field is Zero filled. The digits to the right of the decimal point represent the numerator of a fraction. The denominator is always represented in 100ths (e.g., 99.99). It may represent a value of Zero or greater.

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

6.05 NUMBER OF INDICES IN GROUP

2 Bytes, Numeric. Right Justified, Zero filled.

Represents the total number of indices contained in a particular message.

- R -

6.06 RESERVED

Variable (V) Bytes, Alphanumeric. Reserved fields are Space filled unless otherwise defined.

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 their normal data processing.**

7.0 ADMINISTRATIVE MESSAGES

7.01 Administrative Message

The length of an administrative message is variable. The total length of the entire message cannot exceed 1000 characters, including the SOH character, the Message Header, the ETX character and all characters between those characters.

7.02 Administrative Message Text

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

7.03 Line Integrity Message

During the production day a type of Administrative message, the Line Integrity message, is sent out once each minute. The text of the message is "LINE INTEGRITY TEST ". The purpose of the message is to validate that the data path remains operational in the event that no other traffic is occurring.

8.0 CONTROL MESSAGES

8.01 CONTROL MESSAGE SUMMARY

Control messages perform specified system advisory and control functions.

A Control message may be originated by CBOE and transmitted to the data recipients. The following represents all Control messages that may be originated by CBOE that are sent to all lines:

MESSAGE IDENTIFICATION CATEGORY TYPE		CONTROL MESSAGE
H	**C**	Start of Day
H	**J**	End of Day
H	**K**	Reset Sequence Number

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.

For all Control messages, the **Exchange ID** field in the **Message Header** will contain a character identifying CBOE as the exchange originating the message as follows:

CODE	VALUE
C	CBOE

CBOE can originate Control messages as follows:

EXCHANGE ID CODE	CONTROL MESSAGE
C	Start of Day
C	End of Day
C	Reset Sequence Number

The **Reserved** field in the **Message Header** is ASCII space filled.

The first alphabetic upper case character of the **Message Identification** field in the **Message Header** contains the Message Category character **"H" meaning Control Message.** The second alphabetic upper case character of the **Message Identification** field in the **Message Header** contains one of the following characters **"C, J, or K "** designating the particular **Message Type**.

In textual portions of Control messages, the Exchange Identification identifies the abbreviated name of the referenced exchange or Processor as follows:

Exchange Identification Abbreviation	**EXCHANGE**
CBOE	Chicago Board Options Exchange
CBSX	Chicago Board Stock Exchange
CFE	CBOE Futures Exchange
ONE	OneChicago LLC Securities Futures Exchange

In the free form textual portions of Control messages, where specified, **MM=Month, DD=Day, HH=Hour and MM=Minute** (The time is Central Time and format is Military).

8.02 CONTROL MESSAGE DESCRIPTIONS

8.02.1 Start of Day – Category H Type C

The Start of Day message is transmitted to data recipients at the beginning of the day to signal the start of message processing by CFN and transmission of messages to data recipients.

Test cycle messages can be repeated until shortly before transmission of the Start of Day message.

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

"START OF DAY" for Type C

The Message Sequence Number (MSN) field always contains a sequence number of Zero.

8.02.2 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:

"END OF DAY" for Type J

The MSN field contains a number one greater than the highest MSN previously transmitted.

8.02.3 Reset Sequence Number - Category H Type K

CFN transmits a Reset Sequence Number message to the data recipients when the sequence numbers on a line require resetting to a number specified in the Message Sequence Number field in the Message Header.

The Reset Sequence Number message will consist of the standard Message Header immediately followed by the textual message:

"SET MESSAGE SEQUENCE NUMBER"

The MSN field contains the number to which the MSN counter is to be reset.