Next Gen Multicast Market Data Manual

Version 1.1.7

Introduction

The Direct Edge Next Gen exchanges (NG-A and NG-X) provide a multicast depth of book feed. This document describes the general operation of the depth of book feeds and specifies the protocols that members use to receive and interact with these feeds.

1.1. Partitioning and General Operation

NG-A and NG-X maintain distinct order books. Direct Edge does not offer a consolidated feed containing orders from both exchanges. Each exchange's multicast book feed is further divided into a number of partitions. Each partition distributes the depth of book information for a distinct subset of symbols traded by that exchange. The assignment of symbols to partitions may be found in appendix A of this document. It is subject to change with notice from Direct Edge.

For each partition there are two instances of the feed (referred to as the "A" and "B" instances), publishing the same data. Each instance is comprised of three services: The Depth of Book Multicast, the Message Retransmission Multicast, and the Recovery Service.

1.1.1 Depth of Book Multicast

The Depth of Book Multicast is the primary method used to deliver depth of book information from Direct Edge to members in real time. It is a one way protocol: an ordered sequence of depth of book messages are sent from Direct Edge to members. The Depth of Book Multicast is described in detail in Section 3.

1.1.2 Message Retransmission Multicast

The Message Retransmission Multicast is used to re-deliver messages from Direct Edge to members that were missed by the member when they were originally transmitted. There is one Message Retransmission Multicast address per instance of the feed. Members request message retransmissions over a separate TCP/IP connection to an application called the Message Retransmission Server. Each exchange has two Message Retransmission Servers: one handles all retransmission requests for the "A" instance of all partitions on that exchange, and the other handles retransmission requests for the "B" instance of all partitions on that exchange. The Message Retransmission Service is described in detail in Section 4.

1.1.3 Recovery Service

The Recovery Service gives members a snapshot of all open orders in the book. This allows members who have missed large numbers of messages to get caught up to real time quickly without requesting every missed message from the Message Retransmission Service. The Recovery Service is described in detail in Section 5.

1.2. Using Multiple Feed Instances

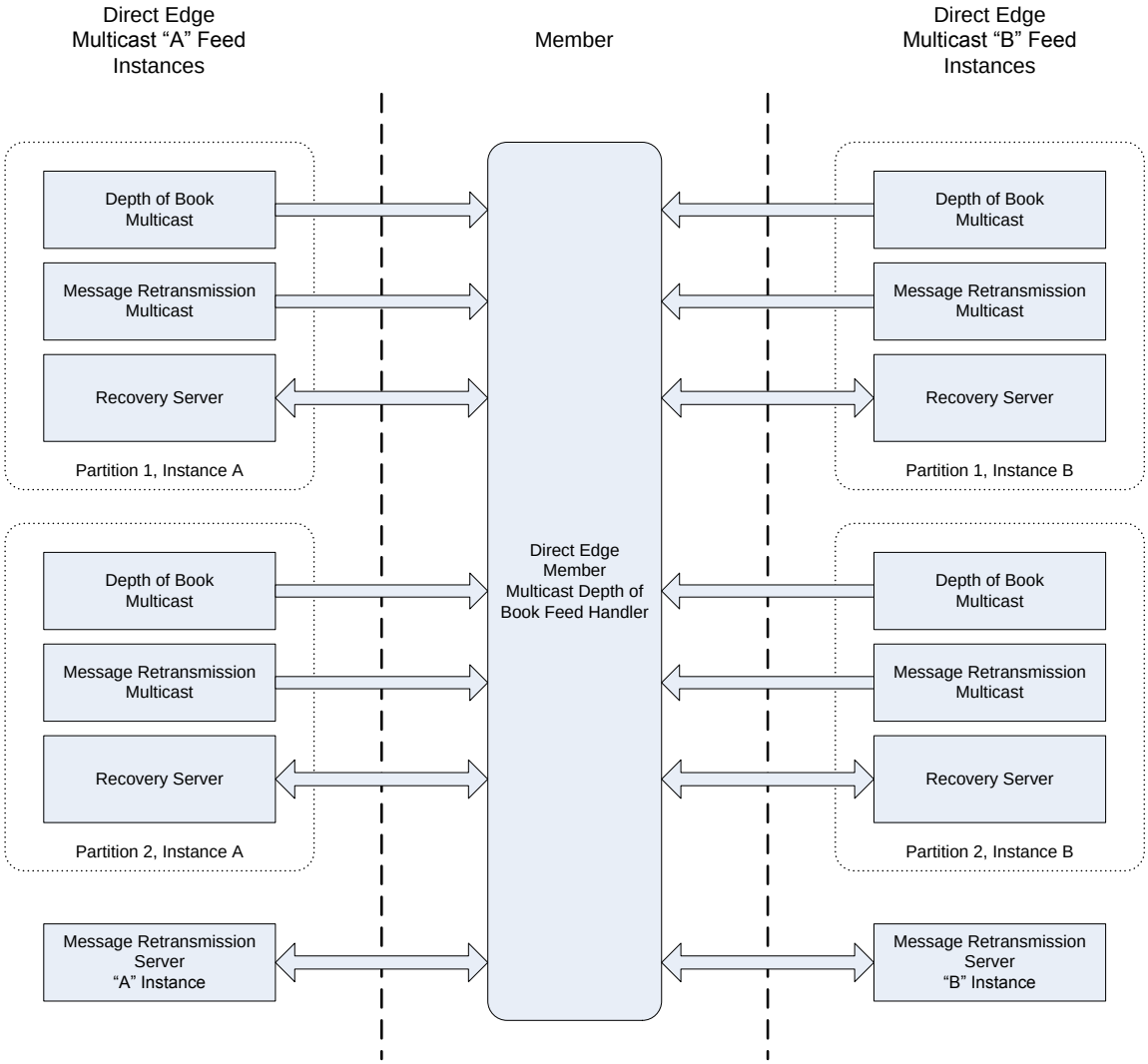
Members may choose to receive one or both instances of the feed for each partition. Using both the "A" and "B" instances better protects the member from hardware failure at Direct Edge, and is considered the best practice. Members who receive both feed instances should note the following:

- Message order is preserved between the "A" and "B" feed instances, but message framing within Common Session Messages (Section 2) is not guaranteed to be identical.

- Members should connect to both the “A” and “B” instances of the Message Retransmission Server. Members may either use one instance as the primary and the other as a backup, or they may send their requests to both servers in a round-robin fashion. If a member chooses to do this, they should be prepared for the failure of one server, in which case all requests should be directed to the remaining active server.
- Members who intend to use the Recovery Servers should connect to both the “A” and “B” instances, and arbitrarily designate one as the primary and the other as the backup.

1.2.1 System Diagram

The following diagram shows the flow of messages between Direct Edge and a member feed handler that is listening to the “A” and “B” instances of two book partitions:



Common Messaging

1.3. Data Types

All messages sent to and from Direct Edge multicast book feed services use the data types defined below. Binary data types are Little-Endian encoded.

Data Type	Size (bytes)	Description
String	Var	ASCII encoded, right-padded with spaces.
Byte	1	Single byte. Used to hold one ASCII character or 8 1-bit flags.
UInt8	1	8-bit unsigned integer.
UInt16	2	Little-endian encoded 16 bit unsigned integer.
UInt32	4	Little-endian encoded 32 bit unsigned integer.
UInt64	8	Little-endian encoded 64 bit unsigned integer.
Price16	2	Base-10 fixed point number with 2 digits to the right of an implied decimal point.
Price64	8	Base-10 fixed point number with 4 digits to the right of an implied decimal point.

1.4. Common Session Message

All messages sent to and from Direct Edge multicast book feed services use a Common Session Message format. This message serves as a wrapper to deliver one or more higher level messages. The header fields in the Common Session Message indicate the number and aggregate size of the higher level messages contained in the payload.

1.4.1 Message Format

Field Name	Offset	Size	Type	Remarks
Length	0	2	UInt16	The length of the message, including this header.
Message Count	2	1	UInt8	The number of messages contained in the payload field.
Partition	3	1	Byte	The partition number at which the message originated.
Sequence	4	4	UInt32	The sequence number of the first message in the payload.
Payload	8	var	-	One or more higher level messages.

1.4.2 Message Bundling

Multiple higher-level messages may be delivered in the payload of one Common Session Message. All messages that are bundled in such a way have the following common fields:

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	The length of the bundled message.
Message Type	1	1	Byte	The type of the bundled message.

Direct Edge reserves the right to add message types to this specification in the future. Member's message handlers should be able to discard unexpected message types.

1.4.3 Sequencing

1.4.3.1 Depth of Book Multicast

Messages transmitted by Direct Edge on the Depth of Book multicast address use the sequencing functionality of the Common Session Message. The first sequence number of the day is 1. The sequence number of the first message in a Common Session Message payload is given explicitly. Each subsequent message in the payload has a sequence number of one greater than the previous message.

1.4.3.2 Message Retransmission Multicast

Messages transmitted on the Message Retransmission multicast address are not sequenced independently from the Depth of Book messages. Rather, the sequence number field of the Common Session Message indicates the sequence number of the message when it was originally transmitted by Direct Edge.

1.4.3.3 TCP Services

Messages sent to and from the Direct Edge Message Retransmission and Recovery Servers are not explicitly sequenced. The Sequence field in these common session messages will always be set to 0 on messages sent by Direct Edge. Messages sent from members to Direct Edge must also have their sequence field set to 0.

2 Depth of Book Multicast

2.1 Introduction

The Depth of Book Multicast is the primary method of transmitting depth of book information from Direct Edge to members. The Depth of Book messages described in this section are encapsulated in Common Session Messages (Section 2.2) when transmitted by Direct Edge, allowing members to detect lost or out of order messages. If a member believes that they have lost a depth of book message, they should request a replay from the Message Retransmission Service (Section 3).

An example of the operation of the Depth of Book Multicast is given in Appendix B.

2.1.1 Heartbeats

Direct Edge sends heartbeats by sending a Common Session Message with the Message Count set to 0 and the Sequence field set to the next expected sequence number. Heartbeat messages do not increase the expected sequence number for a depth of book multicast session. Heartbeats may be sent with a sequence number of 0 after trading hours for connectivity testing.

2.1.2 Order Reference Numbers and Execution Reference Numbers

Members may track their visible limit orders in the depth of book feed. The order reference number used by the book feed is identical to the order identifier used in Direct Edge order entry sessions (API field “Order Reference Number”, FIX field 37). However, members may elect to have a new, system-generated order reference number applied to the replenishment of a reserve order. To request this feature, contact FIXSUPPORT@directedge.com.

When hidden quantity executes, Direct Edge sends a Trade Message (section 2.2.8). For this message, the order reference number will not correspond to the order identifier used in member’s order entry sessions. Members wishing to identify their own hidden executions in the book feed should use the Execution Reference Number, which will be identical to the execution identifier in their order entry session (API field “Match”, FIX field 17).

2.1.3 Table of Message Types

Value	Section	Description
0x20	2.2.1	Timestamp Message
0x21	2.2.2	Add Order Message (Long Form)
0x22	2.2.2	Add Order Message (Short Form)
0x2F	2.2.2	Add Order Message (Extended Form)
0X34	2.2.2	Add Order Message (with Attribution)
0x23	2.2.3	Order Executed Message
0x24	2.2.4	Order Executed At Message
0x27	2.2.5	Order Modified Message (Long Form)
0x28	2.2.5	Order Modified Message (Short Form)
0x29	2.2.6	Order Canceled Message
0x2A	2.2.7	Trade Message (Long Form)
0x2B	2.2.7	Trade Message (Short Form)
0x30	2.2.7	Trade Message (Extended Form)
0x2C	2.2.8	Trade Break Message

0x2D	2.2.09	End of Session Message
0x2E	2.2.10	Security Status Message

2.2 Depth of Book Messages

2.2.1 Timestamp Message

The Timestamp message serves as a reference for the timestamp field in all other message types. The timestamps in other message types are given as an offset from the most recent Timestamp message.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Timestamp messages are 10 bytes long.
Message Type	1	1	Byte	0x20 indicates a timestamp message.
Timestamp	2	8	UInt64	Given in 64-bit time_t format.

2.2.2 Add Order Messages

The Add Order Messages indicate that a visible standing limit order has been added to the Direct Edge book. These messages may represent a new order, or they may represent the replenishment of a Display/Reserve order. There are extended, long, and short forms of the Add Order Message along with an Add Order Message with Attribution.

Note: Attributed orders will appear on the feed two times; once without attribution using one of the original order formats and once with attribution using the new Add Order with Attribution format..

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Add Order Messages (Long Form) are 34 bytes long.
Message Type	1	1	Byte	0x21 indicates an Add Order Message (Long Form).
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	Any subsequent order modifications refer to this number.
Side	14	1	Byte	0x42 ('B') indicates that the order is a bid. 0x53 ('S') indicates that the order is an offer.
Quantity	15	4	UInt32	The displayed quantity of the new order.
Security	19	6	String	The ticker symbol of the new order.
Price	25	8	Price64	The limit price of the new order.
Flags	33	1	Byte	See section 2.2.2.1 for flag values.

Long Form

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Add Order Messages (Short Form) are 26 bytes long.
Message Type	1	1	Byte	0x22 indicates an Add Order Message (Short Form).
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	Any subsequent order modifications refer to this number.
Side	14	1	Byte	0x42 ('B') indicates that the order is a bid. 0x53 ('S') indicates that the order is an offer.
Quantity	15	2	UInt16	The displayed quantity of the new order.
Security	17	6	String	The ticker symbol of the new order.
Price	23	2	Price16	The limit price of the new order.
Flags	25	1	Byte	See section 2.2.2.1 for flag values.

Short Form

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Add Order Messages (Extended Form) are 36 bytes long.
Message Type	1	1	Byte	0x2F indicates an Add Order Message (Extended Form).
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	Any subsequent order modifications refer to this number.
Side	14	1	Byte	0x42 ('B') indicates that the order is a bid. 0x53 ('S') indicates that the order is an offer.
Quantity	15	4	UInt32	The displayed quantity of the new order.
Security	19	8	String	The ticker symbol of the new order.
Price	27	8	Price64	The limit price of the new order.
Flags	35	1	Byte	See section 2.2.2.1 for flag values.

Extended Form

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Add Order Messages (Extended Form) are 36 bytes long.
Message Type	1	1	Byte	0x34 indicates an Add Order Message (with Attribution)
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Ref Number	6	8	UInt64	Any subsequent order modifications refer to this number.
Side	14	1	Byte	0x42 ('B') indicates that the order is a bid. 0x53 ('S') indicates that the order is an offer.
Quantity	15	4	UInt32	The displayed quantity of the new order.
Security	19	8	String	The ticker symbol of the new order.
Price	27	8	Price64	The limit price of the new order.
Flags	35	1	Byte	See section 2.2.2.1 for flag values.
Participant ID	36	4	String	Market Participant ID for attributed orders.

Add Order Message with Attribution

2.2.2.1 Add Order Flags

Bit	Name	Description
0	Display Flag	0: This order is not aggregated in Direct Edge's SIP quote. 1: This order is aggregated in Direct Edge's SIP quote.
1	Unused	Unused
2	Replenish Flag	0: This message indicates a new order. 1: This message indicates a replenishment of an existing reserve order.
3	Attribution	0: This order is not attributed. 1: This order is attributed.

2.2.3 Order Executed Message

The Order Executed Message indicates that an order displayed on the Direct Edge book has been executed in whole or in part.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Order Executed Messages are 26 bytes long.
Message Type	1	1	Byte	0x23 indicates an Order Executed Message.
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	The order reference number of the order that executed.
Execution Quantity	14	4	UInt32	The number of shares that executed.
Execution Reference Number	18	8	UInt64	A day-unique number identifying the execution. If the trade is subsequently broken, this number will be used to identify the trade.

2.2.4 Order Executed At Message

The Order Executed At Message indicates that an order displayed on the Direct Edge book has been executed in whole or in part at a price other than the one at which it was displayed at the time of execution. Please note: The Order Executed At message can contain an execution quantity that is greater than the current quoted size. Therefore, Subscribers should use the Remaining Shares field to determine the number of shares quoted after the execution.

Direct Edge does not use this message type to indicate replenishment of a reserve order.

Field Name	Offset	Size		Remarks
Message Length	0	1	UInt8	Order Executed At Messages are 38 bytes long.
Message Type	1	1	Byte	0x24 indicates an Order Executed At Message.
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	The Order Reference Number of the order that executed.
Quantity	14	4	UInt32	The number of shares traded.
Remaining Shares	18	4	UInt32	The number of visible shares remaining for the order.
Execution Reference Number	22	8	UInt64	A day-unique number identifying the execution. If the trade is subsequently broken, this number will be used to identify the trade.
Execution Price	30	8	Price64	The price of the execution.

2.2.5 Order Modified Messages

The Order Modified Messages indicate that an order resting on the Direct Edge book has had its price or visible quantity changed. When order quantity is reduced, it retains its original execution priority. When an order quantity is increased, it loses its original execution priority. There are long and short forms of the Order Modified Message.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Order Modified Messages (Long Form) are 27 bytes long.
Message Type	1	1	Byte	0x27 indicates an Order Modified Message (Long Form).
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	The Order Reference Number of the order being modified.
Quantity	14	4	UInt32	The new quantity of the order.
Price	18	8	Price64	The new limit price of the order.
Flags	26	1	Byte	See section 2.2.5.1 for flag values.

Long Form

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Order Modified Messages (Short Form) are 19 bytes long.
Message Type	1	1	Byte	0x28 indicates an Order Modified Message (Short Form).
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	The Order Reference Number of the order being modified.
Quantity	14	2	UInt16	The new quantity of the order.
Price	16	2	Price16	The new limit price of the order.
Flags	18	1	Byte	See section 2.2.5.1 for flag values.

Short Form

2.2.5.1 Order Modified Flags

Bit	Name	Description
0	Priority Flag	0: This order loses its execution priority. 1: This order retains its execution priority.

2.2.6 Order Canceled Message

The Order Canceled Message indicates that an order displayed on the Direct Edge book has had its entire quantity canceled.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Order Canceled Messages are 14 bytes long.
Message Type	1	1	Byte	0x29 indicates an Order Canceled Message.
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	The Order Reference Number of the order being canceled.

2.2.7 Trade Messages

The Trade Message indicates that an order that was not displayed on the Direct Edge book (hidden liquidity) has executed. There are long, short and extended forms of the Trade Message.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Trade Messages (Long Form) are 41 bytes long.
Message Type	1	1	Byte	0x2A indicates a Trade Message (Long Form).
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	The Order Reference Number of the order that executed.
Side	14	1	Byte	0X48 ('H') Resting order side was undisclosed.
Quantity	15	4	UInt32	The number of shares that executed.
Security	19	6	String	The ticker symbol of the security that executed.
Price	25	8	Price64	The execution price.
Execution Reference Number	33	8	UInt64	A day-unique number identifying the execution. If the trade is subsequently broken, this number will be used to identify the trade.

Long Form

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Trade Messages (Short Form) are 33 bytes long.
Message Type	1	1	Byte	0x2B indicates a Trade Message (Short Form).
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	The Order Reference Number of the order that executed.
Side	14	1	Byte	0X48 ('H') Resting order side was undisclosed.
Quantity	15	2	UInt16	The number of shares that executed.

Security	17	6	String	The ticker symbol of the security that executed.
Price	23	2	Price16	The execution price.
Execution Reference Number	25	8	UInt64	A day-unique number identifying the execution. If the trade is subsequently broken, this number will be used to identify the trade.

Short Form

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Trade Messages (Extended Form) are 43 bytes long.
Message Type	1	1	Byte	0x30 indicates a Trade Message (Extended Form).
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Order Reference Number	6	8	UInt64	The Order Reference Number of the order that executed.
Side	14	1	Byte	0X48 ('H') Resting order side was undisclosed.
Quantity	15	4	UInt32	The number of shares that executed.
Security	19	8	String	The ticker symbol of the security that executed.
Price	27	8	Price64	The execution price.
Execution Reference Number	35	8	UInt64	A day-unique number identifying the execution. If the trade is subsequently broken, this number will be used to identify the trade.

Extended Form

2.2.8 Trade Break Message

The Trade Break Message indicates that a trade previously indicated in the Direct Edge book feed with an Order Executed, Order Executed At, or Trade Message has been broken.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Trade Break Messages are 14 bytes long.
Message Type	1	1	Byte	0x2C indicates a Trade Break Message.
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Execution Reference Number	6	8	UInt64	The Execution Reference Number of the trade that is being broken.

2.2.9 End of Session Message

The end of session message indicates that the Multicast Depth of book feed is done for the day. No subsequent market data messages will be transmitted by Direct Edge. Direct Edge may continue to send heartbeats (with the sequence number set to 0) for the purpose of testing connectivity.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	End of Session Messages are 2 bytes long.
Message Type	1	1	Byte	0x2D indicates an End of Session Message.

2.2.10 Security Status Message

The Security Status Message indicates a change in the trading status of an individual security.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Security Status Messages are 21 bytes long.
Message Type	1	1	Byte	0x2E indicates a Security Status Message.
Timestamp	2	4	UInt32	Nanoseconds offset from the latest Timestamp Message.
Security Name	6	8	String	The ticker symbol of the security to which this message applies.
Issue Type	14	1	Byte	See section 2.2.10.1 for Issue Type values.
Minimum Order Quantity	15	1	UInt8	The minimum number of shares that Direct Edge will accept on an order for this security.
Round Lot Quantity	16	1	UInt8	The round lot quantity for this security.
Tape Type	17	1	Byte	The tape type for this security.
Orderbook Number	18	1	UInt8	The identifier for the Order book (matching partition) for this security.
Security Status	19	1	Byte	See section 2.2.10.2 for Security Status values.
Flags	20	1	Byte	See section 2.2.10.3 for Flags values.

2.2.10.1 Table of Issue Type Values

Hex	ASCII	Description
0x43	C	Common Shares
0x52	R	Rights
0x55	U	Units
0x57	W	Warrants
0x50	P	Preferred Shares
0x41	A	ADR
0x45	E	ETF

2.2.10.2 Table of Security Status Values

Hex	ASCII	Description
0x54	T	Security is Trading
0x48	H	Security is Halted

NOTE: Between 7:30 am - 7:45 am daily, Direct Edge executes a “spin” to convey the symbols that are trading on the Exchange for that day. Security Status prior to the Pre-Market Session will be “Security is Halted” which reflects that trading is not yet occurring and no orders are being displayed on the book feed. During this time, orders ***are*** being accepted by the System.

At the transition to Pre-Market, Security Status will change to “Security is Trading” for symbols that are tradable. If a halt is in place for a security at the Pre-Market transition, the status will remain “Security is Halted”.

2.2.10.3 Table of Security Status Flags

Bit	Name	Description
0	When Issued	0: Security is not trading on a When-Issued basis. 1: Security is trading on a When-Issued basis.
1	Short Sale Restriction	0: Security is not trading with Short Sale Restrictions. 1: Security is trading with Short Sale Restrictions.

2.3 Symbology

Suffix Description	CQS Suffix	CMS Suffix	DE Suffix
Called	/CL	CL	*
Class A	/A	A	.A
Class B	/B	B	.B
Class A Called	/A/CL	ACL	.A*
Class B Called	/B/CL	BCL	.B*
Class A When Issued	/Aw	AWI	.A#
Class B When Issued	/Bw	BWI	.B#
Convertible	/CV	CV	%
Class A Convertible	A/CV	ACV	.A%
Class B Convertible	B/CV	BCV	.B%
Preferred	p	PR	-
Preferred Class A	pA	PRA	-A
Preferred Class B	pB	PRB	-B
Preferred Class A Called	pA/CL	PRACL	-A*
Preferred Class B Called	pB/CL	PRBCL	-B*
Preferred Class A Convertible	pA/CV	PRACV	-A%
Preferred Class B Convertible	pB/CV	PRBCV	-B%
Preferred Class A When Issued	pAw	PRAWI	-A#
Preferred Class B When Issued	pBw	PRBWI	-B#
Preferred When Issued	pw	PRWI	-#
Preferred Class A When Distributed	pA/WD	PRAWD	-A$
Preferred Class B When Distributed	pB/WD	PRBWD	-B$
Preferred When Distributed	p/WD	PRWD	-$
Partial Paid	/PP	PP	@
Convertible Called	/CV/CL	CVCL	%*
Rights	r	RT	^
Rights When Issued	rt	RTWI	^#
Test	/TEST	TEST	~
Units	/U	U	=
Warrants	/WS	WS	+
Warrants Class A	/WS/A	WSA	+A
Warrants Class B	/WS/B	WSB	+B
Warrant When Issued	/WSw	WSWI	+#
When Distributed	/WD	WD	$
When Issued	w	WI	#

3 Message Retransmission Service

3.1 Introduction

The Message Retransmission Service allows members who have missed multicast messages on both the 'A' and 'B' multicast addresses to request a retransmission of those messages. Members maintain a TCP/IP connection to the Message Retransmission Server. The Message Retransmission Server processes retransmission requests, and responds by accepting or denying the request. If the retransmission request is accepted, the replayed message(s) are transmitted on the requested Message Retransmission Multicast address. Direct Edge may introduce a delay of up to 2ms between an accepted retransmission request and retransmitting the requested messages.

An example of the operation of the Message Retransmission Service is given in Appendix B.

3.1.1 Heartbeat Messages

On the retransmission multicast addresses, Direct Edge will send a heartbeat after no more than one second without a message retransmission. A Common Session Message with the Message Count and Sequence Number set to 0 is used for heartbeats. Over the TCP connection between the Message Retransmission Server and the member client, Direct Edge will send a heartbeat once every second. Members should send a heartbeat to Direct Edge once every five seconds. If a client fails to send two consecutive heartbeats, Direct Edge may disconnect that client.

3.1.2 Table of Message Types

Value	Section	Description
0x01	4.3.1	Login Request Message
0x03	4.3.2	Retransmission Request Message
0x05	4.3.3	Logout Request Message
0x02	4.4.1	Login Response Message
0x04	4.4.2	Retransmission Response Message

3.2 Retransmission Service Multicast Messages

Retransmitted messages are encapsulated in Common Session Messages. The Sequence field is set to the original sequence number of the message being retransmitted. The framing of retransmitted messages inside of Common Session Messages may differ between the original transmission and retransmission.

3.3 Retransmission Service Unicast Messages (Member to Direct Edge)

3.3.1 Login Request Message

A Login Request Message must be the first message sent from a member to Direct Edge upon connecting to the Message Retransmission Server. The login / password combination is assigned by Direct Edge.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Login Request Messages are 22 bytes long.
Message Type	1	1	Byte	0x01 indicates a Login Request Message.
Session	2	4	UInt32	Unused.
Login	6	6	String	Assigned by Direct Edge.
Password	12	10	String	Assigned by Direct Edge.

3.3.2 Retransmission Request Message

The Retransmission Request Message is sent from a member to Direct Edge when that member detects that they have missed multicast messages on both the “A” and “B” feeds.

Field Name	Offset	Size		Remarks
Message Length	0	1	UInt8	Retransmission Request Messages are 9 bytes long.
Message Type	1	1	Byte	0x03 indicates a Retransmission Request Message.
Partition	2	1	Byte	The partition number of the requested retransmission.
Sequence	3	4	UInt32	The starting sequence number of the requested retransmission.
Count	7	2	UInt16	The number of messages to retransmit.

3.3.3 Logout Request Message

Upon receiving a Logout Request Message, the Direct Edge Retransmission Request Server will immediately close the client socket.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Logout Request Messages are 2 bytes long.
Message Type	1	1	Byte	0x05 indicates a Logout Request Message.

3.4 Retransmission Service Unicast Messages (Direct Edge to Member)

3.4.1 Login Response Message

The Login Response Message is sent from the Direct Edge Message Retransmission Server to the member in response to a Login Request Message. The Response Code field indicates whether or not the login attempt was successful.

Field Name		Size	Type	Remarks
Message Length	0	1	UInt8	Login Response Messages are 3 bytes long.
Message Type	1	1	Byte	0x02 indicates a Login Response Message
Response Code	2	1	Byte	The result of the login request. All values other than 0x41 ('A') should be interpreted as a rejected login request.

3.4.1.1 Table of Login Response Codes

Hex	ASCII	Description
0x41	A	Login was accepted.
0x4E	N	Login was rejected.
0x42	B	Not Used.
0x53	S	Not Used.

3.4.2 Retransmission Response Message

The Retransmission Response Message is sent from the Direct Edge Message retransmission server to the member in response to a Retransmission Request Message. The Status field indicates whether or not the retransmission request was successful.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Retransmission Response Messages are 10 bytes long.
Message Type	1	1	Byte	0x04 indicates a Retransmission Response Message
Partition	2	1	Byte	The partition number of the retransmission.
Sequence	3	4	UInt32	The starting sequence number of the retransmission, as specified in the Retransmission Request Message.
Count	7	2	UInt16	The number of messages being retransmitted.
Status	9	1	Byte	The status of the Retransmission Request. All values other than 0x41 ('A') should be interpreted as a rejected retransmission request.

NOTE: The Payload of the response message will include both attributed and non-attributed orders satisfying the sequence numbers requested. Members that are not subscribed to Edge Book Attributed will need to treat re-transmitted attributed messages as they do attributed messages received on the feed.

3.4.2.1 Table of Retransmission Status Codes

Hex	ASCII	Description
0x41	A	Retransmission was Accepted.
0x4F	O	Request was not in range.
0x44	D	Request exceeded daily retransmission limit.
0x4D	M	Request exceeded one minute retransmission limit
0x53	S	Request exceeded one second retransmission limit
0x43	C	Retransmission request was too large.
0x49	I	Invalid partition in retransmission request
0x55	U	Retransmission not currently available

4 Recovery Service

4.1 Introduction

The Direct Edge Recovery Service allows members who have missed large numbers of sequenced data messages to catch up with real-time messaging faster than if they were to request gap fill messages for each message that they missed. The Recovery Server sends the member a snapshot of every order displayed on the book as of a certain sequence number. After receiving this snapshot, the member may then process multicast book messages subsequent to the snapshot as normal. The member might use this functionality if they were to begin listening to the multicast session mid-day, for example.

Direct Edge maintains two Recovery Servers for each book partition. Each member using the multicast book feed should maintain a TCP connection to every Recovery Server. When they wish to receive a snapshot of all orders on the book for a given partition, they send a snapshot request message to one of the Recovery Servers for that partition. The snapshot request message contains the sequence number at which the member would like the snapshot taken. The Recovery Server will reply with a snapshot that is accurate as of the sequence number given in the Snapshot Begin message. The sequence number that the Recovery Server chooses to use may be greater than or equal to the one that the member requested. The member must buffer all multicast messages with sequence numbers greater than the sequence number given in the Snapshot Begin message. These multicast messages must be processed in order after the Snapshot End message is processed by the member.

An example of the operation of the Recovery Service is given in Appendix B.

4.1.1 Table of Snapshot Protocol Message Types

Value	Section	Description
0x01	5.2.1	Login Request Message
0x84	5.2.2	Snapshot Request Message
0x03	5.2.3	Logout Request Message
0x02	5.3.1	Login Response Message
0x82	5.3.2	Snapshot Response Message
0x83	5.3.3	Snapshot Complete Message

4.2 Member to Direct Edge Messages

4.2.1 Login Request Message

A Login Request Message must be the first message sent from a member to Direct Edge upon connecting to the Recovery Server. The login / password combination is assigned by Direct Edge.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Login Request Messages are 22 bytes long.
Message Type	1	1	Byte	0x01 indicates a Login Request Message.
Session	2	4	UInt32	Unused
Login	6	6	String	Assigned by Direct Edge.
Password	12	10	String	Assigned by Direct Edge.

4.2.2 Snapshot Request Message

The Snapshot Request Member is sent from the member to Direct Edge when the member wants to receive a current picture of all of the orders on the Direct Edge book. The Minimum Sequence Number field should be the first sequence number from which the member can construct an unbroken sequence of multicast depth of book messages.

The Snapshot Request Message is not changed with the addition of attributed orders.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Snapshot Request Messages are 6 bytes long.
Message Type	1	1	Byte	0x84 indicates a Snapshot Request Message. Only non-attributed order formats will be returned.
Minimum Sequence Number	2	4	UInt32	The minimum sequence number from which the client can build a complete picture of the book. Note that the server may respond with a snapshot that starts at a greater sequence number.

Snapshot Request Message

4.2.3 Logout Request Message

The Logout Request Message is sent from the client to Direct Edge when the client wishes to disconnect from the Recovery Server. Upon receiving this message, the Recovery Server may immediately close the client socket.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Logout Request Messages are 2 bytes long.
Message Type	1	1	Byte	0x05 indicates a Logout Request Message.

4.3 Server to Client Messages

4.3.1 Login Response Message

The Login Response Message is sent from the Direct Edge Recovery Server to the client in response to a Login Request Message. The Response Code field indicates whether or not the login attempt was successful.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Login Response Messages are 3 bytes long.
Message Type	1	1	Byte	0x02 indicates a Login Response Message
Response Code	2	1	Byte	The result of the Login Request. All values other than 0x41 ('A') should be interpreted as a rejected login request.

4.3.1.1 Table of Login Response Codes

Hex	ASCII	Description
0x41	A	Login was accepted.
0x4E	N	Login was rejected.
0x42	B	Not Used.
0x53	S	Not Used.

4.3.2 Snapshot Response Message

The Snapshot Response Message is sent from the Direct Edge Recovery Server to the client in response to a Snapshot Request Message. The sequence number is the last sequence number that is included in the snapshot. This field will be greater than or equal to the sequence number indicated in the corresponding Snapshot Request Message.

NOTE: TCP Recovery Server ports, by default, provide order information without Attribution. Port must specifically be entitled to receive orders with Attribution. Please update the Logical Port Request Form found on the Direct Edge website at: www.directedge.com/Connect to reflect your interest in Attribution.

For those subscribed to EdgeBook Attributed, the payload associated with the Snapshot Response message will include a combination of attributed orders and non-attributed orders. If an order was originally attributed, it will be included in the Snapshot response only once using the new Add Order with Attribution format. This behavior is different from the EdgeBook Attributed feed which will convey the order twice: once with attribution and once without. Orders that were not originally attributed will be delivered using the original Add Order formats.

For those subscribed to EdgeBook Depth without attribution the response will include *all* orders without attribution. These will be delivered using the previously available Add Order formats.

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Snapshot Response Messages are 11 bytes long.
Message Type	1	1	Byte	0x82 indicates a Snapshot Response Message.
Snapshot Sequence	2	4	UInt32	The last sequence number included in the snapshot. This number may be greater than or equal to the Minimum Sequence Number field in the corresponding Snapshot Request Message.
Order Count	6	4	UInt32	The number of orders in the snapshot.
Status	10	1	Byte	The status of the snapshot request. All values other than 0x41 ('A') should be interpreted as a rejected snapshot request.

4.3.2.1 Table of Snapshot Response Codes

Hex	ASCII	Description
0x41	A	The snapshot request was accepted.
0x4F	O	The snapshot request was out of range (sequence number too high).
0x53	S	One snapshot is already in progress.

4.3.3 Snapshot Complete Message

Field Name	Offset	Size	Type	Remarks
Message Length	0	1	UInt8	Snapshot Complete Messages are 6 bytes long.
Message Type	1	1	Byte	0x83 indicates a Snapshot Complete Message.
Sequence	2	4	UInt32	The last sequence number included in the spin.

Appendix A. Partitioning and Networking

Direct Edge reserves the right to periodically change multicast addresses as well as partition information. All changes will be communicated in advance via email.

A.1 Partition Information -*EDGA*

Partition	Symbol Ranges	Tape Type
1	A-FGZZZ	C
2	FH-PAZZZ	C
3	PB -ZZZZZ	C
4	A-DHY	A/B
5	DHZ-FXH	A/B
6	FXI-IXG	A/B
7	IXH-OIH	A/B
8	OII-SOXL	A/B
9	SOXM-VBR	A/B
10	VBS-ZZZZZ	A/B

Partition Information: - *EDGX*

Partition	Symbol Ranges	Tape Type
1	A-FGZZZ	C
2	FH-PAZZZ	C
3	PB -ZZZZZ	C
4	A-DRQ	A/B
5	DRR-GDXJ	A/B
6	GDXK-IYH	A/B
7	IYI-PRK	A/B
8	PRL-SPYG	A/B
9	SPYH-UXJ	A/B
10	UXK-ZZZZZ	A/B

A.2 Multicast Rendezvous Point

Direct Edge has upgraded its production multicast market data switches. With this change, the Rendezvous Points for EDGA are now separated from those for EDGX.

EDGA: **Rendezvous Points**

Rendezvous Point (RP)	Existing IP Address
EDGA-B	74.115.128.32
EDGA-A	74.115.128.31

EDGX: **Rendezvous Points**

Rendezvous Point (RP)	Existing IP Address
EDGX-A	74.115.128.1
EDGX-B	74.115.128.2

MEMBER TEST: **Rendezvous Points**

Rendezvous Point (RP	Existing IP address
Member Test-A	74.115.128.11
Member Test- B	74.115.128.12

A.2 Member TEST: Multicast and Recovery Service Addresses - *EDGA*

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
A	Multicast	Partition 1	74.112.227.242	**BOOK Stream**	**224.0.73.0**	**44001**
				Retransmission Response Stream	**224.0.73.1**	**44001**
	TCP			**Recovery Request Server**	74.112.227.242	**44101**
	Multicast	Partition 2	74.112.227.242	**BOOK Stream**	**224.0.73.2**	**44002**
				Retransmission Response Stream	**224.0.73.3**	**44002**
	TCP			**Recovery Request Server**	74.112.227.242	**44102**
	TCP	Retransmission Request Server			74.112.227.242	44100
B	Multicast	Partition 1	74.112.227.242	**BOOK Stream**	**224.0.73.10**	**45001**
				Retransmission Response Stream	**224.0.73.11**	**45001**
	TCP			**Recovery Request Server**	**74.112.227.242**	**45101**
	Multicast	Partition 2	74.112.227.242	**BOOK Stream**	**224.0.73.12**	**45002**
				Retransmission Response Stream	**224.0.73.13**	**45002**
	TCP			**Recovery Request Server**	**74.112.227.242**	**45102**
	TCP	Retransmission Request Server			**74.112.227.242**	45100

A.3 Member TEST: Multicast and Recovery Service Addresses - *EDGX*

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
A	Multicast	Partition 1	74.112.227.250	BOOK Stream	224.0.73.130	44001
				Retransmission Response Stream	224.0.73.131	44001
	TCP			Recovery Request Server	74.112.227.250	44101
	Multicast	Partition 2	74.112.227.250	BOOK Stream	224.0.73.132	44002
				Retransmission Response Stream	224.0.73.133	44002
	TCP			Recovery Request Server	74.112.227.250	44102
	TCP	Retransmission Request Server			74.112.227.250	44100
B	Multicast	Partition 1	74.112.227.250	BOOK Stream	224.0.73.140	45001
				Retransmission Response Stream	224.0.73.141	45001
	TCP			Recovery Request Server	74.112.227.250	45101
	Multicast	Partition 2	74.112.227.250	BOOK Stream	224.0.73.142	45002
				Retransmission Response Stream	224.0.73.143	45002
	TCP			Recovery Request Server	74.112.227.250	45102
	TCP	Retransmission Request Server			74.112.227.250	45100

A.4 Multicast and Recovery Service Application Addresses – *EDGA*

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
A	Multicast	Partition 1	74.112.226.18	BOOK Stream	233.130.124.0	36001
				Retransmission Response Stream	233.130.124.1	36001
	TCP			Recovery Request Server	74.115.130.18	36101
	Multicast	Partition 2	74.112.226.19	BOOK Stream	233.130.124.2	36002
				Retransmission Response Stream	233.130.124.3	36002
	TCP			Recovery Request Server	74.115.130.19	36102
	Multicast	Partition 3	74.112.226.20	BOOK Stream	233.130.124.4	36003
				Retransmission Response Stream	233.130.124.5	36003
	TCP			Recovery Request Server	74.115.130.20	36103
	Multicast	Partition 4	74.112.226.21	BOOK Stream	233.130.124.6	36004
				Retransmission Response Stream	233.130.124.7	36004
	TCP			Recovery Request Server	74.115.130.21	36104
	Multicast	Partition 5	74.112.226.22	BOOK Stream	233.130.124.8	36005
				Retransmission Response Stream	233.130.124.9	36005
	TCP			Recovery Request Server	74.115.130.22	36105
	Multicast	Partition 6	74.112.226.23	BOOK Stream	233.130.124.10	36006
				Retransmission Response Stream	233.130.124.11	36006

	TCP			Recovery Request Server	74.115.130.23	36106
	Multicast	Partition 7	74.112.226.24	BOOK Stream	233.130.124.12	36007
				Retransmission Response Stream	233.130.124.13	36007
	TCP			Recovery Request Server	74.115.130.24	36107
	Multicast	Partition 8	74.112.226.25	BOOK Stream	233.130.124.14	36008
				Retransmission Response Stream	233.130.124.15	36008
	TCP			Recovery Request Server	74.115.130.25	36108
	Multicast	Partition 9	74.112.226.26	BOOK Stream	233.130.124.16	36009
				Retransmission Response Stream	233.130.124.17	36009
	TCP			Recovery Request Server	74.115.130.26	36109
	Multicast	Partition 10	74.112.226.27	BOOK Stream	233.130.124.18	36010
				Retransmission Response Stream	233.130.124.19	36010
	TCP			Recovery Request Server	74.115.130.27	36110
	TCP	Retransmission Request Server			74.115.130.17	36100

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
B	Multicast	Partition 1	74.112.226.114	BOOK Stream	233.130.124.32	37001
				Retransmission Response Stream	233.130.124.33	37001
	TCP			Recovery Request Server	74.115.130.114	37101
	Multicast	Partition 2	74.112.226.115	BOOK Stream	233.130.124.34	37002
				Retransmission Response Stream	233.130.124.35	37002
	TCP			Recovery Request Server	74.115.130.115	37102
	Multicast	Partition 3	74.112.226.116	BOOK Stream	233.130.124.36	37003
				Retransmission Response Stream	233.130.124.37	37003
	TCP			Recovery Request Server	74.115.130.116	37103
	Multicast	Partition 4	74.112.226.117	BOOK Stream	233.130.124.38	37004
				Retransmission Response Stream	233.130.124.39	37004
	TCP			Recovery Request Server	74.115.130.117	37104
	Multicast	Partition 5	74.112.226.118	BOOK Stream	233.130.124.40	37005
				Retransmission Response Stream	233.130.124.41	37005
	TCP			Recovery Request Server	74.115.130.118	37105

	Multicast	Partition 6	74.112.226.119	**BOOK Stream**	**233.130.124.42**	**37006**
				Retransmission Response Stream	**233.130.124.43**	**37006**
	TCP			**Recovery Request Server**	**74.115.130.119**	**37106**
	Multicast	Partition 7	74.112.226.120	**BOOK Stream**	**233.130.124.44**	**37007**
				Retransmission Response Stream	**233.130.124.45**	**37007**
	TCP			**Recovery Request Server**	**74.115.130.120**	**37107**
	Multicast	Partition 8	74.112.226.121	**BOOK Stream**	**233.130.124.46**	**37008**
				Retransmission Response Stream	**233.130.124.47**	**37008**
	TCP			**Recovery Request Server**	**74.115.130.121**	**37108**
	Multicast	Partition 9	74.112.226.122	**BOOK Stream**	**233.130.124.48**	**37009**
				Retransmission Response Stream	**233.130.124.49**	**37009**
	TCP			**Recovery Request Server**	**74.115.130.122**	**37109**
	Multicast	Partition 10	74.112.226.123	**BOOK Stream**	**233.130.124.50**	**37010**
				Retransmission Response Stream	**233.130.124.51**	**37010**
	TCP			**Recovery Request Server**	**74.115.130.123**	**37110**
	TCP	Retransmission Request Server			74.115.130.113	37100

A.5 Multicast and Recovery Service Application Addresses – *EDGX*

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
A	Multicast	Partition 1	74.112.226.140	BOOK Stream	233.130.124.64	34001
				Retransmission Response Stream	233.130.124.65	34001
	TCP			Recovery Request Server	74.115.130.140	34101
	Multicast	Partition 2	74.112.226.141	BOOK Stream	233.130.124.66	34002
				Retransmission Response Stream	233.130.124.67	34002
	TCP			Recovery Request Server	74.115.130.141	34102
	Multicast	Partition 3	74.112.226.142	BOOK Stream	233.130.124.68	34003
				Retransmission Response Stream	233.130.124.69	34003
	TCP			Recovery Request Server	74.115.130.142	34103
	Multicast	Partition 4	74.112.226.143	BOOK Stream	233.130.124.70	34004
				Retransmission Response Stream	233.130.124.71	34004
	TCP			Recovery Request Server	74.115.130.143	34104
	Multicast	Partition 5	74.112.226.144	BOOK Stream	233.130.124.72	34005
				Retransmission Response Stream	233.130.124.73	34005
	TCP			Recovery Request Server	74.115.130.144	34105
	Multicast	Partition 6	74.112.226.145	BOOK Stream	233.130.124.74	34006
				Retransmission Response Stream	233.130.124.75	34006
	TCP			Recovery Request Server	74.115.130.145	34106
	Multicast	Partition 7	74.112.226.146	BOOK Stream	233.130.124.76	34007
				Retransmission Response Stream	233.130.124.77	34007
	TCP			Recovery Request Server	74.115.130.146	34107
	Multicast	Partition 8	74.112.226.147	BOOK Stream	233.130.124.78	34008
				Retransmission Response Stream	233.130.124.79	34008
	TCP			Recovery Request Server	74.115.130.147	34108
	Multicast	Partition 9	74.112.226.148	BOOK Stream	233.130.124.80	34009
				Retransmission Response Stream	233.130.124.81	34009
	TCP			Recovery Request Server	74.115.130.148	34109
	Multicast	Partition 10	74.112.226.149	BOOK Stream	233.130.124.82	34010
				Retransmission Response Stream	233.130.124.83	34010
	TCP			Recovery Request Server	74.115.130.149	34110
	TCP	Retransmission Request Server			74.115.130.139	34100

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
B	Multicast	Partition 1	74.112.226.204	BOOK Stream	233.130.124.96	35001
				Retransmission Response Stream	233.130.124.97	35001
	TCP			Recovery Request Server	74.115.130.204	35101
	Multicast	Partition 2	74.112.226.205	BOOK Stream	233.130.124.98	35002
				Retransmission Response Stream	233.130.124.99	35002
	TCP			Recovery Request Server	74.115.130.205	35102
	Multicast	Partition 3	74.112.226.206	BOOK Stream	233.130.124.100	35003
				Retransmission Response Stream	233.130.124.101	35003
	TCP			Recovery Request Server	74.115.130.206	35103
	Multicast	Partition 4	74.112.226.207	BOOK Stream	233.130.124.102	35004
				Retransmission Response Stream	233.130.124.103	35004
	TCP			Recovery Request Server	74.115.130.207	35104
	Multicast	Partition 5	74.112.226.208	BOOK Stream	233.130.124.104	35005
				Retransmission Response Stream	233.130.124.105	35005
	TCP			Recovery Request Server	74.115.130.208	35105
	Multicast	Partition 6	74.112.226.209	BOOK Stream	233.130.124.106	35006
				Retransmission Response Stream	233.130.124.107	35006
	TCP			Recovery Request Server	74.115.130.209	35106
	Multicast	Partition 7	74.112.226.210	BOOK Stream	233.130.124.108	35007
				Retransmission Response Stream	233.130.124.109	35007
	TCP			Recovery Request Server	74.115.130.210	35107
	Multicast	Partition 8	74.112.226.211	BOOK Stream	233.130.124.110	35008
				Retransmission Response Stream	233.130.124.111	35008
	TCP			Recovery Request Server	74.115.130.211	35108
	Multicast	Partition 9	74.112.226.212	BOOK Stream	233.130.124.112	35009
				Retransmission Response Stream	233.130.124.113	35009
	TCP			Recovery Request Server	74.115.130.212	35109
	Multicast	Partition 10	74.112.226.213	BOOK Stream	233.130.124.114	35010
				Retransmission Response Stream	233.130.124.115	35010
	TCP			Recovery Request Server	74.115.130.213	35110
	TCP	Retransmission Request Server			74.115.130.203	35100

A.6 CERMAK The following information pertains to the CERMAK Disaster Recovery Facility.

A.61 Multicast Rendezvous Point

EDGA A Feed: 74.115.128.81
EDGA B Feed: 74.115.128.82

EDGX A Feed: 74.115.128.83
EDGX B Feed: 74.115.128.84

NOTE: There are no member test facilities at this site.

A.6 Multicast and Recovery Service Application Addresses – *EDGA, A*

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
A	Multicast	Partition 1	74.115.131.7	BOOK Stream	233.209.92.129	36001
				Retransmission Response Stream	233.209.92.130	36001
	TCP			Recovery Request Server	74.115.131.135	36101
	Multicast	Partition 2	74.115.131.8	BOOK Stream	233.209.92.131	36002
				Retransmission Response Stream	233.209.92.132	36002
	TCP			Recovery Request Server	74.115.131.136	36102
	Multicast	Partition 3	74.115.131.9	BOOK Stream	233.209.92.133	36003
				Retransmission Response Stream	233.209.92.134	36003
	TCP			Recovery Request Server	74.115.131.137	36103
	Multicast	Partition 4	74.115.131.10	BOOK Stream	233.209.92.135	36004
				Retransmission Response Stream	233.209.92.136	36004
	TCP			Recovery Request Server	74.115.131.138	36104
	Multicast	Partition 5	74.115.131.11	BOOK Stream	233.209.92.137	36005
				Retransmission Response Stream	233.209.92.138	36005
	TCP			Recovery Request Server	74.115.131.139	36105
	Multicast	Partition 6	74.115.131.12	BOOK Stream	233.209.92.139	36006
				Retransmission Response Stream	233.209.92.140	36006
	TCP			Recovery Request Server	74.115.131.140	36106

		Partition 7	74.115.131.13	**BOOK Stream**	**233.209.92.141**	**36007**
	Multicast			**Retransmission Response Stream**	**233.209.92.142**	**36007**
	TCP			**Recovery Request Server**	**74.115.131.141**	**36107**
		Partition 8	74.115.131.14	**BOOK Stream**	**233.209.92.143**	**36008**
	Multicast			**Retransmission Response Stream**	**233.209.92.144**	**36008**
	TCP			**Recovery Request Server**	**74.115.131.142**	**36108**
		Partition 9	74.115.131.15	**BOOK Stream**	**233.209.92.145**	**36009**
	Multicast			**Retransmission Response Stream**	**233.209.92.146**	**36009**
	TCP			**Recovery Request Server**	**74.115.131.143**	**36109**
		Partition 10	74.115.131.16	**BOOK Stream**	**233.209.92.147**	**36010**
	Multicast			**Retransmission Response Stream**	**233.209.92.148**	**36010**
	TCP			**Recovery Request Server**	**74.115.131.144**	**36110**
	TCP	Retransmission Request Server			**74.115.131.145**	**36100**

Multicast and Recovery Service Application Addresses – *EDGA, B*

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
B		Partition 1	74.115.131.39	**BOOK Stream**	**233.209.92.161**	**37001**
	Multicast			**Retransmission Response Stream**	**233.209.92.162**	**37001**
	TCP			**Recovery Request Server**	**74.115.131.167**	**37101**
		Partition 2	74.115.131.40	**BOOK Stream**	**233.209.92.163**	**37002**
	Multicast			**Retransmission Response Stream**	**233.209.92.164**	**37002**
	TCP			**Recovery Request Server**	**74.115.131.168**	**37102**
		Partition 3	74.115.131.41	**BOOK Stream**	**233.209.92.165**	**37003**
	Multicast			**Retransmission Response Stream**	**233.209.92.166**	**37003**
	TCP			**Recovery Request Server**	**74.115.131.169**	**37103**
		Partition 4	74.115.131.42	**BOOK Stream**	**233.209.92.167**	**37004**
	Multicast			**Retransmission Response Stream**	**233.209.92.168**	**37004**
	TCP			**Recovery Request Server**	**74.115.131.170**	**37104**
		Partition 5	74.115.131.43	**BOOK Stream**	**233.209.92.169**	**37005**
	Multicast			**Retransmission Response Stream**	**233.209.92.170**	**37005**
	TCP			**Recovery Request Server**	**74.115.131.171**	**37105**
		Partition 6	74.115.131.44	**BOOK Stream**	**233.209.92.171**	**37006**
	Multicast			**Retransmission Response Stream**	**233.209.92.172**	**37006**
	TCP			**Recovery Request Server**	**74.115.131.172**	**37106**
		Partition 7	74.115.131.45	**BOOK Stream**	**233.209.92.173**	**37007**
	Multicast			**Retransmission Response Stream**	**233.209.92.174**	**37007**
	TCP			**Recovery Request Server**	**74.115.131.173**	**37107**
		Partition 8	74.115.131.46	**BOOK Stream**	**233.209.92.175**	**37008**
	Multicast			**Retransmission Response Stream**	**233.209.92.176**	**37008**
	TCP			**Recovery Request Server**	**74.115.131.174**	**37108**
		Partition 9	74.115.131.47	**BOOK Stream**	**233.209.92.177**	**37009**
	Multicast			**Retransmission Response Stream**	**233.209.92.178**	**37009**
	TCP			**Recovery Request Server**	**74.115.131.175**	**37109**
		Partition 10	74.115.131.48	**BOOK Stream**	**233.209.92.179**	**37010**
	Multicast			**Retransmission Response Stream**	**233.209.92.180**	**37010**

	TCP			Recovery Request Server	74.115.131.176	37110
	TCP	Retransmission Request Server			74.115.131.177	37100

Multicast and Recovery Service Application Addresses – *EDGX, A*

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
A		Partition 1	74.115.131.71	**BOOK Stream**	**233.209.92.193**	**34001**
	Multicast			**Retransmission Response Stream**	**233.209.92.194**	**34001**
	TCP			**Recovery Request Server**	**74.115.131.199**	**34101**
		Partition 2	74.115.131.72	**BOOK Stream**	**233.209.92.195**	**34002**
	Multicast			**Retransmission Response Stream**	**233.209.92.196**	**34002**
	TCP			**Recovery Request Server**	**74.115.131.200**	**34102**
		Partition 3	74.115.131.73	**BOOK Stream**	**233.209.92.197**	**34003**
	Multicast			**Retransmission Response Stream**	**233.209.92.198**	**34003**
	TCP			**Recovery Request Server**	**74.115.131.201**	**34103**
		Partition 4	74.115.131.74	**BOOK Stream**	**233.209.92.199**	**34004**
	Multicast			**Retransmission Response Stream**	**233.209.92.200**	**34004**
	TCP			**Recovery Request Server**	**74.115.131.202**	**34104**
		Partition 5	74.115.131.75	**BOOK Stream**	**233.209.92.201**	**34005**
	Multicast			**Retransmission Response Stream**	**233.209.92.202**	**34005**
	TCP			**Recovery Request Server**	**74.115.131.203**	**34105**
		Partition 6	74.115.131.76	**BOOK Stream**	**233.209.92.203**	**34006**
	Multicast			**Retransmission Response Stream**	**233.209.92.204**	**34006**
	TCP			**Recovery Request Server**	**74.115.131.204**	**34106**
		Partition 7	74.115.131.77	**BOOK Stream**	**233.209.92.205**	**34007**
	Multicast			**Retransmission Response Stream**	**233.209.92.206**	**34007**
	TCP			**Recovery Request Server**	**74.115.131.205**	**34107**
		Partition 8	74.115.131.78	**BOOK Stream**	**233.209.92.207**	**34008**
	Multicast			**Retransmission Response Stream**	**233.209.92.208**	**34008**
	TCP			**Recovery Request Server**	**74.115.131.206**	**34108**
		Partition 9	74.115.131.79	**BOOK Stream**	**233.209.92.209**	**34009**
	Multicast			**Retransmission Response Stream**	**233.209.92.210**	**34009**
	TCP			**Recovery Request Server**	**74.115.131.207**	**34109**
	Multicast	Partition 10	74.115.131.80	**BOOK Stream**	**233.209.92.211**	**34010**

				Retransmission Response Stream	**233.209.92.212**	**34010**
	TCP			**Recovery Request Server**	**74.115.131.208**	**34110**
	TCP	Retransmission Request Server			**74.115.131.209**	**34100**

Multicast and Recovery Service Application Addresses ***EDGX, B***

INSTANCE	Protocol	Source	Source IP	Description	Address	Port
B	Multicast	Partition 1	74.115.131.103	BOOK Stream	233.209.92.225	35001
	Multicast			Retransmission Response Stream	233.209.92.226	35001
	TCP			Recovery Request Server	74.115.131.231	35101
	Multicast	Partition 2	74.115.131.104	BOOK Stream	233.209.92.227	35002
	Multicast			Retransmission Response Stream	233.209.92.228	35002
	TCP			Recovery Request Server	74.115.131.232	35102
	Multicast	Partition 3	74.115.131.105	BOOK Stream	233.209.92.229	35003
	Multicast			Retransmission Response Stream	233.209.92.230	35003
	TCP			Recovery Request Server	74.115.131.233	35103
	Multicast	Partition 4	74.115.131.106	BOOK Stream	233.209.92.231	35004
	Multicast			Retransmission Response Stream	233.209.92.232	35004
	TCP			Recovery Request Server	74.115.131.234	35104
	Multicast	Partition 5	74.115.131.107	BOOK Stream	233.209.92.233	35005
	Multicast			Retransmission Response Stream	233.209.92.234	35005
	TCP			Recovery Request Server	74.115.131.235	35105
	Multicast	Partition 6	74.115.131.108	BOOK Stream	233.209.92.235	35006
	Multicast			Retransmission Response Stream	233.209.92.236	35006
	TCP			Recovery Request Server	74.115.131.236	35106
	Multicast	Partition 7	74.115.131.109	BOOK Stream	233.209.92.237	35007
	Multicast			Retransmission Response Stream	233.209.92.238	35007
	TCP			Recovery Request Server	74.115.131.237	35107
	Multicast	Partition 8	74.115.131.110	BOOK Stream	233.209.92.239	35008
	Multicast			Retransmission Response Stream	233.209.92.240	35008
	TCP			Recovery Request Server	74.115.131.238	35108
	Multicast	Partition 9	74.115.131.111	BOOK Stream	233.209.92.241	35009
	Multicast			Retransmission Response Stream	233.209.92.242	35009
	TCP			Recovery Request Server	74.115.131.239	35109
	Multicast	Partition 10	74.115.131.112	BOOK Stream	233.209.92.243	35010
	Multicast			Retransmission Response Stream	233.209.92.244	35010
	TCP			Recovery Request Server	74.115.131.240	35110
	TCP	Retransmission Request Server			74.115.131.241	35100

Appendix B. Examples

B.1 Depth of Book Multicast Examples

This example describes a sequence of depth of book messages from Direct Edge to members.

B.1.1 Timestamp Message

```
12 00 01 01   01 00 00 00
0A 20 98 C0   3D 4B 00 00
00 00
```

Common Session Message

Field	Value
Length	12 00
Messages	01
Partition	01
Sequence	01 00 00 00
Payload	(remainder of message)

Payload Message 1 – Timestamp Message

Field	Value	Remarks
Message Length	0A	10 bytes
Message Type	20	Timestamp Message
Timestamp	98 C0 3D 4B 00 00 00 00	Jan 1, 2010 9:30:00 AM

B.1.2 Add Order Message (Long Form)

```
2A 00 01 01   02 00 00 00
22 21 40 42   0F 00 01 00
00 00 00 00   00 00 42 A0
86 01 00 5A   58 5A 5A 54
20 00 2D 31   01 00 00 00
00 01
```

Common Session Message

Field	Value
Length	2A 00
Messages	01
Partition	01
Sequence	02 00 00 00
Payload	(remainder of message)

Payload Message 1 – Add Order Message (Long Form)

Field	Value	Remarks
Message Length	22	34 bytes
Message Type	21	Add Order Message (Long Form)
Timestamp	40 42 0F 00	9:30:00.001000000 AM
Order Reference Number	01 00 00 00 00 00 00 00	Order #1

Side	42	Buy
Quantity	A0 86 01 00	100,000 shares
Security	5A 58 5A 5A 54 20	ZXZZT
Price	00 2D 31 01 00 00 00 00	$2000.0000
Flags	01	DisplayFlag=true, ReplenishFlag=false

B.1.3 Add Order Message (Short Form)

```
22 00 01 01   03 00 00 00
1A 22 28 46   0F 00 02 00
00 00 00 00   00 00 42 C8
00 5A 56 5A   5A 54 20 60
EA 01
```

Common Session Message

Field	Value
Length	22 00
Messages	01
Partition	01
Sequence	03 00 00 00
Payload	(remainder of message)

Payload Message 1 – Add Order Message (Short Form)

Field	Value	Remarks
Message Length	1A	26 bytes
Message Type	22	Add Order Message (short form)
Timestamp	28 46 0F 00	9:30:00.001001000 AM
Order Reference Number	02 00 00 00 00 00 00 00	Order #2
Side	42	Buy
Quantity	C8 00	200 shares
Security	5A 56 5A 5A 54 20	ZVZZT
Price	60 EA	$600.00
Flags	01	DisplayFlag=true, ReplenishFlag=false

B.1.4 Add Order Message (Extended Form)

```
2C 00 01 01          04 00 00 00
24 2F 8C 46          0F 00 64 00
00 00 00 00          00 00 53 F4
01 00 00 41          42 43 44 45
2E 41 20 00          71 02 00 00
00 00 00 01
```

Common Session Message

Field	Value
Length	2C 00
Messages	01

Partition	01
Sequence	04 00 00 00
Payload	(remainder of message)

Payload Message 1 – Add Order Message (Extended Form)

Field	Value	Remarks
Message Length	24	36 bytes
Message Type	2F	Add Order Extended
Timestamp	8C 46 0F 00	09:30:00.001001100 AM
Order Reference Number	64 00 00 00 00 00 00 00	Order #
Side	53	Sell
Quantity	F4 01 00 00	500 shares
Security	41 42 43 44 45 2E 41 20	ABCDE.A
Price	00 71 02 00 00 00 00 00	$16.0000
Flags	01	DisplayFlag=true ReplenishFlag=false

B 1.5 Add Order Message (with Attribution)

```
30 00 01 01          04 00 00 00
30 34 8C 46          0F 00 64 00
00 00 00 00          00 00 53 F4
01 00 00 41          42 43 44 45
2E 41 20 00          71 02 00 00
00 00 00 01          41 42 43 44
```

Common Session Message

Field	Value
Length	30 00
Messages	01
Partition	01
Sequence	04 00 00 00
Payload	(remainder of message)

Payload Message 1 – Add Order Message (with Attribution)

Field	Value	Remarks
Message Length	30	48 bytes
Message Type	34	Add Order with Attribution
Timestamp	8C 46 0F 00	09:30:00.001001100AM
Order Reference Number	64 00 00 00 00 00 00 00	Order #
Side	53	Sell
Quantity	F4 01 00 00	500 shares
Security	41 42 43 44 45 2E 41 20	ABCDE.A
Price	00 71 02 00 00 00 00 00	$16.0000

Flags	09	DisplayFlag = true ReplenishFlag = false AttributedFlag = true
Participant ID	41 42 43 44	ABCD (MMID)

B.1.6 Order Executed Message + Order Replenishment

```
3C 00 02 01   04 00 00 00
1A 23 10 4A   0F 00 02 00
00 00 00 00   00 00 C8 00
00 00 01 00   00 00 00 00
00 00 1A 22   10 4A 0F 00
02 00 00 00   00 00 00 00
42 C8 00 5A   56 5A 5A 54
20 60 EA 05
```

Common Session Message

Field	Value
Length	3C 00
Messages	02
Partition	01
Sequence	04 00 00 00
Payload	(remainder of message)

Payload Message 1 – Order Executed

Field	Value	Remarks
Message Length	1A	26 bytes
Message Type	23	Order Executed Message
Timestamp	10 4A 0F 00	9:30:00.001002000 AM
Order Reference Number	02 00 00 00 00 00 00 00	Order #2
Execution Quantity	C8 00 00 00	200 shares
Execution Reference Number	01 00 00 00 00 00 00 00	Execution #2

Payload Message 2 – Add Order Message (Short Form)

Field	Value	Remarks
Message Length	1A	26 bytes
Message Type	22	Add Order Message (Short Form)
Timestamp	10 4A 0F 00	9:30:00.001002000 AM
Order Reference Number	02 00 00 00 00 00 00 00	Order #2
Side	42	Buy
Quantity	C8 00	200 shares
Security	5A 56 5A 5A 54 20	ZVZZT
Price	60 EA	$600.00
Flags	05	DisplayFlag=true, ReplenishFlag=true

B.1.7 Order Executed At Message

```
2E 00 01 01   06 00 00 00
26 24 F8 4D   0F 00 01 00
00 00 00 00   00 00 C8 00
00 00 D8 85   01 00 02 00
00 00 00 00   00 00 10 54
31 01 00 00   00 00
```

Common Session Message

Field	Value
Length	2E 00
Messages	01
Partition	01
Sequence	06 00 00 00
Payload	(remainder of message)

Payload Message 1 – Order Executed At Message

Field	Value	Remarks
Message Length	26	38 bytes
Message Type	24	Order Executed At Message
Timestamp	F8 4D 0F 00	9:30:00.001003000 AM
Order Reference Number	01 00 00 00 00 00 00 00	Order #1
Quantity	C8 00 00 00	200 shares
Remaining Shares	D8 85 01 00	99,800 shares
Execution Reference Number	02 00 00 00 00 00 00 00	Execution #2
Execution Price	10 54 31 00 00 00 00	$2001.0000

B.1.8 Order Modified Message (Long Form)

```
23 00 01 01   09 00 00 00
1B 27 B0 59   0F 00 01 00
00 00 00 00   00 00 10 27
00 00 F0 05   31 01 00 00
00 00 00
```

Common Session Message

Field	Value
Length	23 00
Messages	01
Partition	01
Sequence	09 00 00 00

Payload	(remainder of message)

Payload Message 1 – Order Modified Message (Long Form)

Field	Value	Remarks
Message Length	1B	27 bytes
Message Type	27	Order Modified Message (Long Form)
Timestamp	B0 59 0F 00	9:30:00.001006000
Order Reference Number	01 00 00 00 00 00 00 00	Order #1
Quantity	10 27 00 00	10,000 shares
Price	F0 05 31 01 00 00 00 00	$1999.0000
Flags	00	PriorityFlag=false

B.1.9 Order Modified Message (Short Form)

```
1B 00 01 01   0A 00 00 00
13 28 98 5D   0F 00 02 00
00 00 00 00   00 00 C8 00
FC E9 00
```

Common Session Message

Field	Value
Length	1B 00
Messages	01
Partition	01
Sequence	0A 00 00 00
Payload	(remainder of message)

Payload Message 1 – Order Modified Message (Short Form)

Field	Value	Remarks
Message Length	13	19 bytes
Message Type	28	Order Modified Message (Short Form)
Timestamp	98 5D 0F 00	9:30:00.001007000 AM
Order Reference Number	02 00 00 00 00 00 00 00	Order #2
Quantity	C8 00	200 shares
Price	FC E9	$599.00
Flags	00	PriorityFlag=false

B.1.10 Order Canceled Message

```
16 00 01 01   0B 00 00 00
0E 29 80 61   0F 00 02 00
00 00 00 00   00 00
```

Common Session Message

Field	Value
Length	16 00

Messages	01
Partition	01
Sequence	0B 00 00 00
Payload	(remainder of message)

Payload Message 1 – Order Canceled Message

Field	Value	Remarks
Message Length	0E	14 bytes
Message Type	29	Order Canceled Message
Timestamp	80 61 0F 00	9:30:00.001008000 AM
Order Reference Number	02 00 00 00 00 00 00 00	Order #2

B.1.11 Trade Message (Long Form)

```
31 00 01 01   0C 00 00 00
29 2A 68 65   0F 00 03 00
00 00 00 00   00 00 53 70
11 01 00 5A   57 5A 5A 54
20 C0 EA 21   01 00 00 00
00 03 00 00   00 00 00 00
00
```

Common Session Message

Field	Value
Length	31 00
Messages	01
Partition	01
Sequence	0C 00 00 00
Payload	(remainder of message)

Payload Message 1 – Trade Message (Long Form)

Field	Value	Remarks
Message Length	29	41 bytes
Message Type	2A	Trade Message (Long Form)
Timestamp	68 65 0F 00	9:30:00.001009000 AM
Order Reference Number	03 00 00 00 00 00 00 00	Order #3
Side	53	Sell
Quantity	70 11 01 00	70,000 shares
Security	5A 57 5A 5A 54 20	ZWZZT
Price	C0 EA 21 01 00 00 00 00	$1900.0000
Execution Reference Number	03 00 00 00 00 00 00 00	Execution #3

B.1.12 Trade Message (Short Form)

```
29 00 01 01   0D 00 00 00
21 2B 50 69   0F 00 04 00
00 00 00 00   00 00 42 D0
07 5A 57 5A   5A 54 20 50
C3 04 00 00   00 00 00 00
00
```

Common Session Message

Field	Value
Length	29 00
Messages	01
Partition	01
Sequence	0D 00 00 00
Payload	(remainder of message)

Payload Message 1 – Trade Message (Short Form)

Field	Value	Remarks
Message Length	21	33 bytes
Message Type	2B	Trade Message (Short Form)
Timestamp	50 69 0F 00	9:30:00.001010000 AM
Order Reference Number	04 00 00 00 00 00 00 00	Order #4
Side	42	Buy
Quantity	D0 07	2000 shares
Security	5A 57 5A 5A 54 20	ZWZZT
Price	50 C3	$500.00
Execution Reference Number	04 00 00 00 00 00 00 00	Execution #4

B.1.13 Trade Message (Extended Form)

```
33 00 01 01          0F 00 00 00
2B 30 B4 69          0F 00 C8 00
00 00 00 00          00 00 48 80
38 01 00 41          42 43 44 45
2E 41 20 F0          49 02 00 00
00 00 00 14          00 00 00 00
00 00 00
```

Common Session Message

Field	Value
Length	33 00
Messages	01
Partition	01
Sequence	0F 00 00 00
Payload	(remainder of message)

Payload Message 1 – Trade Message (Extended Form)

Field	Value	Remarks
Message Length	2B	43 bytes
Message Type	30	Trade Message (Extended Form)
Timestamp	B4 69 0F 00	09:30:00.001010100
Order Reference Number	C8 00 00 00 00 00 00 00	200
Side	48	Hidden
Quantity	80 38 01 00	80,000 shares
Security	41 42 43 44 45 2E 41 20	ABCDE.A
Price	F0 49 02 00 00 00 00 00	$15.0000
Execution Reference Number	14 00 00 00 00 00 00 00	20

Quantity	80 38 01 00	80,000 shares
Security	41 42 43 44 45 2E 41 20	ABCDE.A
Price	F0 49 02 00 00 00 00 00	$15.0000
Execution Reference Number	14 00 00 00 00 00 00 00	20

B.1.14 Trade Break Message

```
16 00 01 01    0E 00 00 00
0E 2C 38 6D    0F 00 01 00
00 00 00 00    00 00
```

Common Session Message

Field	Value
Length	16 00
Messages	01
Partition	01
Sequence	0E 00 00 00
Payload	(remainder of message)

Payload Message 1 – Trade Break Message

Field	Value	Remarks
Message Length	0E	14 bytes
Message Type	2C	Trade Break Message
Timestamp	28 6D 0F 00	9:30:00.001011000 AM
Execution Reference Number	01 00 00 00 00 00 00 00	Execution #1

B.1.15 Security Status Message

```
1D 00 01 01          11 00 00 00
15 2E 20 71          0F 00 5A 58
5A 5A 54 20         20 20 43 01
64 43 02 48          00
```

Common Session Message

Field	Value
Length	1D 00
Messages	01
Partition	01
Sequence	11 00 00 00
Payload	(remainder of message)

Payload Message 1 – Security Status Message

Field	Value	Remarks
Message Length	15	21 bytes
Message Type	2E	Security Status Message
Timestamp	20 71 0F 00	09:30:00.001012000 AM
Security Name	5A 58 5A 5A 54 20 20 20	ZXZZT
Issue Type	43	Common Shares
Minimum Order Quantity	01	1 share
Round Lot Quantity	64	100 shares
Tape Type	43	Tape C
Orderbook Number	02	Orderbook 02
Security Status	48	Security is Halted
Flags	00	WhenIssuedFlag=false

B.1.16 End of Session Message

```
0A 00 01 01   11 00 00 00
02 2D
```

Common Session Message

Field	Value
Length	0A 00
Messages	01
Partition	01
Sequence	11 00 00 00
Payload	(remainder of message)

Payload Message 1 – End of Session Message

Field	Value	Remarks
Message Length	02	2 bytes
Message Type	2D	End of Session Message

B.2 Message Retransmission Service Examples

B.2.1 Login Request Message

```
1E 00 01 01   00 00 00 00
16 01 00 00   00 00 55 53
45 52 30 31   70 61 73 73
77 6F 72 64   20 20
```

Common Session Message

Field	Value
Length	1E 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Login Request Message

Field	Value	Remarks
Message Length	16	22 bytes
Message Type	01	Login Request Message
Session	00 00 00 00	Unused
Login	55 53 45 52 30 31	“USER01” – Supplied by Direct Edge
Password	70 61 73 73 77 6F 72 64 20 20	“password” – Supplied by Direct Edge

B.2.2 Login Response Message

```
0B 00 01 01   00 00 00 00
03 02 41
```

Common Session Message

Field	Value
Length	0B 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Login Response Message

Field	Value	Remarks
Message Length	03	3 bytes
Message Type	02	Login Response Message
Response Code	41	Login Accepted

B.2.3 Retransmission Request Message

```
11 00 01 01   00 00 00 00
09 03 01 06   00 00 00 02
00
```

Common Session Message

Field	Value
Length	11 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Retransmission Request Message

Field	Value	Remarks
Message Length	09	9 bytes
Message Type	03	Retransmission Request Message
Partition	01	Partition 0x01
Sequence	06 00 00 00	6
Count	02 00	2

B.2.4 Retransmission Response Message

```
12 00 01 01   00 00 00 00
0A 04 01 06   00 00 00 02
00 41
```

Common Session Message

Field	Value
Length	12 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Retransmission Response Message

Field	Value	Remarks
Message Length	0A	10 bytes
Message Type	04	Retransmission Response Message
Partition	01	Partition 0x01
Sequence	06 00 00 00	6
Count	02 00	2
Response Code	41	Retransmission Accepted

B.2.5 Retransmitted Multicast Message

```
40 00 02 01   06 00 00 00
26 24 F8 4D   0F 00 01 00
00 00 00 00   00 00 C8 00
00 00 D8 85   01 00 02 00
00 00 00 00   00 00 10 54
31 01 00 00   00 00 12 25
E0 51 0F 00   01 00 00 00
00 00 00 00   C8 5E 01 00
```

Common Session Message

Field	Value
Length	40 00
Messages	02
Partition	01
Sequence	06 00 00 00
Payload	(remainder of message)

Payload Message 1 – Order Executed At Message

Field	Value	Remarks
Message Length	26	38 bytes
Message Type	24	Order Executed At Message
Timestamp	F8 4D 0F 00	9:30:00.001003000 AM
Order Reference Number	01 00 00 00 00 00 00 00	Order #1
Quantity	C8 00 00 00	200 shares
Remaining Shares	D8 85 01 00	99,800 shares
Execution Reference Number	02 00 00 00 00 00 00 00	Execution #2
Execution Price	10 54 31 00 00 00 00	$2001.0000

B.2.6 Logout Request Message

```
0A 00 01 01   00 00 00 00
02 05
```

Common Session Message

Field	Value
Length	0A 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Logout Request Message

Field	Value	Remarks
Message Length	02	2 bytes
Message Type	05	Logout Request Message

B.3 Recovery Service Examples

B.3.1 Login Request Message

```
1E 00 01 01   00 00 00 00
16 01 00 00   00 00 55 53
45 52 30 32   70 61 73 73
77 6F 72 64   20 20
```

Common Session Message

Field	Value
Length	1E 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Login Request Message

Field	Value	Remarks
Message Length	16	22 bytes
Message Type	01	Login Request Message
Session	00 00 00 00	Unused
Login	55 53 45 52 30 32	“USER02” – Assigned by Direct Edge
Password	70 61 73 73 77 6F 72 64 20 20	“password” – assigned by Direct Edge

B.3.2 Login Response Message

```
0B 00 01 01   00 00 00 00
03 02 41
```

Common Session Message

Field	Value
Length	0B 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Login Response Message

Field	Value	Remarks
Message Length	03	3 bytes
Message Type	02	Login Response Message
Response Code	41	Login Accepted

B.3.3 Snapshot Request Message

```
08 00 01 01   00 00 00 00
06 84 04 00   00 00
```

Common Session Message

Field	Value
Length	08 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Snapshot Request Message

Field	Value	Remarks
Message Length	06	6 bytes
Message Type	84	Snapshot Request Message
Minimum Sequence Number	04 00 00 00	4

B.3.4 Snapshot Response Message

```
13 00 01 01   00 00 00 00
0B 82 0A 00   00 00 01 00
00 00 41
```

Common Session Message

Field	Value
Length	13 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Snapshot Response Message

Field	Value	Remarks
Message Length	0B	11 bytes
Message Type	82	Snapshot Response Message
Snapshot Sequence	0A 00 00 00	Snapshot is current through sequence number 10
Order Count	01 00 00 00	1 order
Status	41	Snapshot request accepted

B.3.5 Add Order Message

```
2C 00 01 01   00 00 00 00
0A 20 98 C0   3D 4B 00 00
00 00 1A 22   98 5D 0F 00
02 00 00 00   00 00 00 00
42 C8 00 5A   56 5A 5A 54
20 FC E9 01
```

Common Session Message

Field	Value
Length	2C 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Add Order Message (Short Form)

Field	Value	Remarks
Message Length	1A	26 bytes
Message Type	22	Add Order Message (short form)
Timestamp	01 00 00 00	Sequenced message beginning with 01 and increasing with blank timestamp
Order Reference Number	02 00 00 00 00 00 00 00	Order #2
Side	42	Buy
Quantity	C8 00	200 shares
Security	5A 56 5A 5A 54 20	ZVZZT
Price	FC E9	$599.00
Flags	01	DisplayFlag=true, ReplenishFlag=false

B.3.6 Snapshot Complete Message

```
0E 00 01 01   00 00 00 00
06 83 0A 00   00 00
```

Common Session Message

Field	Value
Length	0E 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Snapshot Complete Message

Field	Value	Remarks
Message Length	06	6 bytes
Message Type	83	Snapshot Complete Message
Sequence	0A 00 00 00	Shapshot is current through sequence number 10.

B.3.7 Logout Request Message

```
0A 00 01 01   00 00 00 00
02 05
```

Common Session Message

Field	Value
Length	0A 00
Messages	01
Partition	01
Sequence	00 00 00 00
Payload	(remainder of message)

Payload Message 1 – Logout Request Message

Field	Value	Remarks
Message Length	02	2 bytes
Message Type	05	Logout Request Message

C. Revision History

Date	Version	Remarks
2009-08-15	0.3.0	Initial Publication
2009-08-27	0.4.0	Re-worked retransmission mechanism to use two Message Retransmission Servers per exchange, rather than two per Book Partition. Messages Changed: o Common Session Message (2.2.1) o Retransmission Request Message (4.3.2) o Retransmission Response Message (4.4.2) Text in sections 1 & 2 significantly reworked.
2009-09-01	0.4.1	Typo / Notation Improvement: o Typo in 3.1.3 message type table: Long / Short Forms of Trade Message were reversed. o Notation Change in Security Status Message: "Matching Partition" becomes "Orderbook" to avoid confusion with "Book Partition".
2009-09-01	0.4.2	Added Change Log
2009-09-09	0.4.3	Typos / Notation: o Fixed section numbering in 5.5.1 o Changed "Snapshot End" to "Snapshot Complete" in 5.5.1. o Added "Security Status" field to Security Status Message (3.2.11) o Fixed incorrect remark regarding length of Security Status Message (3.2.11)
2009-09-11	0.5.0	Began filling in examples section (B.1.*).
2009-09-16	0.5.1	Finished Book Examples section (B.1.*). Added rejection codes for Retransmission Response (4.4.2.1).
2009-09-16	0.5.2	Added Issue Types (3.2.11.1): o ETF o ADR Typos / Notation: o Updated terminology in 3.1.2. o Fixed example error: B.1.4
2009-09-28	0.9.0	Finished Examples Section. Increased Version number to 0.9 to indicate "release-candidate" spec. Removed networking information.
2010-01-13	0.9.1	Added extended forms of Add Order and Trade Messages (3.2.2, 3.2.8). Changed message type values for System Status Message to accommodate new message types (3.2.12). Typos / Notation: o Cleaned up introduction to Message Retransmission Service (4.1)
2010-02-18	0.9.2	1. Added "H" as universal Side indicator regardless of side of actual execution for Trade messages 2. Changed "Security Status" message to expand character length for Security name field to support imminent NYSE 5 character Symbol root feature. 3. Added all Connectivity info for members to Member Test and Production
2010-05-28	0.9.3	1. Changed Member Test IP Address info

2010-06-09	0.9.4	1. Added Production Partition Information
2011-01-24	0.9.5	1. Section 3.2.11.3 Table of Security Status Flags: Added Short Sale Restriction. Security is either trading with or without Short Sale Restrictions. 2. Trade Message: Added 0X48 ('H') Resting order side was undisclosed.
2011-02-22	0.9.6	TELX multicast addresses included in Section A.6
2011-04-20	0.9.7	A replenished reserve order may be represented on the book feed with a randomly-generated Order Reference Number Section 3.1.2.
2011-06-16	0.9.8	Appendix A. Partitioning and Networking A.1 Partition Information has been updated to reflect order book rebalancing for EDGX. System Status Message Removed….Not supported on multicast feed.
2011-06-29	0.9.8a	Appendix A. Partitioning and Networking A.1 Partition Information has been updated to reflect order book re-balancing for EDGA.
2011-12-07 2011-12-22	0.9.9	Example, page 51, B.3.5 Timestamp Message/Add Order Message Timestamp not populated on Add Order Message; remark updated to show (blank) Updated references in table 2.1.3 to show proper Section numbers and removed reference to System Status Message. (Message format was removed in 0.9.8.)
2012-03-28	Not distributed	Updated the reference for add order flag values to 2.2.2.1. Updated the reference for modify order flag values to 2.2.6.1
2012-06-19	1.0	**Revision Number updated to reflect New Add Order format.** 2.1.3 Table of Messages updated to include Add Order Message (with Attribution , Value = 0X34) 2.2.2.1 Flag value of 3 is added to Order flags table to convey Attribution 2.2.2 Add Order Message with Attribution introduced. Noted that attributed orders will appear on the feed twice while unattributed orders will only appear once. 3.4.2 Retransmission Response Message: Noted that the Response message does not change but the payload will include both attributed and non-attributed messages. 4.2.2 Noted that Snapshot Request message does not change. 4.3.2 Noted that Snapshot Response message does not change. However, the payload will be a combination of attributed and non-attributed orders for subscribers to Edge Book Attributed but only non-attributed orders for those not subscribed. Recovery ports must be configured for attribution. Members are directed to www.directedge.com/Connect. Appendix B. 1) Example for Add Order Message with Attribution inserted as B.1.5 and subsequent messages were re-numbered.

		2) Removed System Status Message B1.17. 3) Removed timestamp message from B 3.5.
2012-07-20	1.1	Appendix A Section A. 2. New Rendezvous Points are added for EDGA with their respective activation dates.
2012-09 - 10	1.1.1	Section 2.2: Removed Order Reduced Message as it is not deployed in Production. Other sections have been renumbered to reflect the removal of Order Reduced Message (originally 2.2.5) Updated the Order Modified Message to include both quantity increases and decreases and their respective impact on execution priority. Appendix A: Section 2: Updated Rendezvous Point information to reflect the successful separation of EDGA and EDGX. Appendix B: Removed examples of Order Reduced Messages and re-numbered the following examples.
2013-01-31	1.1.2	Section 2.2.2 Removed this line from Market Participant ID field description in the Add Order with Attributed Message. "Blank for non-attributed orders."
2013-03-19	1.1.3	Removed Side elements Buy (B) and Sell (S) from Trade Message. The Trade Message is used to convey a hidden trade so it will not reflect side. It will always be "H". The short, long and extended messages were all updated to reflect this change. 0X42 ('B') Resting order was a bid. 0X53 ('S') Resting order was an offer.
2013-03-26	1.1.4	Table of Message Types 2.1.3 was modified. Removed references to Order Reduced Messages (0X25 and 0 X 26) B.2.5 Retransmitted Multicast Message Removed Payload Message 2-Order Reduced (Long Form)
2013-05-15	1.1.5	Updated references in Section 2.1.3 to reflect proper Section numbers.2.2.5-2.2.10
2013-08-15 2013-08-27	1.1.6	Updated Appendix A Section A.6 replacing TELX with CERMAK Updated the description for 2.2.7. The Trade Message conveys hidden order executions therefore the resting side is always "Hidden" to preserve the order's characteristics. Removed B and S as alternatives.
2013-10-02	1.1.7	Added Note to 2.2.10.2 to describe the "SPIN" behavior.