OTC Markets Multicast Data Feeds

Technical Specification

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1. Introduction

1.1 Overview

This document provides a technical specification of OTC Market Group's new real-time multicast market data products. Each product provides access to a set of multicast channels carrying quote, trade and security reference data.

Each channel's data is published in duplicate on two separate multicast addresses, feed A and feed B, for high availability. Subscribers can request gap-fills or snapshots over a TCP socket-based connection.

Please visit http://www.otcmarkets.com/traders-brokers/realtime-data/overview for more information about these products, and for the latest version of this document.

1.2 Multicast Products

OTC Markets Group currently offers three real-time multicast Market Data products. All our price data is available in real-time.

- **Real-Time Reference Prices:** Real-time OTC Link inside quote prices (bid & offer). Quote size information is not available. The license also includes access to real-time OTC Link trade data. The innovative RTR Price license allows our market data distributors to provide this data free to their public websites and market data terminal users that want to monitor real-time OTC market prices. There is no cost to distributors of our premium products. There is a small monthly fee for websites and financial portals that do not re-sell our premium market data.
- **Real-Time Level 1+:** Real-time OTC Link price levels (bid & offer) and real-time OTC Link Trade information. Clients can access just the top price level (the inside price) or all the price levels. Sizes are aggregated for all price levels. Market Participant source attribution is not provided. Please see the OTC Markets Display Requirements document for details regarding data display.
- **Real-Time Level 2+:** Real-time complete quote data including market participant information, and real-time OTC Link Trade information. The RT Level 2+ License is our premium license, which allows subscribers access to all of our multi-cast channels. Please see the OTC Markets Display Requirements document for details regarding data display.

Access to security information (tiers, caveat emptor, etc.) is provided for all three products.

1.3 Product-Channel Mapping

Market data is published on a set of multicast channels. A product offers access to a subset of these multicast channels. The following table shows the channels available for each product.

The **X** marks the primary channel for a given product. The O marks optional channels that a product subscriber may additionally choose to receive. As an example, a Level 2 + product subscriber may choose to only listen to our Quote Book and Reference Data (w cusip) channels, even though they have access to all channels.

Receiving all optional channels will result in significant duplication of data.

Product / Channel[1]	OTC Markets Real-Time Reference Prices	OTC Markets Real-Time Level 1+	OTC Markets Real-Time Level 2+
Quote Book Channels			**X**
Quote Inside Channels		**X**	O
Quote Price Depth Channels		O	O
Quote Reference Price Channels	**X**	O	O
OTC Link Trade Channels[2]	O	O	O
Reference Data Channels (w/ cusip) [2]	O	O	O
Reference Data Channels (w/o cusip) [2]	O	O	O

Table 1: Product-Channel Mapping

[1] For redundancy, each channel is published twice, as an A feed and a B feed.

[2] Messages on these three channels are formatted in ASCII. Messages on the remaining channels are in binary.

1.4 Multicast Channels

The following table describes the available multicast channels. Each set of channels consist of two real-time data channels and two snapshot data channels.

Multicast Channel	Channel Description	Channel ID	
		Real Time	Snapshot
Quote Book Channels	All individual quote messages: price, size, qap, mmid, priceType, open/close indicator	11	12
Quote Inside Channels	OTC Link Best Bid and Offer: Best bid price, aggregate bid size, best offer price, aggregate offer size	14	15

Quote Reference Price Channels	OTC Link Best Bid and Offer Prices: Best bid price, best offer price, bid and offer size set to 1. This is essentially equivalent to the Inside channel, but without the size information.	17	18
Quote Price Depth Channels	All open quote prices aggregated by price level: price, aggregate size, # of quotes at that price level	20	21
OTC Link Trade Channels [1]	OTC Link Trade: last price, last size, mmid if advertised, buy/sell indicator	1	
Reference Data Channels (with cusip) [1, 2]	Extended security (cusip, company name, etc.) information for market data recipients who own a cusip license.	5	
Reference Data Channels (w/o cusip) [1, 2]	Extended security (company name, etc.) information for market data recipients who do not own a cusip license.	6	

Table 2: Channel Descriptions and IDs

[1] Messages on these three channels are formatted in ASCII. Messages on the remaining channels are in binary.

[2] An abbreviated set of Security reference data is also sent in-line on the quote book, inside, reference price and depth channels.

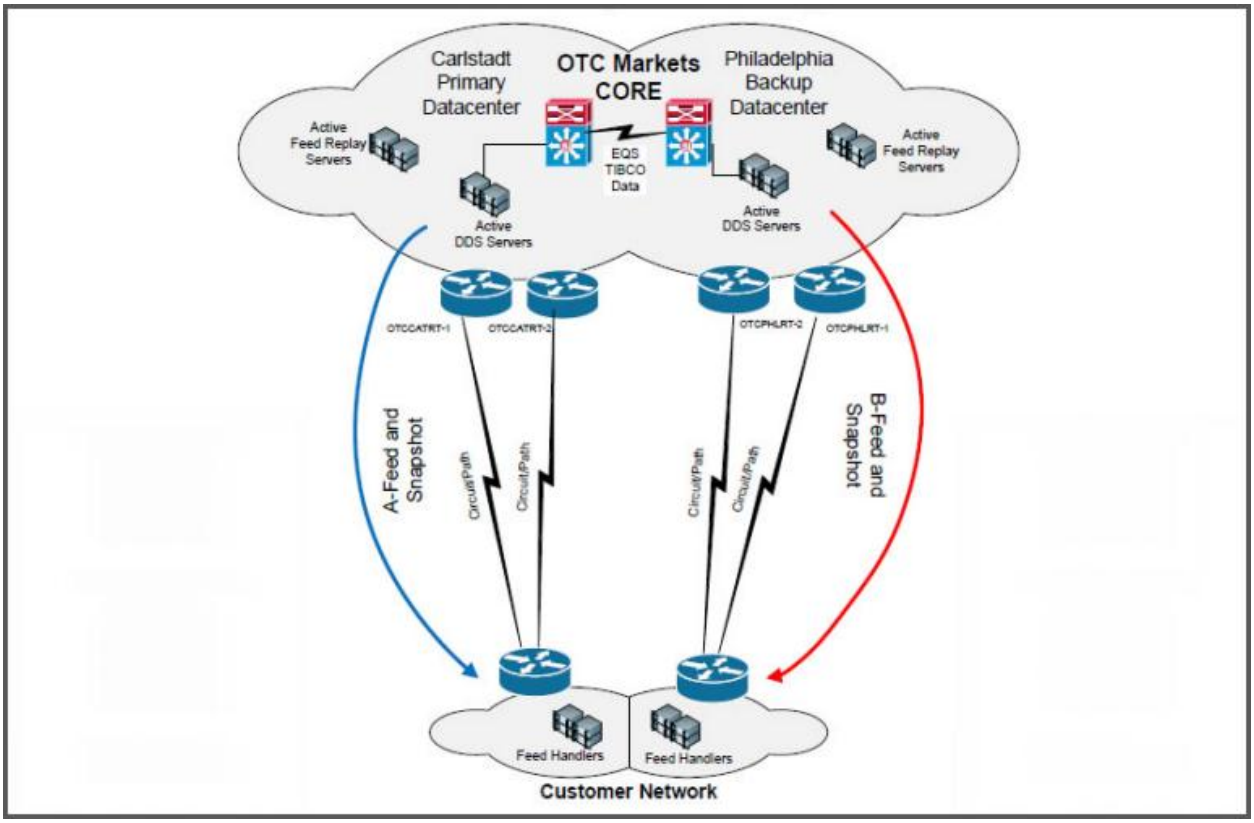
2. Connectivity

This section provides a high level overview of client integration and connection functionality

Clients should contact OTC Markets Group technical support or their designated network service provider to obtain technical details concerning connections such as IP addresses, ports, etc.

2.1 Network Configuration

Because UDP is an unreliable message transport and it suffers from occasional packet loss, OTC Feed distributes each data feed using two multicast broadcasts channels. An "A" channel is published from our primary data center in Carlstadt, NJ, and a "B" channel is published from our secondary data center in Philadelphia, PA. Both data centers contain Feed Replay Servers, which can respond to Gap Fill and Snapshot requests sent by subscribers over TCP/IP. All the Feed Replay Servers contain identical information.



2.2 Bandwidth Recommendations

Connection via Extranet: Please refer to http://www.otcmarkets.com/traders-brokers/realtime-data/specifications for bandwidth requirements for each channel.

Direct Connection: Please refer to Connectivity Guide at:
http://www.otcmarkets.com/content/doc/connectivity-guide.pdf

2.3 Supported Carriers

Please refer to http://www.otcmarkets.com/traders-brokers/realtime-data/connection for a current list of supported carriers

2.4 IP Endpoints and Multicast Groups

Please refer to the document entitled “Multicast Group Documentation” at http://www.otcmarkets.com/traders-brokers/realtime-data/specifications for documentation on multicast groups, channels and source IPs.

3. Binary Channels

3.1 Binary Message Distribution

Each UDP multicast packet will contain a packet header. In the case where this header indicates it is a Heartbeat or Sequence Number Reset, the packet will contain no other messages. The SeqNum field will always contain the next expected sequence number not the current. For most packets, the PacketFlag field will be unset (zero), which indicates normal message traffic. In this case, the Messages field of the packet header will contain the number of messages contained in that packet.

Each message contained in the packet will contain a message header, which specifies the message type and message size. The message type and size fields should be used for decoding individual messages. It is important to note that future versions may append additional data fields to a message, thus proper use of the message size will be critical to ensuring backward compatibility.

Messages will be formatted in big endian, with each field having a fixed length and a fixed position.

3.1.1 Packet Header

Field	Offset	Size	Format	Description
PacketSize	0	2	Unsigned Integer	Size of packet + header size in bytes
SeqNum	2	4	Unsigned Integer	Sequence number of packet (channel specific). If heartbeat or if sequence number is being reset, will contain next expected sequence number.
PacketFlag	6	1	Bit map	see Packet flag definition
Messages	7	1	Unsigned Integer	Number of messages in packet
PacketMilli	8	4	Unsigned Integer	Milliseconds since local time midnight (EST/EDT)

3.1.2 Packet Flag

Bit	Name	Set	Clear
0	Heartbeat[1]	No message in packet	Normal message contents
1	SeqNum Reset[2]	No message in packet	Normal message contents
2	Reserved		
3	Reserved		

Bit	Name	Set	Clear
4	Reserved		
5	Reserved		
6	Replay	Packet contains replay messages	Normal message contents
7	Reserved		

[1] A Heartbeat is sent if no business level message has been published for more than a second. The heartbeats will continue to be sent in 1 second intervals until the next business level message is published.
[2] A SeqNumReset message will be sent at the start of day and in the scenario where a major outage leads to the feed generator application needing a fresh start. The message indicates that the channel sequence numbers are being reset to 1.

3.1.3 Message Header

Field	Offset	Size	Format	Description
MessageSize	0	2	Unsigned Integer	Size of message + header size in bytes
MessageType	2	1	Unsigned byte	See *Table 3: Message Type Values* below
Message Payload	3	-		

Message	Quote (Add, Delete, Spin)	Quote Update	Inside (Add, Delete, Spin)	Inside Update	Price Level (Add, Delete, Spin)	Price Level Update	Reference Price (Add, Delete, Spin)	Reference Price Update	Security Reference	Start of Spin	End of Spin	Market Open	Market Close
Value	1	2	3	4	5	6	7	8	9	11	12	13	14

Table 3: Message Type Values

3.2 Binary Message To Channel Mapping

Message Name	Message Type	Sent on Channel	Channel ID
Quote (Add, Delete, Spin)	1	Quote Book Channel	11
Quote Update	2	Quote Book Channel	11
Inside (Add, Delete, Spin)	3	Quote Inside Channel	14
Inside Update	4	Quote Inside Channel	14
Price Level (Add, Delete, Spin)	5	Quote Price Depth Channel	20
Price Level Update	6	Quote Price Depth Channel	20
Reference Price (Add, Delete, Spin)	7	Quote RT Reference Price Channel	17
Reference Price Update	8	Quote RT Reference Price Channel	17
Security Reference	9	All four binary channels	
Start of Spin	11	All four binary channels	
End of Spin	12	All four binary channels	
Market Open	13	All four binary channels	
Market Close	14	All four binary channels	

3.3 Binary Message Definitions

3.3.1 Start of Spin

This message appears on all quote channels and indicates the beginning of a spin message cycle.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
SpinType	4	1	Unsigned byte	1 - Reference 2 - Market Data 3 - Opening
SpinStartTimeMilli	5	8	Unsigned Integer	Milliseconds since UTC epoch
SpinLastSeqNum	13	4	Unsigned Integer	Last sequence number applied to this spin
Message Size		17		

3.3.2 End of Spin

This message appears on all quote channels and indicates the end of a spin message cycle.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
SpinType	4	1	Unsigned byte	1 - Reference 2 - Market Data 3 - Opening
SpinMsgCt	5	4	Unsigned Integer	Total messages in spin
SpinEndTimeMilli	9	8	Unsigned Integer	Milliseconds since UTC epoch
SpinLastSeqNum	17	4	Unsigned Integer	Last sequence number applied to this spin
Message Size		21		

3.3.3 Market Open

This message is sent out at 6 AM on all channels. The message can also be sent mid-day if a technical outage caused a temporary closure of the market.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
MarketOpen	4	8	Unsigned Integer	Milliseconds since UTC epoch
MarketClose	12	8	Unsigned Integer	Anticipated market close Milliseconds since UTC epoch
Message Size		20		

3.3.4 Market Close

This message is sent out at 5 PM on all channels. The message can also be sent mid-day if a technical outage causes a temporary closure of the market.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
MarketCloseTimeMilli	4	8	Unsigned Integer	Milliseconds since UTC epoch midnight
MarketMsgCt	12	4	Unsigned Integer	Total day message count
Message Size		16		

3.3.5 Security

The Security Message is included in all the quote channels and provides basic security attribute information. For complete security attribute information (e.g. CUSIP), please see section 4.3.2 – ASCII Reference Data Security Message.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
Symbol	4	10	ASCII	Ticker symbol. Fixed income symbols may not have a symbol. For these securities, the security ID or CUSIP (Reference Data Security Message) must be used as an identifier.
LastUpdateMilli	14	8	Unsigned Integer	Milliseconds from UTC epoch
SecurityAction	22	1	Unsigned Integer	0x1 = Update 0x2 = Add 0x3= Delete 0x4= Spin
AssetClass	23	1	Unsigned Integer	0x1 = Equity 0x2 = Fixed Income
SecurityID	24	4	Unsigned Integer	Unique security ID issued by OTC Markets
SecurityFlags	28	1	BitMap	See SecurityFlag definition
Tier	29	1	Unsigned Integer	The market tier assigned by OTC Markets Group. Valid values: 0 - No Tier 1 - OTCQX U.S. Premier 2 - OTCQX U.S. 5 - OTCQX International Premier 6 - OTCQX International 10 - OTCQB 11 - OTCBB Only 20 - OTC Pink Current 21 - OTC Pink Limited 22 - OTC Pink No Information 30 - Grey Market 50 – OTC Yellow 51 – OTC Bonds Distributors must display with the price data, the market tier assigned in a manner acceptable to OTC Markets Group. Please see the Data Display Requirements document. Please see Appendix for a tier to primary market mapping table.
DisclosureStatus	30	1	Unsigned Integer	The current disclosure status of the issuer. 0 – No Disclosure Status 2 – Current Information 3 – Limited Information 4 – No Information

Field	Offset	Size	Format	Description
SecurityStatus	31	1	ASCII	A – Active S – Suspended H – Halted I – Internal Halt R – Revoked D – Deleted
Message Size		32		

3.3.6 Security Flag

This flag notes security level attributes and is only included in the Security Message.

Bit	Name	Set	Clear
0	PiggybackFlag 15c2-11 “PiggyBack” exempt security status flag	Yes	No
1	CaveatFlag Indicates whether a Caveat Emptor warning has been applied to the security.	Yes	No
2	RegShoFlag Indicates if security is on Regulation SHO/NASD Rule 3210 Threshold Security List	Yes	No
3	UnsolicitedOnlyFlag Indicates if security is only quoted unsolicited. If a Security has 1 or more market participant quotes, and all those quotes are UNS, the security is quoted UNS.	Yes	No
4	BB Quoted Indicates if security is quoted on the OTC Bulletin Board interdealer quotation system	Yes	No
5	MessagingDisabledFlag Indicates whether trade messaging is disabled (for securities where only quoting is supported on the OTC Link Platform)	Yes	No
6	Reserved		
7	Reserved		

3.3.7 Quote (Add, Delete, Spin)

This message is sent on the Quote Book channel.

An Opening Spin is sent early in the morning, during which all quotes across all securities are disseminated. All quotes will be in Closed state (9548 = 0) at this time. Most market participants close their quotes at the end of the day, and open them again the next morning. Others delete their quotes at the end of the day, and create them anew the next morning. The quotes for the latter will not be part of the daily opening spin.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
QuoteID	4	4	Unsigned Integer	Unique Quote ID
QuoteAction	8	1	Unsigned Integer	0x2 = Add 0x3= Delete 0x4= Spin
QuoteFlags	9	1	Bit map	see QuoteFlag definition
SecurityID	10	4	Unsigned Integer	OTC Markets security ID
MPID	14	4	ASCII	Market Participant ID owning the quote always 4 characters
AskPrice	18	8	Unsigned Integer	Price, 6 decimal places assumed
AskSize	26	4	Unsigned Integer	Number of shares
AskQAP	30	1	Integer	Specifies the access fee or rebate for the bid/offer. Positive Integers (1 to 30) indicate a rebate, and negative Integers (-1 to -30) indicate an access fee. 0 indicates no rebate or access fee.
AskTimeMilli	31	8	Unsigned Integer	Milliseconds from UTC epoch
BidPrice	39	8	Unsigned Integer	Price, 6 decimal places assumed
BidSize	47	4	Unsigned Integer	Number of shares
BidQAP	51	1	Integer	Specifies the access fee or rebate for the bid/offer. Positive Integers (1 to 30) indicate a rebate, and negative Integers (-1 to -30) indicate an access fee. 0 indicates no rebate or access fee.
BidTimeMilli	52	8	Unsigned Integer	Milliseconds from UTC epoch
Message Size		60		

3.3.8 Quote Update

Quote update information for the Quote Book channel.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
QuoteID	4	4	Unsigned Integer	Quote ID refers back to original Quote Reference
QuoteFlags	8	1	Bit map	see QuoteFlag definition
Price	9	8	Unsigned Integer	Price, 6 decimal places assumed
Size	17	4	Unsigned Integer	Number of shares
QAP	21	1	Integer	Specifies the access fee or rebate for the bid/offer. Positive Integers (1 to 30) indicate a rebate, and negative Integers (-1 to -30) indicate an access fee. 0 indicates no rebate or access fee.
QuoteTimeMilli	22	8	Unsigned Integer	Milliseconds from UTC epoch
Message Size		30		

3.3.9 Quote Flag

This flag is part of eight messages: The Quote Add/Delete/Spin message, the Quote Update message, the Inside Add/Delete/Spin message, the Inside Update message, the Quote Price Depth Add/Delete/Spin message, the Quote Price Depth Update message, the Reference Prices Add/Delete/Spin message and the Reference Prices Update message. Not all fields are applicable on every message - see table footnotes below.

Bit	Name	Set	Clear
0	Update Side[1]	Ask	Bid
1	State	Open	Closed
2	Ask Unsolicited[2]	Unsolicited	Solicited
3	Ask Priced[3]	Actual	Unpriced/BW
4	Ask BW (Bid Wanted) [3]	BW	Unpriced
5	Bid Unsolicited[2]	Unsolicited	Solicited
6	Bid Priced[3]	Actual	Unpriced/OW

Bit	Name	Set	Clear
7	Bid OW (Offer Wanted) [3]	OW	Unpriced

[1] Applicable for Update messages only. Ignore for other messages.

[2] Applicable for Quote Add/Delete/Spin message and Quote Update message only. Ignore for Inside, Price Depth and Reference Prices messages – unsolicited quotes are never part of the inside.

[3] Quotes can have one of three price types – Actual, Bid/Offer Wanted, or Unpriced. The Ask Price Type is represented by bits 3 and 4, and the Bid Price Type is represented by bits 6 and 7. Insides are always one of two price types - Actual or Unpriced.

3.3.10 Inside (Add, Delete, Spin)

This message is sent on the Quote Inside Channel.

An insideID is generated for each inside bid or offer when it is newly created. This id is unique across all inside entries for all securities, across both bids and offers. For subsequent updates and deletes, this id should be used to look up the original inside entry. For updates, the Inside Update message, defined in next section, is published.

The price of an inside bid (offer) for a security is the highest bid price (lowest offer price) of all open bids (offers) for that security. The size of an inside bid (offer) is the aggregated size of all bids (offers) at the inside bid (offer) price.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
InsideID	4	4	Unsigned Integer	Unique Inside ID
InsideAction	8	1	Unsigned Integer	0x2 = Add 0x3= Delete 0x4= Spin
QuoteFlags	9	1	Bit map	see QuoteFlag definition
SecurityID	10	4	Unsigned Integer	OTC Markets security ID
AskPrice	14	8	Unsigned Integer	Price, 6 decimal places assumed
AskSize	22	4	Unsigned Integer	Number of shares
AskTimeMilli	26	8	Unsigned Integer	Milliseconds from UTC epoch
BidPrice	34	8	Unsigned Integer	Price, 6 decimal places assumed
BidSize	42	4	Unsigned Integer	Number of shares

Field	Offset	Size	Format	Description
BidTimeMilli	46	8	Unsigned Integer	Milliseconds since UTC epoch
AskNumPricedMP	54	1	Unsigned Integer	Number of priced market participants at Inside price level
BidNumPricedMP	55	1	Unsigned Integer	Number of priced market participants at Inside price level
Message Size		56		

3.3.11 Inside Update

Quote update information for the Quote Inside channel. Note that Size information is aggregated across participants at the inside price level.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
InsideID	4	4	Unsigned Integer	Inside ID refers back to original Inside Reference
QuoteFlags	8	1	Bit map	see QuoteFlag definition
Price	9	8	Unsigned Integer	Price, 6 decimal places assumed
Size	17	4	Unsigned Integer	Number of shares
InsideTimeMilli	21	8	Unsigned Integer	Milliseconds from UTC epoch
NumPricedMM	29	1	Unsigned Integer	Number of priced market participants at Inside price level.
Message Size		30		

3.3.12 Price Level (Add, Delete, Spin)

This message is sent on the Quote Price Depth Channel, which is **not currently in production**. Please contact marketdata@otcmarkets.com if you have questions regarding the Price Depth Channel.

A display rank (AskPriceLevel/BidPriceLevel) is sent with each price level. This specifies at which position the price level is to be inserted on the displayed montage. Thus if a new bid price level is received with 290=3, the bid should be inserted at position 3 from the top, and all existing bid price levels at rank 3 and below should be pushed down by one position. Thus, the ranks of other existing price levels will change over time, by implication, as newer price levels are inserted.

An MDEntryID is generated for each price level (bid or offer) when it is newly created. This id is unique across all price level entries for all securities, across both bids and offers. For subsequent updates and deletes, this id should be used to look up the original price level entry. The lookup is essential, since update entries will only contain deltas values, i.e. just the values that have changed since the last update. For deletes, only the MDEntryID will be specified.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
PriceID	4	4	Unsigned Integer	Unique Price ID
PriceAction	8	1	Unsigned Integer	0x2 = Add 0x3= Delete 0x4= Spin
QuoteFlags	9	1	Bit map	see QuoteFlag definition
SecurityID	10	4	Unsigned Integer	OTC Markets security ID
AskPrice	14	8	Unsigned Integer	Price, 6 decimal places assumed
AskSize	22	4	Unsigned Integer	Number of shares
AskPriceLevel	26	1	Unsigned Integer	Position of price level entry, numbered from most competitive to least competitive, starting from 1. Valid only at time of update.
AskTimeMilli	27	8	Unsigned Integer	Milliseconds from UTC epoch
BidPrice	35	8	Unsigned Integer	Price, 6 decimal places assumed
BidSize	43	4	Unsigned Integer	Number of shares
BidPriceLevel	47	1	Unsigned Integer	Position of price level entry, numbered from most competitive to least competitive, starting from 1. Valid only at time of update.
BidTimeMilli	48	8	Unsigned Integer	Milliseconds since UTC epoch
AskNumPricedMM	56	1	Unsigned Integer	Number of priced market participants at this price level
BidNumPricedMM	57	1	Unsigned Integer	Number of priced market participants at this price level
Message Size		58		

3.3.13 Price Level Update

Quote update information for the Quote Price Depth channel. Level information is valid only at the time of update.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
PriceID	4	4	Unsigned Integer	Price ID refers back to original Price Level Reference
QuoteFlags	8	1	Bit map	see QuoteFlag definition
Price	9	8	Unsigned Integer	Price, 6 decimal places assumed
Size	17	4	Unsigned Integer	Number of shares
Level	21	1	Unsigned Integer	Position of price level entry, numbered from most competitive to least competitive, starting from 1. Valid only at time of update.
TimeMilli	22	8	Unsigned Integer	Milliseconds from UTC epoch
NumPricedMM	30	1	Unsigned Integer	Number of priced market participants at this price level
Message Size		31		

3.3.14 Reference Price (Add, Delete, Spin)

This message is sent on the Reference Prices Channel. Size will always be set to 1.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
ReferencePriceID	4	4	Unsigned Integer	Unique Reference Price ID
ReferencePriceAction	8	1	Unsigned Integer	0x2 = Add 0x3= Delete 0x4= Spin
QuoteFlags	9	1	Bit map	See QuoteFlag definition
SecurityID	10	4	Unsigned Integer	OTC Markets security ID
AskPrice	14	8	Unsigned Integer	Price, 6 decimal places assumed
AskSize	22	4	Unsigned Integer	Always 1
QuoteTimeMilli	26	8	Unsigned Integer	Milliseconds from UTC epoch
BidPrice	34	8	Unsigned Integer	Price, 6 decimal places assumed
BidSize	42	4	Unsigned Integer	Always 1

Field	Offset	Size	Format	Description
BidTimeMilli	46	8	Unsigned Integer	Milliseconds since UTC epoch
Message Size		54		

3.3.15 Reference Price Update

Quote update information for the Reference Price channel. Note 'Size' will always be set to 1.

Field	Offset	Size	Format	Description
ChannelSeqNum	0	4	Unsigned Integer	Monotonically increasing message sequence number at the channel level
ReferencePriceID	4	4	Unsigned Integer	Unique Reference Price ID
QuoteFlags	8	1	Bit map	see QuoteFlag definition
Price	9	8	Unsigned Integer	Price, 6 decimal places assumed
Size	17	4	Unsigned Integer	Always 1
TimeMilli	21	8	Unsigned Integer	Milliseconds from UTC epoch
Message Size		29		

4. Ascii Channels

4.1 Ascii Message Distribution

Each UDP multicast packet will typically contain multiple messages. There are no packet level headers or message headers. A message always starts with field 35 (MsgType) and ends with field 10 (Checksum). The rest of the fields in a message are not guaranteed to be in the sequence specified in the message definition.

A message is terminated by the final SOH character on the Checksum field.

4.2 Ascii Messages to Channel Mapping

The following messages are sent on the ASCII multicast channels

Message Name	Message Type	Sent on Channel	Channel ID
Trade Message	35 = XT	OTC Link Trade Channel	1355 = 1
Extended Security Message	35 = XS	Reference Data Channels	1355 = 5,6
Trader Message	35 = XTI	Reference Data Channels	1355 = 5,6
Heartbeat Message	35 = 0	All Channels	NA

Note on Message Headers: While these messages are formatted similar to FIX messages, FIX session level semantics are not used for the multicast channels, and thus the standard FIX header and trailer are not included in the messages.

Note on Coding for Extensibility: OTC Markets Group may occasionally add new fields to existing messages. To ensure future compatibility, subscribers must code their feed handlers to ignore unknown fields in any incoming message.

4.3 Ascii Message Definitions

4.3.1 Trade Message

This message is sent on the OTC Link Trade Channel.

Tag	Field Name	Req	Description	Notes
35	MsgType	Y	XT – Market Data Trade Message	Alphanumeric
1181	ApplSeqnum	Y	Monotonically increasing message sequence number at the channel level	Numeric
279	MDUpdateAction	Y	Always 0 = New	Numeric
278	MDEntryID	Y	Unique ID for each new Trade	Numeric

Tag	Field Name	Req	Description	Notes
9509	OTCSecurityID	Y	OTC Security ID	Numeric
55	Symbol	Y	The symbol from the order submitted	Max 6 chars. Typically 4 or 5 chars
65	SymbolSfx	N	Optional symbol suffix	Max 5 chars. Typically none
271	MDEntrySize	Y	Number of shares in this trade	Numeric. Max 9,999,999
270	MDEntryPx	Y	The execution price of this trade in US Dollars	Floating Point number. Max precision is 5 decimal points. Max price is $99,999,999
273	MDEntryTime	Y	Time in ET the trade was processed. Assume current ET date.	"HH:MM:SS.sss"
288	MDEntryBuyer	Y	MarketParticipantID of buyer. Value "ANON" indicates buyer wants to remain anonymous	Always 4 characters. All caps.
289	MDEntrySeller	Y	MarketParticipantID of seller. Value "ANON" indicates seller wants to remain Anonymous	Always 4 characters. All caps.
54	Side	Y	From the Liquidity Taker's viewpoint: 1 = Buy 2 = Sell	Numeric.
10	CheckSum	Y	Checksum field for message validation.	Numeric. Sum of all the bytes up to the checksum field (which is last) modulo 256

4.3.2 Extended Security Message

This message is sent on the two Reference Data Channels ("with cusip" and "w/o cusip"). Note that a Security message with a basic set of security attributes is sent in-line on the binary Quote channels. The Extended Security message defined here is for subscribers who need additional security information.

Tag	Field Name	Req	Description	Comments
35	MsgType	Y	XS – Extended Security Status message	
1181	ApplSeqnum	Y	Monotonically increasing message sequence number at the channel level	
55	Symbol	N	The ticker symbol. When a suffix is present, this field will have the form "symbol.suffix". Fixed income symbols may not have a symbol. For these securities, the security ID or CUSIP must be used as an identifier.	
779	LastUpdateTime	Y	Time in ET. "HH:MM:SS.sss"	
9540	UpdateType	Y	0 = New; 1 = Update; 3 = Opening Spin	
9547	OTCIssuerID	Y	Unique ID for each issuer.	
106	Issuer	Y	Company Name of security issuer	
107	SecurityDesc	N	Optional text describing security	

Tag	Field Name	Req	Description	Comments
9527	ShortName	N	Name of Security. If there is not ShortName, then text in the Issuer field should be used instead.	
9661	AssetClass	Y	1 = Equity; 2 = Fixed Income.	
167	SecurityType	Y	Indicates type of security: CS - Common Stock PS - Preferred Stock RTS - Rights UTS - Units OS - Ordinary Shares ADR - American Depository Receipts GDR - Global Depository Receipts WTS - Warrants OTHER - Other Security Type FUND - Fund NYRS - New York Registry Shs SP - Structured Product ETF - Exchange-Traded Fund CORP – Corporate Bond AGEN – Agency Bond EQLK – Equity Linked Bond	
9550	PrimaryMarket	Y	Used to indicate which market or stock exchange the security primarily trades on: OP – OTC Link OB – OTCBB OBP – OTC Link and OTCBB OY – Yellow Sheets N – NYSE O – NASDAQ A – NYSE AMEX X – ARCA G – Grey Market	
9509	OTCSecurityID	Y	A unique ID for security issued by OTC Markets Group. This is the key field to link a security to a Quote	
9602	Cusip	N	Applicable only for reference data channel with cusip (1355 = 5). Will be present for securities that have a cusip. For reference data channel without cusip (1355 = 6), this field will never be present.	
9522	PiggybackFlag	Y	15c2-11 “PiggyBack” exempt security status flag Y = Yes, qualified; N = No, not qualified	

Tag	Field Name	Req	Description	Comments
9555	Tier	Y	The market tier assigned by OTC Markets Group. Valid values: 0 - No Tier 1 - OTCQX U.S. Premier 2 - OTCQX U.S. 5 - OTCQX International Premier 6 - OTCQX International 10 - OTCQB 11 - OTCBB Only 20 - OTC Pink Current 21 - OTC Pink Limited 22 - OTC Pink No Information 30 - Grey Market 50 – OTC Yellow 51 – OTC Bonds	Distributors must display with the price data, the market tier assigned in a manner acceptable to OTC Markets Group. Please see the Data Display Requirements document.
9556	DisclosureStatus	Y	The current disclosure status of the issuer. Valid values: 0 – No Disclosure Status 2 – Current Information 3 – Limited Information 4 – No Information	
9557	CaveatFlag	Y	Indicates whether a Caveat Emptor warning has been applied to the security. Y = Yes; N = No	
9558	RegShoFlag	Y	Indicates if security is on Regulation SHO/NASD Rule 3210 Threshold Security List. Valid values: Y = Yes, on list. N = No, not on list.	
9659	UnsolicitedOnlyFlag	Y	Indicates if security is only quoted unsolicited. If a Security has 1 or more market participant quotes, and all those quotes are UNS, the security is quoted UNS. (Securities that have some UNS mm quotes and some not UNS are not flagged UNS). Valid values: N – not quoted unsolicited Y – quoted unsolicited only	
965	SecurityStatus	Y	The status of the security on the OTC Link system. Valid values: A – Active S – Suspended H – Halted I – Internal Halt R – Revoked D – Deleted	
258	TradedFlatSwitch	N	Indicates whether this security is traded flat (applicable only for bonds). Y = Yes; N = No (default)	
10	CheckSum	Y	Three byte checksum	

4.3.3 Trader Message

This message is being deprecated. It is currently sent on the two Reference Data Channels (“with cusip” and “w/o cusip”). It contains contact info and other details about a trader.

Tag	Field Name	Req	Description	Comment
35	MsgType	Y	XTI – Trader Message	
1181	ApplSeqnum	Y	Monotonically increasing message sequence number at the channel level.	
779	LastUpdateTime	Y	ET Time. Assume current ET Date.	
9540	UpdateType	Y	0 = New; 1 = Update; 3 = Opening Spin	
9552	TraderTrackID	Y	A unique numerical ID for a trader.	
9536	TraderID	Y	Up to 8 character ID of trader	Displayable ID for trader
9538	MarketParticipantID	Y	4 character ID of Market Participant	
9505	MarketParticipantName	Y	Name of market participant firm. Max 40 characters.	
9537	MPLocation		Text describing Market Participant Location (i.e. geographic location and/or desk). (max length 40 characters)	
9551	NASDLocID		One character indicating at what Market Participant location the Trader works.	
9541	StateOrCountry	Y	2 character code representing state or country where the trader works.	
9542	Telephone Primary	Y	max 19 characters	
9545	Telephone Secondary	N	max 19 characters.	
10	CheckSum	Y	Three byte checksum	

4.3.4 Heartbeat Message

This message is sent on all Ascii channels. A heartbeat message is published on a channel if no other messages have been published on that channel in the last 15 seconds.

The ApplEndSeqNo (1183) included in a heartbeat message is the value of the ApplSeqNum (1181) in the last application (i.e. non-heartbeat) message sent out on the channel. The heartbeat message does not increment the ApplSeqNum.

Tag	Field Name	Req	Description
35	MsgType	Y	0 – Heartbeat Message
1183	ApplEndSeqNo	Y	ApplSeqNum of last application message sent on this channel
10	CheckSum	Y	Three byte checksum

5. Message Recovery

Since by its nature multicast distribution is unreliable, messages may be lost or delivered out of order. Therefore, the subscriber must implement message recovery processing. To aid in this processing three recovery mechanisms are provided:

1. Multicast Group Redundancy: The data for each product is distributed via two multicast groups (A/B) that are routed over separate network paths.
2. Gap Fills: A TCP socket based message recovery service is provided for any messages that are missed on both A and B feeds.
3. On-Demand Snapshots: Snapshots may be requested via TCP for the four high volume channels (Quote Book, Quote Inside, Quote Reference Price and Quote Price Depth. Data will be delivered via the respective dedicated snapshot channel. This is a new feature available as of early December 2011.

Note: A replay server test environment is available. Please refer to our 'Multicast Group' document at http://www.otcmarkets.com/traders-brokers/realtime-data/specifications for the correct IPs/ports.

5.1 A/B Feed Arbitration

The real time data for each product is distributed via two multicast groups (A/B) that are routed over separate network paths. The A channel is published from our primary data center in Carltstadt and the B channel is published out of our secondary data center in Philadelphia.

Each of the A and B channels will contain the identical message level traffic, but not identical packet level traffic. The message level sequence number can used to detect gaps on an individual channel. If a gap is detected on one channel, the missing messages can be recovered from the other channel. This arbitration should be done at the message level, and not at the packet level.

Note that the Snapshot channels are also published from both Data Centers as A and B channels. However, the snapshot channels are not synchronized and cannot be arbitrated. If gaps are detected on a snapshot, subscribers can use the gap fill functionality to request missed messages, or wait for the next snapshot.

5.2 Gap Fill Recovery

The Recovery Server listens on a TCP socket for Gap Fill requests. Subscribers can use this service for requesting resends of missed market data messages from the multicast channels. The subscriber should initiate a TCP socket connection with the Recovery Server when a message gap is detected. After the replay request has been satisfied by the Recovery Server the TCP socket will be closed by the service.

Before requesting a resend of "missed" messages, the subscriber must make sure that the particular message or messages have indeed been missed, and have not simply delivered out of order by the underlying UDP protocol. This procedure would entail keeping track of missed messages by using a combination of techniques e.g. tracking ApplSeqNum for gaps and setting a timer at the expiry of which, if the missing message or messages has not been received it is safe to assume the message or message are lost and no longer available on the multicast stream. Another suggestion is to set a "gap tolerance" of 'N' messages -- a resend request should only be sent after receiving the Nth message (by sequence number) after the missed message.

The Recovery Server supports replay requests for missed messages from both the real-time data multicast channels and from the snapshot multicast channels. Use field 1355 (RefApplID) in the Replay Request message to specify the channel being requested.

One Recovery Server is located in our primary data center (Carlstadt) from where the A feeds are published, and one Recovery Server is located in our secondary data center (Philadelphia) from where the B feeds are published. For gaps on the real-time channels, the gap fill request may be sent to either data center. For gaps on the snapshot channels, the gap fill request must be sent to the appropriate data center.

Gap Fill Restrictions: A single request is limited to a maximum of 2000 messages. To fill larger gaps, clients will need to send multiple requests or request a snapshot (See 5.3 Snapshot Recovery). The server will enforce throttling on the resend connection to prevent excessive resend activity on one client connection from negatively affecting the overall system. Hence requests may be queued if received at a rapid rate. These throttles are based on market conditions and will change over time.

The Gap Fill mechanism exists to enable subscribers to recover from short network or application outages. To recover from longer outages, the Snapshot Recovery mechanism should be used.

5.3 Snapshot Recovery

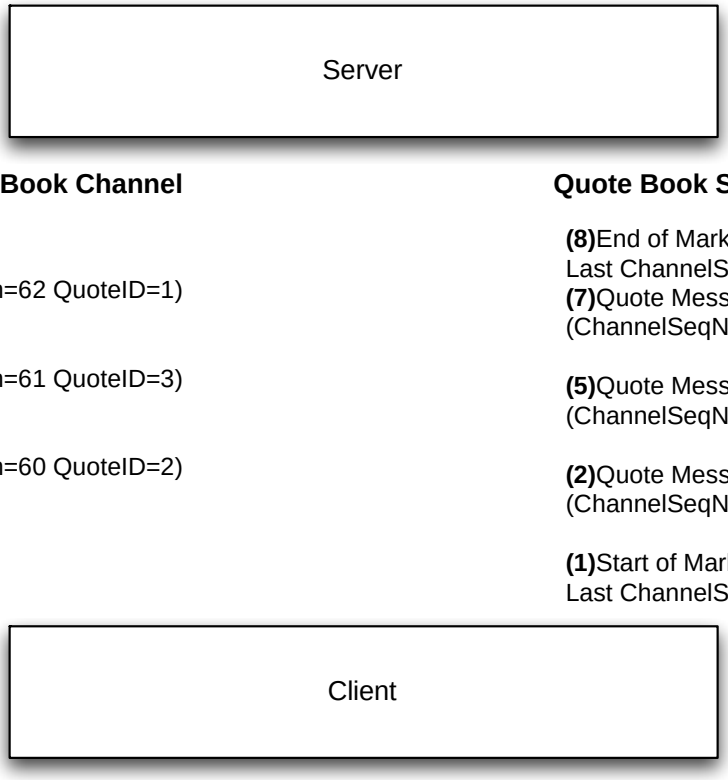
To assist in quick recovery after a system failure at a client, a snapshot request feature is available for the following four high-volume market data channels:

1. Quote Book Channel
2. Quote Price Level Channel
3. Quote Inside Channel
4. Reference Price Channel

Requesting a Multicast Snapshot: Each real-time multicast feed channel has a corresponding dedicated snapshot channel. A snapshot request (Replay Request with 1347 = 1) can be sent on the TCP socket connection to the Recovery Server. On receiving the request, the Recovery Server will acknowledge the request by sending a Resend Request Ack on the TCP connection, and start publishing a snapshot on the appropriate multicast snapshot channel. The TCP connection will be closed after the Resend Request Ack has been sent. In some cases, the subscriber may start receiving the snapshot before the Ack is received. If a snapshot broadcast is in progress, the request snapshot will not begin until the in progress snapshot has completed.

Processing a Multicast Snapshot: Before sending a snapshot request message, the subscriber must buffer all messages on the appropriate product multicast channel. Once a complete snapshot refresh has been received, the subscriber/client can apply the buffered messages and then resume normal real-time message processing.

Recovering from Message Gaps on a Snapshot: Unlike the real-time channels, the snapshot A and B channels are not synchronized, and thus A/B message arbitration cannot be performed for these channels. Subscribers can listen to either the A channel or the B channel for snapshots. If gaps are detected on a snapshot on a given channel, subscribers can use the gap fill functionality to request missed messages, or wait for the next snapshot on the same channel, or switch to the other channel and attempt to recover from there. If the gap fill functionality is being used, the gap fill request must be sent to the same data center from which the snapshot originated.



Message Processing Timeline

(1) Quote Book Spin begins indicating the last sequence number applied to this spin is 61

(2) Quote Message arrives and is processed

(3) Quote Update arrives and is buffered

(4) Quote Update arrives and is buffered

(5) Quote Message arrives and is processed

(6) Quote Update arrives and is buffered

(7) Quote Message arrives and is processed

(8) Quote Book Spin completes

(9) Quote Update **(3)** discarded message ChannelSeqNum < last ChannelSeqNum applied

(10) Quote Update **(4)** discarded message ChannelSeqNum < = last ChannelSeqNum applied

(11) Quote Update **(6)** applied message ChannelSeqNun > last ChannelSeqNum applied

(12) Recovery complete normal processing resumes

5.4 Recovery Message Definitions

The following messages are supported on the TCP socket based resend channel:

- Replay Request
- Replay Request Ack
- Appropriate market data message (for gap fill requests)

The Replay Request and Replay Request Ack messages are formatted in a TAG=VALUE[SOH] FIX-like format. i.e. each field consists of four items:

1. The tag number
2. The = sign
3. The value
4. The SOH character

The messages are terminated by the final SOH character on the checksum field.

5.4.1 Replay Request

Tag	Field Name	Required	Description
35	Message Type	Y	BW
49	SenderCompID	Y	Message Sender
1346	ApplReqID	Y	Unique ID identifying this request.
1347	ApplReqType	N	0 = Gap Fill Request 1 = Snapshot Request If this field is not present, value 0 (Gap Fill Request) is assumed
1355	RefApplID	Y	A unique id identifying which multicast channel this request is for. Use IDs defined in Table 2: Channel Descriptions and IDs
1182	ApplBegSeqNo	Y	Application sequence number of first message in range to be resent. Not required for snapshot request.
1183	ApplEndSeqNo	Y	Application sequence number of last message in range to be resent. If request is for a single message ApplBeginSeqNo = ApplEndSeqNo. A maximum of 2000 messages can be requested per Gap Fill Request message. Not required for snapshot request.
10	Checksum[1]	Y	Three byte checksum

[1] Follow the standard FIX protocol algorithm in calculating the checksum. This consists of summing up the decimal value of the ASCII representation all the bytes up to the checksum field (which is last) and returning the value modulo 256."

5.4.2 Resend Request Ack

Tag	Field Name	Present	Description
35	Message Type	Always	BX
59	TargetCompID	Always	Message Recipient
1346	ApplReqID	Always	Identifier of the request associated with this ACK message
1348	ApplResponseType	Always	0 – Request successfully processed 1 – Request limits exceeded 2 – Messages are not available 3 – User not entitled to application 4 – Badly formed request Field 58 may provide additional details.
58	Text	Sometimes	May contain additional descriptive detail about the response when 1348 is non-zero.
1355	RefApplID	Always	Echo back of the RefApplID received in the Request message.
1182	ApplBegSeqNo	Sometimes	Application sequence number of first message in range to be resent. Present if field 1348 = 0.
1183	ApplEndSeqNo	Sometimes	Application sequence number of last message in range to be resent. Present if 1348 = 0.
10	Checksum	Always	Three Byte Checksum

If the Replay Request was for a Snapshot, the TCP socket connection will be terminated by the Recovery Server after the Replay Request Ack is sent.

If the Replay Request was for a Gap Fill, the appropriate messages will follow the Replay Request Ack. If the messages requested are from a Binary channel, the messages sent will be formatted in binary. Packet headers will not be sent but message headers will be. If the messages requested are from an ASCII channel, the messages sent will be formatted in ASCII.

Please use our replay server test environment for testing. Details regarding the test environment may be found in our 'Multicast Group' document at http://www.otcmarkets.com/traders-brokers/realtime-data/specifications. The data available on this server will be identical to the Production A feeds. This server will accept snapshot requests but will not publish snapshot data. Gap fill responses will be generated.

6. Appendix

6.1 OTC Market Tier/BB Quoted – OTC Primary Market Mapping

The below table notes the mapping between the OTC Tier value, the BB Quoted value and the OTC Primary Market value. The Primary Market for OTC equity securities may be derived from the combination of OTC Tier and BB Quoted values noted below.

Note: The BB Quoted flag will always be set to No for No Tier (0), Grey Market (30), OTC Yellow (50) and OTC Bonds (51) tiers. It is not possible to quote these securities on the OTCBB.

OTC Market Tier	BB Quoted	Primary Market Mapping
OTCQX (1,2,5,6), OTCQB (10) and OTC Pink (20,21,22)	Yes	OTC Link/OTCBB (OBP)
OTCQX (1,2,5,6), OTCQB (10) and OTC Pink (20,21,22)	No	OTC Link (OP)
OTCBB Only (11)	Yes[1]	OTCBB (OB)

[1] BB Quoted value will always be Yes if OTC Market Tier is 'OTCBB Only'

Document Revision History

Version	Description of Version	Date Completed
2.4	Clarification of packet header timestamp Removed details regarding periodic snapshots	2012.10.09
2.3	Clarification regarding null symbols for fixed income securities. Added replay server test environment notation.	2012.03.21
2.2	Addition of BB Quoted flag to the Security Flag (3.3.6). Amendment of snapshot interval timing to every 10 minutes (from 3 minutes)	2012.02.21
2.1	Added specifications for snapshot request functionality. Added appendix section clarifying the tier to venue mapping.	2011.12.12
2.0	Added specifications for Ascii formatted Reference Data and Trade Data channels On Quote Flag field, renamed the QuoteType bit to QuoteSide.	2011.10.06
1.0.9	Made Security message compact by eliminating non-essential fields Added Number of marketmakers field to Inside and Price Level messages Added new value "SpinType=3" to Start of Spin and End of Spin messages	2011.08.12
1.0.8	Corrected offsets in Quote Add and Quote Update messages Specified that snapshots are sent every 3 minutes Marked the market open/close messages as non-optional Added restriction of max 2000 messages/request for Gap Fill Requests	2011.07.28
1.0.7	Flipped Solicited to Unsolicited in Quote Flag Switched SecurityStatus from int to char in Security Message	2011.07.18
1.0.6	Removed trader message and also trader id field from Quote Add message Removed Rank fields from Quote Add and Quote Update messages Added Gap Fill Request and Response message definitions Included Ascii channel descriptions in Product/Channel mapping for completeness Added MessagingDisabledFlag in Security message	2011.07.08
1.0.5	Add market maker ID to quote message Full messages for add, delete and spin only all updates single sided	2011.06.20
1.0.4	Change name of Reference Message Types Remove bid and ask market maker ID from Quote Full Update Correct Action field values Correct Spin message order / contents	2011.06.17

1.0.3	Wrong field size in Price Level Reference Wrong data type in Trade Reference	2011.06.14
1.0.2	Sequence number to Spin and Market open/close	2011.06.03
1.0.1	Multicast recovery clarification Spin last sequence number addition	2011.05.25
1.0	Initial Version	2011.04.25