LME
An HKEX Company

LMEsource

Client Interface Specification v3.05

THE LONDON METAL EXCHANGE

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Revision History

Version	Date	Revision History
1.0	27 Apr 2017	Initial release of document
2.0	11 Jan 2018	Rebranded to LMEsource Updates to message formats Updates to reference data values Additional examples of order book management Known issues appendix added
2.1	19 Jan 2018	Additional information around trading sessions and trade halts added (section 2.3)
2.2	30 Jan 2018	Add details of LMEprecious products (section 1.4) Add additional implied scenario (section 8.6)
2.3	13 Feb 2018	Typos fixed (section 5.2, 5.3) Clarify differences between top of book and aggregate order book order message in the refresh snapshot (section 4.4). Rename 'bait' to 'implied' where appropriate to be consistent with industry standard terminology
2.4	13 Mar 2018	Added known issue for incorrect intraday trade stats following a busted trade in an Option Strip instrument (section 10.4) Add known issue for behavioural differences in the reference data between the LME base metal and the LMEprecious markets (section 10.5).
2.5	21 Mar 2018	Remove references to state change event values of STATE_CHANGE_OS_RULE_GROUP and UNX from section 3.8.1
2.6	10 Apr 2018	Update Market Data Product Summary Table to include Trades in Level 1 products. Section 1.4.7. Add list of valid Segment IDs that may be present in the Security Definition (301) message. Section 6.7. Explicitly state that during BST, the date in the packet header (section 3.3) and the TimeOfEvent field in the Security Status (310) message (section 3.8.1) will be for the previous day between the times of 00:00:00 BST and 00:59:59.999 BST. Correct ERD for Metal Option (section 7.3). Add details around security status messages during a trade halt (section 2.3.2). Further explanation of Orderbook ID behaviour around Rolling Prompts (section 3.7.2.1)

2.7	19 Apr 2018	Remove reference to STATE_CHANGE_OB_RULEGROUP from Security Status (310) message definition (section 3.8.1) Add list of valid trade states (section 6.4.1)
2.8	26 Apr 2018	Correct number of order and number of implieds in examples (section 5.3) Confirm that the number of orders includes any implied orders at the same price level (section 3.9) Include details of additional security status messages for TOM carry contracts at market close. Include details on trade halt types, (section 6.8)
2.9	9 May 2018	Remove trade sub-types: TRADE_REPORT, AUCTION, MANUAL_LAST_TRADE, MANUAL_LAST_AUCTION, MANUAL_LAST_REFERENCE and CLOSING (section 6.5)
2.10	14 May 2018	Addition of sub-type MARKET_ON_OPEN (section 6.5)
2.11	22 May 2018	Traded Instruments are disseminated on Reference Data Flow upon Market Close (section 2.2.2.1)
2.12	24 May 2018	Remove references to PENDING_TRADE_HALT_LIFT from the TradeHaltEventType field. (section 3.8.1)
2.13	29 May 2018	Remove details referring to order book state changes.
2.14	30 May 2018	Remove wording: “If the event is part of a current value this field contains a non-valid value” (sections 3.8.1, 3.9.1, 3.9.2, 3.10.1, 3.10.2, 3.10.3, 8.3, 8.4, 8.5.1, 8.5.2, 8.5.3.1, 8.5.3.2, 8.5.4, 8.5.5)
3.00	09 July 2018	Updates for the introduction of TAS Price Codes Updated Reference Data ERDs to include TasPriceTypeId (sections 3.7 & 7) Updated Instrument Definition Message to include TasPriceTypeId (section 3.7.1) Updated Trade Statistic Message to remove TimeOfTrade field (section 3.10.3) Additional Contract Type Values for CARRY_TAS and OUTRIGHT_TAS (section 6.2) Reference to LMEprecious Futures (section 9.1) Rename Metal Options to Base Metal Options (section 9.2) Add section 9.3 – Precious Options
3.01	13 July 2018	Include TAS codes (section 3.7.1)
3.02	06 Aug 2018	Remove TimeOfTrade field from Trade Statistics example (section 8.5.4)
3.03	03 Sep 2018	Additional information added regarding publication of EOD Trade Statistics (section 3.10.2)

3.04	19 Nov 2018	Update 'Book Identification' section (section 5.1). Add statement to clarify that if a single order results in multiple matched trades, only a single Trade Statistics (352) message will be published after the last trade in the match (section 3.10.3).
3.05	02 Feb 2021	Correction to example Aggregate Order Book example in section 5.3.5

Contents

1 Introduction

1.1 Purpose

This document specifies the interface to the new LME's market data platform "LMEsource".

1.2 Intended Audience

This document is intended for use by LME members, Market Data Vendors and ISVs who wish to subscribe to market data from LMEsource, the new LME market data platform.

1.3 Reading Guide

The chapters following this introduction are:

Chapter 2:	System Overview
Chapter 3:	Message Formats
Chapter 4:	Recovery
Chapter 5:	Aggregated Order Book Management
Chapters 6 - 10:	Appendices

All chapters except Chapter 3 are applicable to all data feeds unless otherwise specified. In Chapter 3, there are indications* in individual sections/sub-sections for their applicability to individual data feeds. Below is an example of the table along with explanations of what each of the data feeds represent.

The information is also summarised in Section 1.4.7 Summary Table.

* Example: Section 3.3 is applicable to M1, M15 and MM data feeds.

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.3	•	•	•

1.4 Products

A range of products are provided catering for the varying needs of LMEsource clients. The products are described below.

The LMEsource product only contains market data from the LME's electronic trading platform LMEselect, and as such is a subset of the LME's market data. Additional LME market data and information is available from the LMEselect MD market data platform.

Future releases of LMEsource will add additional datasets.

1.4.1 LME Level 1 ('M1')

This is a streaming feed for LME Market data for the base and ferrous metals market, which provides the Level 1 book showing only the top price level. This data feed also includes Trades and EOD Trade Statistics.

1.4.2 LME Level 2 ('M15')

This is a streaming feed for LME Market data for the base and ferrous metals market, which provides the Level 2 book showing up to 15 aggregated price levels. This data feed also includes Trades, Intraday Trade Statistics and EOD Trade Statistics.

1.4.3 LME Member ("MM")

This is a streaming feed for LME Market data for the base and ferrous metals market, which provides the Level 2 book showing up to 15 aggregated price levels. This data feed also includes Trades and EOD Trade Statistics.

1.4.4 LME Precious Level 1 ('M1')

This is a streaming feed for LME Market data for the precious metals market, which provides the Level 1 book showing only the top price level. This data feed also includes Trades and EOD Trade Statistics.

1.4.5 LME Precious Level 2 ('M15')

This is a streaming feed for LME Market data for the precious metals market, which provides the Level 2 book showing up to 15 aggregated price levels. This data feed also includes Trades, Intraday Trade Statistics and EOD Trade Statistics.

1.4.6 LME Precious Member ("MM")

This is a streaming feed for LME Market data for the precious metals market, which provides the Level 2 book showing up to 15 aggregated price levels. This data feed also includes Trades and EOD Trade Statistics.

1.4.7 Summary Table

The products above are shown below; please note specific chapters that are relevant to the individual products. The information supplied in the corresponding sub-sections applies to the data feed(s) marked with [●]

Section	Message Formats	LME Level 1 (M1)	LME Level 2 (M15)	LME Member (MM)	LME Precious Level 1 (M1)	LME Precious Level 2 (M15)	LME Precious Member (MM)
3.1	Data Types	●	●	●	●	●	●
3.2	Packet Structure	●	●	●	●	●	●
3.3	Packet Header	●	●	●	●	●	●

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3.10.1	Trade (350)	•	•	•	•	•	•
3.10.2	EOD Trade Statistic (351)	•	•	•	•	•	•
3.10.3	Trade Statistic (352)		•			•	
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3.12	Asian Reference (361)		•	•			
4	Recovery	•	•	•	•	•	•
5	Aggregate Order Book Management		•	•		•	•

1.5 Glossary of Terms

Term	Meaning
Opening Price	The Opening Price is the price of the first trade in LMEselect in the contract during that trading day. This is part of the end of day information sent out at the end of the trading day.
Closing Price	The Closing Price is the price of the last trade in LMEselect in the contract during that trading day. This is part of the end of day information sent out at the end of the trading day.
Trading High	The Trading High is the highest trade price for the contract during that trading day. This is part of the end of day information sent out at the end of the trading day. It is sent out at the end of the trading day for each instrument that has traded.
Trading Low	The Trading Low is the lowest trade price for the contract for that trading day. This is part of the end of day information sent out at the end of the trading day. It is sent out at the end of the trading day for each instrument that has traded.
LMEmini	An LMEmini is a five tonne cash-settled monthly futures contract that settles against the LME 'parent' contract Official LME Settlement price. They are only available for Primary Aluminium, Copper and Zinc.
LMEindex	LMEX is a flat index, in US dollars, constructed from six underlying base metal contracts of the LME (Primary Aluminium, Copper, Lead, Nickel, Tin and Zinc).

2 System Overview

2.1 Scope

LMEsource provides market data represented in an efficient binary message format for all instruments traded on the LME Market. It has been designed for high throughput and low latency.

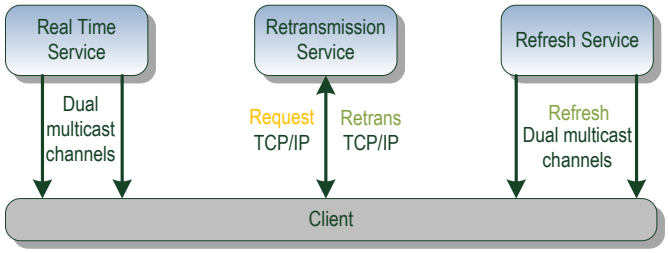


Figure 1: Access to Market Data

2.1.1 Multicast

Messages are published in a one-to-many fashion using the IP multicast and UDP transport protocols. Multicast is not a connection-oriented protocol. Data is sent strictly in one direction from server to clients.

2.1.2 Dual Multicast Channels

Due to the inherently unreliable nature of the UDP transport, packets may be lost or delivered out-of-order. To mitigate the risk of packet loss, the messages are duplicated and sent over two separate multicast channels (Line A and Line B). Technically, a multicast channel corresponds to a multicast group.

Each pair of dual multicast channels has a unique identifier, which is referred to as the Channel ID.

More details regarding the configuration parameters (including IP addresses, port numbers corresponding to the multicast channels) will be found in the Connectivity Guide.

2.1.3 Recovery Mechanisms

LMEsource provides two recovery mechanisms:

- A retransmission service provides on request gap-fill retransmission of lost messages. The retransmission requests and gap-fill replies are point-to-point (TCP/IP connection).
- A refresh service provides snapshots of the market state at regular intervals throughout the business day. Snapshots are sent using multicast on separate channels for the real time messages.

2.2 Session Management

Each multicast channel maintains its own session. A session is limited to one business day. During this day, the message sequence number is strictly increasing and therefore unique within the channel.

2.2.1 Start of Day

LMEsource will normally be brought up at around 00:30am London time. This start up time, however, is not rigid and the Exchange has the right to adjust this time according to the different trading situations.

On each channel, the first message at the start of the business day is the Sequence Reset message. The Sequence Reset message carries sequence number 1. On receipt of this message, the client must clear all cached data for all instruments.

The messages sent at start of day are:

- Security Definition, Combo Leg Definition messages for all tradeable series, including Combo Series
- Latest security quotation and trade statistic snapshot.
- Latest security status snapshot
- Latest Asian Reference snapshot

If a client starts listening after the start of business day and misses the Sequence Reset message and reference data, it must use the refresh service to recover and synchronize with the real time channels.

2.2.2 Normal Transmission

Normal message transmission is expected between when the market opens for trading and when the market is closed. Heartbeats are sent every at regular intervals (currently set at every 2 seconds) on each channel when there is no activity. LME may adjust this interval.

2.2.2.1 Market Close

Upon market close, a Security Definition (301) messages will be published with Action=2 (Update) for every instrument that has traded that day.

2.2.3 End of Day

LMEsource will typically shut down at around 10:00pm London time after the clearing processes have completed. Later shutdown is possible to cater for special circumstances. Shutdown time is not rigid and the Exchange has the right to adjust this time according to the different trading situations.

2.2.4 Error Recovery

2.2.4.1 System Component Failure

If a system component fails that leads to a small amount of packet loss and requires a failover or restart, there will be a short interruption in multicast dissemination from either Line A or Line B. The system is deployed in an active-active configuration with Line A and Line B being generated independently and so line arbitration will allow the client to continue receiving messages – see section 4 for more information about recovery.

2.2.4.2 Disaster Recovery

In the event of a disaster recovery situation at the primary site, LMEsource will be brought up at the disaster recovery (DR) site.

During the interruption, no data will be sent including heartbeats.

A Sequence Reset message will be sent on each channel when LMEsource is brought up. This will be followed by a snapshot of each channel. After the snapshot the market data feed will return to normal operations.

A Disaster Recovery (DR) Signal message indicating the DR status will also be sent on its dedicated channel when LMEsource is brought up – see section 3 for more information about the DR Signal message.

IP addresses and ports that have been provided for the disaster site's retransmission service should be used. See Connectivity Guide for more details.

2.3 Trading Session

Normally, trading is conducted in continuous trading session(s) every trading day. However, there are situations where there is only half day trading with fewer trading session(s), or a trading session is suspended due to any special situation. LMEsource is not affected by the number of trading sessions, and will continue to provide real time data as long as the Exchange's trading system is available.

2.3.1 Change of Trading Session

When LMEselect moves from one trading session to another, e.g. Pre-Open to Open, Open to Post-Trade, Halt to Pre-Open the following messages will be published:

1. An Aggregate OrderBook Update (353) message with UpdateAction = 74 (Orderbook Clear).
2. A Top of Book message (355) sent with Price = null, Qty = 0, No Of Orders = 0
3. A Security Status message with TypeOfStateEvent = 1 (Orderbook state change)

2.3.2 Trading Halts

The messages published by LMEsource differs from those published by the LMEselect MD service. The principle difference is that LMEsource does not publish order book clear messages at the time of the trade halt, but publishes them after the trade halt is lifted. The following sections detail the messages published by LMEsource.

2.3.2.1 Instrument Halt before Transition into Post-Trade

If an instrument is halted and the trading session transitions into Post-Trade without a lift of the trading halt, the following messages will be published:

1. A Security Status (310) message with TypeOfStateEvent set to 'HALT_EVENT' and TradeHaltEventType set to TRADE_HALT is published for the instrument at the time of the trade halt.
2. No OrderBook Clear messages will be published.

3. When the instrument goes into Post-Trade, e.g. at EOD, no Security Status (310) message with newState set to Post Trade will be published. EOD statistics will be published if the instrument previously traded on that business day.

2.3.2.2 Trade Halt Followed by a Trade Halt Lift

When an instrument is halted, and then lifted, the following messages will be published:

1. A Security Status (310) message with TypeOfStateEvent set to 'HALT_EVENT' and TradeHaltEventType set to TRADE_HALT is published for the instrument at the time of the trade halt.
2. No OrderBook Clear messages will be published.
3. When the trade halt is lifted, a Security Status (310) message with TypeOfStateEvent set to 'HALT_EVENT' and TradeHaltEventType set to TRADE_HALT_LIFTED is published for the instrument at the time of the trade halt lift.

   A further Security Status (310) message with TypeOfStateEvent set to 'STATE_CHANGE_OB' and NewState of 'Pre-OpenTH will be published.

   A Top Of Book (355) message will be published on the Level 1 channels. The TopOfBook (355) message will be published with both the Bid and Ask prices set to NULL, and all Number of Orders/Number of Implieds fields set to 0.

   Aa Aggregate Order Book Update (353) message will be published on the Level 2 channels. The Aggregate Order Book Update (353) message will be published with Side set to 0 (Bid) and PriceLevel set to 0 and UpdateAction set to 74 'ClearBook'.
4. After the completion of Pre-Open, a Security Status (310) message with TypeOfStateEvent set to 'STATE_CHANGE_OB' and NewState of 'Open' will be published.

   The same Top Of Book (355) and Aggregate Order Book Update (353) messages will be published as in step 3 above.

2.4 Race Conditions

Due to the nature of the dissemination protocol, the real time order/trade data and reference data are disseminated via separate channels so users need to be aware that there is a race condition.

As an example suppose a Market Status message is sent showing a change to state 'Closed', however for a very short time after this message the regular order and trade information for this series may continue to arrive.

3 Message Formats

3.1 Data Types

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.1	●	●	●

The following table lists all the data types used by LMEsource.

Format	Description
String	ASCII characters which are left aligned and padded with spaces, unless otherwise specified.
Uint8	8 bit unsigned integer.
Uint16	Little-Endian encoded 16 bit unsigned integer.
Uint32	Little-Endian encoded 32 bit unsigned integer.
Uint64	Little-Endian encoded 64 bit unsigned integer.
Int16	Little-Endian encoded 16 bit signed integer.
Int32	Little-Endian encoded 32 bit signed integer.
Int64	Little-Endian encoded 64 bit signed integer.
Binary	Unicode encoding used for Chinese characters which are left aligned and padded with binary null.

3.1.1 Null Values

From time to time certain fields cannot be populated and specific values are used to represent null. This is currently used within Int32 fields of the Trade (350) message, the Aggregate Order Book Update (353) message, the Trade Statistics (360) message as well as the Top Of Book (355) message.

Format	Null representation (Hex 2's complement)
Uint8	0x00
Int32	0x80000000
Int64	0x8000000000000000

3.1.2 DIVISOR Constant Values

Decimal values are sent as integers. Some fields are required to be divided by the Constant DIVISOR in below table. This is done for efficiency - for example, a price value sent as "12345000" and with DIVISOR.PRICE should be interpreted as "12.345000". See individual fields for the relevant DIVISOR to be used.

Constant	Integer Value	Comment
QTY	1000000	Divisor for quantity field
PRICE	1000000	Divisor for price fields
INTEREST	1000000	Divisor for interest fields
DELTA	1000000	Divisor for delta fields
DECIMAL	1000000	Divisor for decimal value fields

3.2 Packet Structure

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
0	●	●	●

Multicast packets are structured into a common packet header followed by zero or more messages. Messages within a packet are laid out sequentially, one after another without any spaces between them.

Packet Header	Message 1	Message 2	...	Message n

The maximum length of a packet is 1500 bytes, which includes the multicast headers, packet header and messages.

The packet header provides information including the total packet length, the number of messages within the packet, the sequence number of the first message and a send timestamp.

A packet will only ever contain complete messages; a single message will never be fragmented across packets.

The format of each message within a packet will vary according to message type. However, regardless of the message type, each message will start with a two-byte message size (MsgSize) followed by a two-byte message type (MsgType). These are described in the following table.

Field	Format	Len	Description

MsgSize	Uint16	2	Message length (including this field)
MsgType	Uint16	2	Type of message. The valid values for MsgType are below: 100 Sequence Reset 101 Logon 102 Logon Response 201 Retransmission Request 202 Retransmission Response 203 Refresh Complete 300 Instrument Definition 301 Security Definition 302 Combo Leg Definition 303 Strike Price Table Definition 310 Security Status 353 Aggregate Order Book Update 355 Top Of Book 350 Trade 351 EOD Trade Statistic 352 Trade Statistics 360 News 361 Asian Reference

3.3 Packet Header

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.3	●	●	●

All packets will begin with a common packet header.

Offset	Field	Format	Len	Description
0	PktSize	Uint16	2	Size of the packet (including this field)
2	MsgCount	Uint8	1	Number of messages included in the packet
3	Filler	String	1	
4	SeqNum	Uint32	4	Sequence number of the first message in the packet

8	SendTime	Uint64	8	UTC Timestamp. The number of *nanoseconds* since *January 1, 1970, 00:00:00 GMT*, precision is provided to the nearest microsecond. During BST, the date value in this field will have the previous day's date between the times of 00:00 BST and 01:00 BST.
Packet Length			16	

3.4 Control Messages

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.4	●	●	●

3.4.1 Heartbeat

Heartbeats consist of a packet header with MsgCount set to 0. They do not carry a sequence number and therefore do not increment the sequence number of the multicast channel. SeqNum is set to the sequence number of the previous message sent on the channel.

The Heartbeat message will be identical for all the services.

3.4.2 Sequence Reset (100)

The Sequence Reset message is sent on each multicast channel at start of day. It may also be sent intraday in case of a disaster recovery.

The client must ignore the sequence number of the Sequence Reset message itself, and set the next expected sequence number to NewSeqNo. The client may receive multiple sequence reset messages from all channels. Whenever the Sequence Reset message is received, clients must clear all cached data for all instruments and then subscribe to the refresh channels to receive the current state of the market.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	◄calculated
2	MsgType	Uint16	2	Type of message.	100 Sequence Reset
4	NewSeqNo	Uint32	4	New sequence number.	Always set to 1
Total Length			8		

3.4.3 **Disaster Recovery Signal (105)**

The Disaster Recovery (DR) Signal message is sent on a dedicated multicast channel (DR channel) whenever site failover is triggered. In normal situation, the dedicated DR channel only carries Heartbeats until the end of the business day.

When site failover begins, DR Signal is sent with "DRStatus=1" indicating that the DR process has been activated. Clients should then clear all cached market data and prepare their own system for the site failover. When the site failover process finishes, DR Signal will be sent with "DRStatus=2" thereupon clients could start rebuild the latest market image from the refresh service. The same DR Signal will be sent periodically until end of business day.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	105 DR Message
4	DRStatus	Uint32	4	Status during site failover	1 – DR in progress 2 – DR completed
Total Length			8		

3.5 Retransmission

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.5	●	●	●

Refer to section 4.3 Retransmission service for details on the retransmission messages.

Note that when the Logon (101) or Retransmission Request (201) messages are sent to the LMEsource server, the client must also include a packet header as shown below.

Also, note that the same header is used by the RTS server when sending either Logon Response (102) or Retransmission Response (202) messages to clients. Again, in this case the SeqNum and SendTime fields are not relevant and can be discarded.

Offset	Field	Format	Len	Values	Notes
0	PktSize	Uint16	2	32	16 bytes for this header plus 16 bytes for either the Logon (101) or Retransmission Request (201) message
2	MsgCount	Uint8	1	1	One message only
3	Filler	String	1		Empty Filler
4	SeqNum	Uint32	4	0	This field is not used
8	SendTime	Uint64	8	0	This field is not used
Total Length			16		

After this header, the fields for either Logon (101) or Retransmission Request (201) should follow.

3.5.1 Logon (101)

The Logon message enables client authentication. This is not required for multicast channels and is only used for retransmission requests.

Normal operation: Client sends a Logon message containing username to the LMEsource, which responds with a Logon Response message with the SessionStatus set to 0 (Session Active).

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	101 Logon
4	Username	String	12	Username to log on, padded with binary null characters	
Total Length			16		

3.5.2 Logon Response (102)

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	102 Logon Response
4	SessionStatus	Uint8	1	Status of the session	0 Session Active 5 Invalid username or IP address 100 User already connected
5	Filler	String	3		
Total Length			8		

3.5.3 Retransmission Request (201)

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	201 Retransmission Request
4	ChannelID	Uint16	2	Multicast Channel ID to which the retransmission relates	
6	Filler	String	2		
8	BeginSeqNum	Uint32	4	Beginning of sequence	
12	EndSeqNum	Uint32	4	Message sequence number of last message in range to be resent	
Total Length			16		

3.5.4 Retransmission Response (202)

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	202 Retransmission Response
4	ChannelID	Uint16	2	Multicast Channel ID with which the retransmission relates	
6	RetransStatus	Uint8	1	Status of the Retransmission response	0 Request accepted 1 Unknown/Unauthorized channel ID 2 Messages not available 100 Exceeds maximum sequence range 101 Exceeds maximum requests in a day
7	Filler	String	1		
8	BeginSeqNum	Uint32	4	Beginning of sequence	
12	EndSeqNum	Uint32	4	Message sequence number of last message in range to be resent	
Total Length			16		

3.6 Refresh

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.6	•	•	•

Refer to section 4.4 Refresh service for details on the Refresh Complete message.

3.6.1 Refresh Complete (203)

This message is published to mark the end of a refresh cycle, see section 4.4 for a full description of refresh.

Message Fields

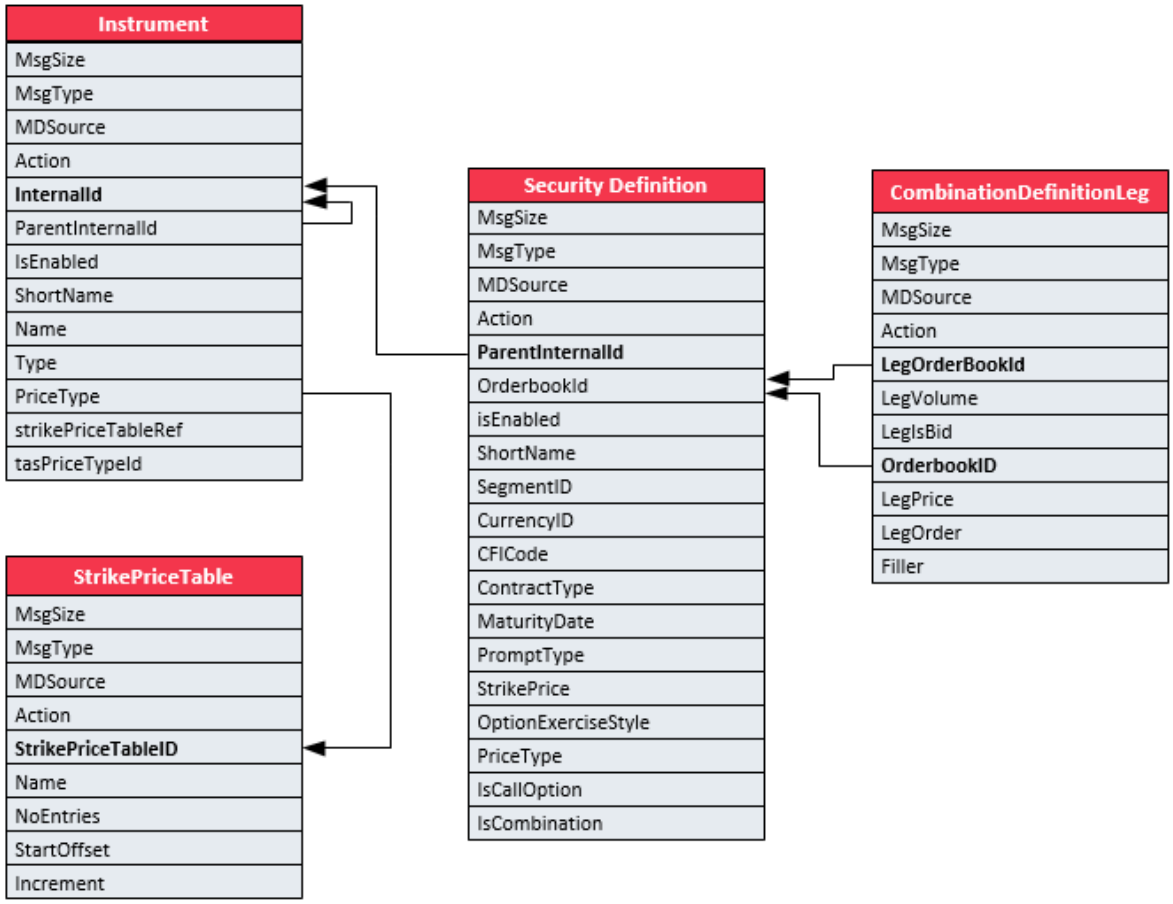
Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	203 Refresh Complete
4	LastSeqNum	Uint32	4	Sequence number with which the refresh is synchronized.	Numerical
Total Length			8		

3.7 Reference Data

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [•]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.7	•	•	•

Static Reference data is organised into two messages, which are shown in the entity relationship diagram below. The fields in bold are the primary keys for each message type.



Examples of reference data messages and their relationships are included in Appendix 7.

3.7.1 Instrument Definition (300)

Describes individual instrument class available from the LMEsource system.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	300 Instrument Definition
4	MDSource	String	2	Data Source of the message	'EL' Electronic
6	Action	Uint16	2	Used to identify cache action	1 Add 2 Update 4 Remove Cache DB
8	InternalID	String	64	A unique instrument identifier. The InternalID is created using the InstrumentID	

Offset	Field	Format	Len	Description	Values
				and InstrumentIdType fields. Example: AA_OUTRIGHT_SYMB	
72	ParentInternalID	String	64	This is a reference to the parent instrument, if any. A parent instrument is typically an underlying instrument when trading derivatives. Shall be set to null if this instrument is a "root" instrument.	
136	IsEnabled	Uint8	1	The administrative state of this item. If is enabled is set to false, all orderbooks at this and all levels below will be set to a persistent full-halt state. An instrument that has been halted may still have this field set to 1.	2 Not Available – no status available from matching engine 1 True 0 False
137	ShortName	String	32	The short display name for the instrument, AA, AA OPTION, AA CARRY for example.	
169	Name	String	64	The complete instrument name.	
233	InstrumentType	String	32	The type of instrument (equity, warrant, future etc.).	Please refer to Appendix 6.1
265	PriceType	UInt8	1	The pricing used for this instrument	1 Premium (for Futures, TAPOS and Index Options) 2 Volatility (For Metal Options)
266	StrikePriceTableRef	Int64	8	The strike price table that is used for Options on this underlying product.	
274	TasPriceTypeID	String	2	The TAS Price Type for this instrument	Example values are: TC Trade at Closing Price TS Trade at Settlement Price TA Trade at AM VWAP TN Trade at Noon VWAP TP Trade at PM VWAP Other values may also be present. May be NULL
276	Filler	String	2		
Total Length			278		

3.7.2 Security Definition (301)

Describes an individual tradable instrument available from the LMEsource system.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	

Offset	Field	Format	Len	Description	Values
2	MsgType	Uint16	2	Type of message.	`301` Security Definition
4	MDSource	String	2	Data Source of the message	`'EL'` Electronic
6	Action	Uint16	2	Used to identify cache action	1 Add 2 Update 4 Remove Cache DB
8	ParentInternalID	String	64	The internalID of the parent Instrument. This id is defined as "parentInstrumentID".	
72	OrderbookID	Int64	8	The id of the orderbook for which trades in this tradable Instrument are held. **Note:** The OrderbookID may not be persistent across different trading days.	
80	IsEnabled	Uint8	1	The administrative state of this item. If is enabled is set to false, all orderbooks at this and all levels below will be set to a persistent full-halt state. An instrument that has been halted may still have this field set to 1.	2 Not Available – no status available from matching engine 1 True 0 False
81	ShortName	String	32	Display name of this tradable instrument	
113	SegmentID	String	32	The segment where this instrument is traded, reflecting a Segment object's segmentId field. The segment specified must belong to the market stated in the marketId field and belong to the market list stated by the marketListId field.	Please refer to Appendix 6.7
145	CurrencyID	String	3	The currency code according to ISO 4217	
148	CFICode	String	6	The instrument classification according to ISO 10962.	
154	ContractType	Int64	8	Constant contract type	Please refer to Appendix 6.2
162	MaturityDate	String	10	The expiration date for this option. The format is yyyy-mm-dd.	
172	PromptType	Uint16	2		Please refer to Appendix 6.3
174	StrikePrice	Int64	8	The strike price for this option.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE
182	OptionExerciseStyle	UInt8	1	The option exercise style (European, American etc.).	0 Undefined or not available 1 European 2 American
183	PriceType	UInt8	1	The pricing model used for this option	0 Undefined (For Futures) 1 Premium (for TAPOS and Index Options) 2 Volatility

Offset	Field	Format	Len	Description	Values
					(For Metal Options)
184	isCallOption	UInt8	1	If set to true, this option tradable instrument represents a call option, otherwise it is a put option	2 Not Available 1 True 0 False
185	IsCombination	Uint8	1	Set to true if this tradable instrument is a combination tradable instrument.	2 Not Available 1 True 0 False
Total Length			186		

3.7.2.1 Order Book IDs

The Orderbook ID for an individual instrument may not persist across business days. An example of when an Orderbook ID will change is when an existing instrument coincides with a “Rolling Prompt” instrument.

For example:

Suppose the Orderbook ID for the AHD JUL18 Metal Future that falls on July 18th 2018 prompt is 1236.

On April 18th 2018, the 3M date will also be July 18th 2018, and therefore the AHD instrument that falls on this date will be the AHD3M instrument with an Orderbook ID of 1030. There will be no AHD JUL18 instrument, and therefore the Orderbook ID of 1236 will not be present in the reference data. Market data relating to the AHD contract on this date will be referenced using the Orderbook ID of 1030.

On April 19th 2018, the 3M date will no longer coincide with July 18th 2018, and so there will be Orderbook IDs for both the AHD JUL18 Metal Future and for the AHD3M instrument.

3.7.3 Combo Leg Definition (302)

Describes individual combination leg definition available from the LMEsource system.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	**302** Combo Leg Definition
4	MDSource	String	2	Data Source of the message	'EL' Electronic
6	Action	Uint16	2	Used to identify cache action	1 Add 2 Update 4 Remove Cache DB
8	LegOrderbookID	Int64	8	One of the order books spanned by the combination. This is the id of the leg, since an order book can only occur once in a combination definition.	

Offset	Field	Format	Len	Description	Values
16	LegVolume	Uint16	2	What volume an order with volume 1 in the combination book describes in this leg order book.	
18	LegIsbid	Uint8	1	What operation a bid order in the combination book describes in this leg order book.	1 True 0 False
19	OrderbookID	Int64	8	This is a redundant field, as it represents the same relation as the orderBook relation below.	
27	LegOrder	Uint16	2	The order of the individual combination legs. The first leg has number 1. This ordering is used for display purposes and for some processing purposes.	
29	Filler	String	2		
Total Length			31		

3.7.4 Strike Price Table Definition (303)

Describes the strike price table definition available from the LMEsource system.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	303 Strike Price Table Definition
4	MDSource	String	2	Data Source of the message	'EL' Electronic
6	Action	Uint16	2	Used to identify cache action	1 Add 2 Update 4 Remove Cache DB
8	StrikePriceTableID	Int64	8	A unique strike price table identifier.	
16	Name	String	48	The display name for this strike price table	
64	NoEntries	Uint8	1	Number of book entries within the message	The maximum number of entries in a StrikePriceTable is 15.
65	StartOffSet	Int64	8	Offset where this new strike price interval is to take effect.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE
73	Increment	Int64	8	Price increment in this interval.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE
Total Length			65 + 16n_o		

(n_o = value of NoEntries)

3.7.5 Intraday Disabling / Deletion of an Instrument

If an instrument is disabled / deleted intraday, a Security Status (310) message for the instrument will be published, specifying a trade halt event type of disabled. An instrument delete message will not be published.

If the deleted instrument is a carry instrument, there will be no delete message sent for the Combination Definition Legs (302). These Combination Definition Legs will not be present on subsequent business days.

3.8 Status Data

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.8	●	●	●

3.8.1 Security Status (310)

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	`310` Security Status
4	MDSource	String	2	Data Source of the message	`'EL'` Electronic
6	TimeOfEvent	Int64	8	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B. During BST, the date value in this field will have the previous day's date between the times of 00:00:00 BST and 00:59:59:999 BST.	
14	TypeOfStateEvent	Uint8	1	The type of the event. Please see the description of STATE_EVENT for an explanation of how state changes on order book and order book rule group level are correlated.	Please refer to Appendix 6.4
15	OrderbookID	Int64	8	The order book ID	
23	NewState	String	32	The name of the new state (i.e. the display name of the state transition).	This field is only filled in if typeOfStateEvent is set to STATE_CHANGE_OB. For all other values of typeOfStateEvent, this field should be ignored. Please refer to Appendix 6.4.1 for a list of valid states.

Offset	Field	Format	Len	Description	Values
55	TradeHaltEventType	Uint8	1	This field is only filled in for the type of state event HALT_EVENT in which it indicates the type of trade halt event.	0 Not a trade halt event 1 Trading_halt 2 Trading_halt_lifted
56	TradeHaltReason	Uint8	1	This field is only filled in for the type of state event HALT_EVENT in which case it indicates the halt reason.	0 Not a trade halt event 1 No_reason_specified 2 Underlying_stopped_trading 3 Technical 4 Regulatory 5 Price_break 6 Clearing 7 Disabled 8 Last_trading_date_past
57	TradeHaltType	Uint8	1	This field is only filled in for the type of state event HALT_EVENT in which case it indicates the type of trade halt.	0 Not a trade halt event 1 No_match 2 Full_halt Please refer to Appendix 6.8 for further details on these trade halt types.
58	Filler	String	2		
Total Length			60		

3.9 Order Book Data

3.9.1 Aggregate Order Book Update (353)

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.9.1		●	●

The aggregate order book is sent whenever there is an orderbook change within the top 15 price levels.

Refer to Section 5 - Aggregate Order Book Management for details on the Aggregate Order Book Update message.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	353 Aggregate Order Book Update
4	MDSource	String	2	Data Source of the message	'EL' Electronic
6	TimeOfEvent	Int64	8	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.	
14	OrderbookID	Int64	8	The order book ID	
22	NoEntries	Uint8	1	Number of book entries within the message	
23	AggregateQuantity	Int64	8	Aggregated quantity.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.QTY.
31	Price	Int64	8	Price	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
39	NumberOfOrders	Uint32	4	Number of orders at this price level	The NumberOfOrders includes any implied orders at the price level. Therefore the value of NumberOfOrders will always be greater than or equal to the value of NumberOfImplieds
43	NumberOfImplieds	Uint32	4	Number of implied orders at this price level	
47	Side	Uint8	1	Side of the order	0 Bid 1 Ask
48	PriceLevel	Uint8	1	Indicates the price level (within top 15) of the information carried in the message	1 to 15 Level 2 Orderbook Liquidity
49	UpdateAction	Uint8	1	Type of market data update action	0 New 1 Change 2 Delete 74 Clear
Total Length		23 + 27n_o			

(n_o = value of NoEntries)

The UpdateAction field will have the value of '74' in the following scenarios:

1. When the market state changes, e.g. from Pre-Open to Open, Open to Post-Trade.
2. When LMEsource is in an internal recovery situation.

3.9.2 Top Of Book (355)

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)

3.9.2	•		

The Top Of Book message is generated when the top price level has been modified.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	355 Top of Book
4	MDSource	String	2	Data Source of the message	'EL' Electronic
6	TimeOfEvent	Int64	8	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.	
14	OrderbookID	Int64	8	The order book ID	
22	AggregateBidQuantity	Int64	8	Aggregated number available on the bid side	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.QTY.
30	AggregateAskQuantity	Int64	8	Aggregated number available on the ask side	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.QTY.
38	BidPrice	Int64	8	The bid price	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
46	AskPrice	Int64	8	The ask price.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
54	NumberBidOrders	Uint32	4	Number of bid orders at this price level	The NumberBidOrders includes any bid implied orders. Therefore the value of NumberBidOrders will always be greater than or equal to the value of NumberBidImplieds
58	NumberAskOrders	Uint32	4	Number of ask orders. at this price level	The NumberAskOrders includes any ask implied orders. Therefore the value of NumberAskOrders will always be greater than or equal to the value of NumberAskImplieds
62	NumberBidImplieds	Uint32	4	Number of bid implied orders at this price level	
66	NumberAskImplieds	Uint32	4	Number of ask implied orders at this price level	
Total Length			**70**		

3.10 Trade and Price Data

3.10.1 Trade (350)

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.10.1		●	●

The Trade message is generated each time a trade has been performed

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	`350` Trade
4	MDSource	String	2	Data Source of the message	`'EL'` Electronic
6	TimeOfEvent	Int64	8	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.	
14	TimeOfTrade	Int64	8	Time of trade. Specified as microseconds from midnight, January 1, 1970 UTC.	
22	OrderbookID	Int64	8	The order book ID	
30	Price	Int64	8	The price of the trade.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
38	Quantity	Int64	8	Trade volume.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.QTY.
46	TypeOfTrade	Uint8	1	Type of trade.	`1` New `2` Busted
47	SubTypeOfTrade	int32	4	Bitmask with sub type information, bits defined in SUB_TYPE_OF_TRADE constant group.	Please refer to Appendix 6.5
51	TradeID	Int64	8	An id is assigned to each individual trade. This id is guaranteed to be unique within the system and over time. A busted trade will have the same TradeID as the original trade.	

Offset	Field	Format	Len	Description	Values
59	DealID	Int64	8	An id is assigned to each deal. A deal is defined as all trades generated by a single event. An event is for example an incoming order or an uncross. Thus all trades resulting from the same event will have the same deal number. This id is guaranteed to be unique with the system and over time.	
Total Length			67		

3.10.2 EOD Trade Statistic (351)

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.10.2	●	●	●

The EOD Trade Statistic message is generated when the market moves to the Post-Trade session for instruments that have traded. LMEsource will publish the LMEselect Opening and Closing Prices, LMEselect Trading High, and LMEselect Trading Low for all contracts that have traded during the day.

Note: due to sequence of message publication the EOD Trade Statistic message may be disseminated before the Security Status (310) message that confirms the instrument as being in a 'Closed' state.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	`351` EOD Trade Statistics
4	MDSource	String	2	Data Source of the message	`'EL'` Electronic
6	TimeOfEvent	Int64	8	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.	
14	OrderbookID	Int64	8	The order book ID	
22	OpenPrice	Int64	8	Opening trade price for the current day.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
30	HighPrice	Int64	8	Highest trade price for the current day.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
38	LowPrice	Int64	8	Lowest trade price for the current day.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.

Offset	Field	Format	Len	Description	Values
46	ClosingPrice	Int64	8	Closing trade price for the current day.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
Total Length			54		

3.10.3 Trade Statistic (352)

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.10.3		●	

The Trade Statistic message contains information for completed trades. The trade statistics information carried in this message type is provided on a snapshot basis. If a single order hits multiple orders resulting in multiple Trade (350) messages, only a single Trade Statistic (352) message will be published after the last trade in the match.

LMEsource will publish the LMEselect Opening Price, LMEselect Trading High, Low and Average Prices, Last Trade Price and Last Trade Volume for the instrument.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	**352** Trade Statistics
4	MDSource	String	2	Data Source of the message	'EL' Electronic
6	TimeOfEvent	Int64	8	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.	
14	OrderbookID	Int64	8	The order book ID	
22	OpenPrice	Int64	8	Opening trade price for the current day.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
30	HighPrice	Int64	8	Highest trade price for the current day.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
38	LowPrice	Int64	8	Lowest trade price for the current day.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.

Offset	Field	Format	Len	Description	Values
46	AveragePrice	Int64	8	Volume-weighted average price (VWAP) so far during the current day.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE. Note: AveragePrice is not populated for Option Strip Instruments.
54	LastTradePrice	Int64	8	Reflects the price of the last non-busted trade (price from the same trade that set lastTradeVolume).	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
62	LastTradeVolume	Int64	8	Reflects the volume of the last non-busted trade (volume from the same trade that set lastTradePrice)	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.QTY.
Total Length			70		

3.11 News

3.11.1 News (360)

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.11.1	●	●	●

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	360 Market Alert
4	MDSource	String	2	Data Source of the message	'EL' Electronic
6	Message	String	255	The message text.	
261	TimeStamp	String	24	The date and time of the message. The format is yyyy-MM-ddTHH:mm:ss.SSS.	
285	MessageID	Uint32	4	Unique identification of the message intraday.	
Total Length			289		

3.12 Reference Information

3.12.1 Asian Reference (361)

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
3.12.1		●	●

Asian reference prices are published to coincide with the end of the Asian trading day, at around 06:55 - 07:00 GMT (07:55 - 08:00 BST).

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	`361` Asian Reference
4	MDSource	String	2	Data Source of the message	`'EL'` Electronic
6	TimeStamp	String	23	The date and time of modification for this reference data object. Format: yyyy-MM-dd'T'HH.mm.ss.SSS. May be null if the object never has been updated.	
29	ContractID	String	128	The id of the instrument the price represents.	
157	CalculatedPrice	Int64	8	The price to be displayed for all.	This field is a fixed point number with a scaling factor equal to 1/DIVISOR.PRICE.
165	PriceType	Uint8	1	The price type, provisional or confirmed	Please refer to Appendix 6.6
166	NumberOfLots	Int64	8	The number of lots used for calculating this price. Not to be officially displayed	
Total Length			174		

4 Recovery

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
4	●	●	●

LMEsource provides three different mechanisms for recovering missed data:

- Line arbitration – using dual multicast channels (Line A and Line B)
- Retransmission Server – recovery of a limited number of messages
- Refresh Server – snapshot of current market state

These mechanisms should be used as described in the following table.

Event	Action
Packet lost on one either Line A or Line B	Try to recover data from the other line with a configurable timeout (“arbitration mechanism”).
Dropped packet(s) on both Line A and Line B	Recover dropped message(s) from the Retransmission Server.
Late start up or extended intraday outage	Wait for a refresh of the current market state and then continue with real time messages.

4.1 Gap Detection

Each packet provides the sequence number (SN) of the first message it contains. This sequence number starts at 1 and increases with each subsequent message.

The sequence numbers provided in every packet header is calculated by adding the previous sequence number and the message count, as shown in table below:

Packet	Sequence Number	Message Count
Packet 1	1	4
Packet 2	5	2
Packet 3	7	1
Packet 4	8	3
Packet 5	11	1

If the client drops the first five packets, they would request a gap fill for messages 1-11.

All messages conform to the message level sequencing. Each channel has its own sequence number. This allows recipients to detect gaps or duplicates in each message sequence number and, if appropriate, reconcile them (line arbitration) with the primary or secondary multicast groups or request retransmission of the missing / corrupted messages.

Users should use this sequence number to detect gaps in the transmission of messages.

The following diagram illustrates how the message sequence number should be used to detect gaps in the feed.

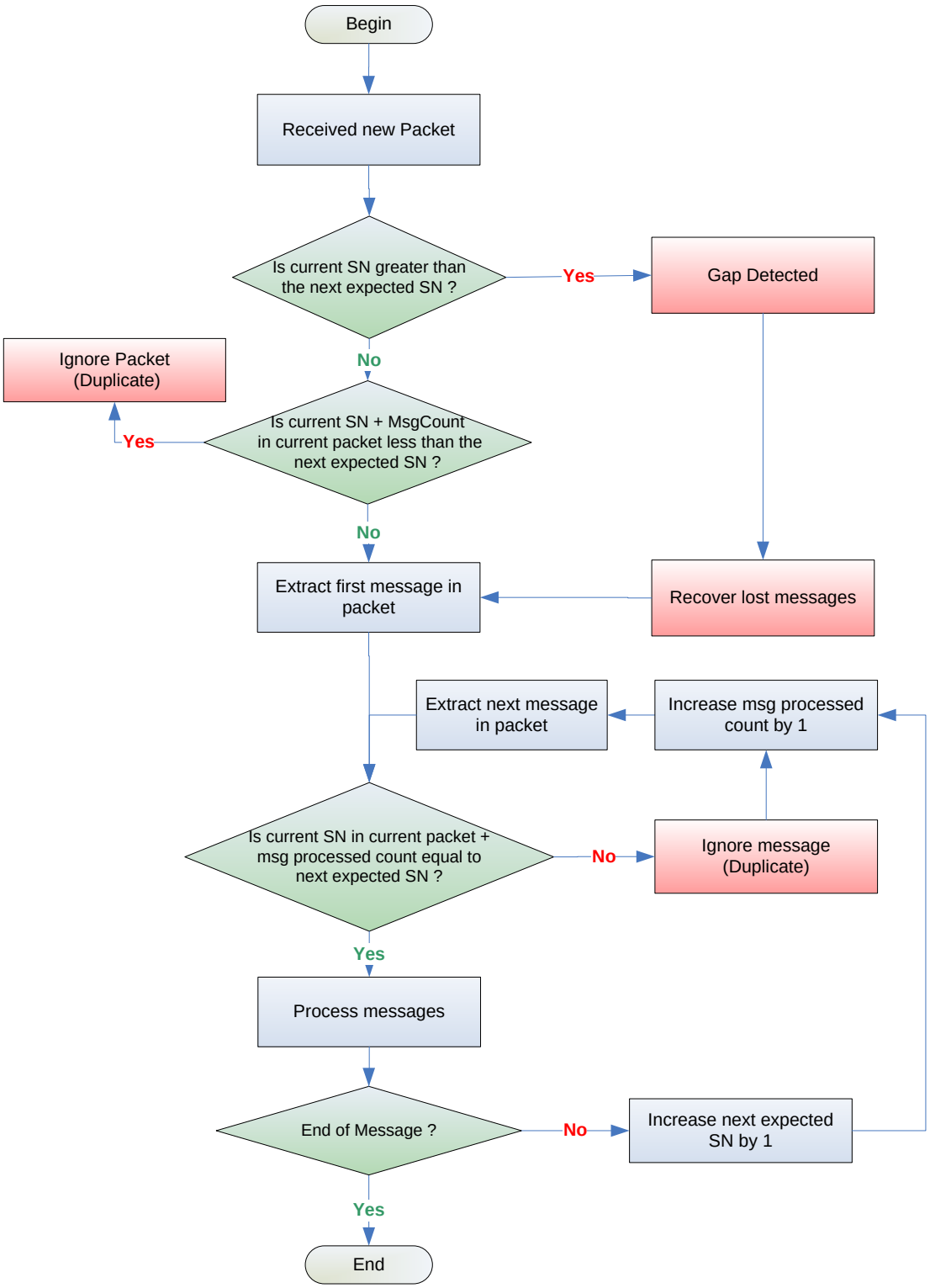


Figure 2: Gap Detection using the Sequence Number (SN)

4.2 Line Arbitration

Client applications should check the sequence number (SN) and message count (MC) for every packet received. SNs are unique and increase monotonically for each service; the MC indicates the number of messages within each packet.

Line A and Line B are identical in terms of:

- SNs
- Messages that are sent
- Sequence in which messages are sent

However, it is not guaranteed that a packet content between Line A and Line B will be the same. For example, the third packet of the day from the Line A could contain SN 10 with MC 3, whereas the third packet of the day from Line B could contain SN 9 with MC 4. For this reason clients must arbitrate on SN (at the message level) rather than packet content. Client applications should listen to both Line A and Line B in real-time. Clients should look at packets coming from both lines and process the ones that arrive first, regardless of whether they came from Line A or Line B. It is advisable to apply the “first come – first served” rule.

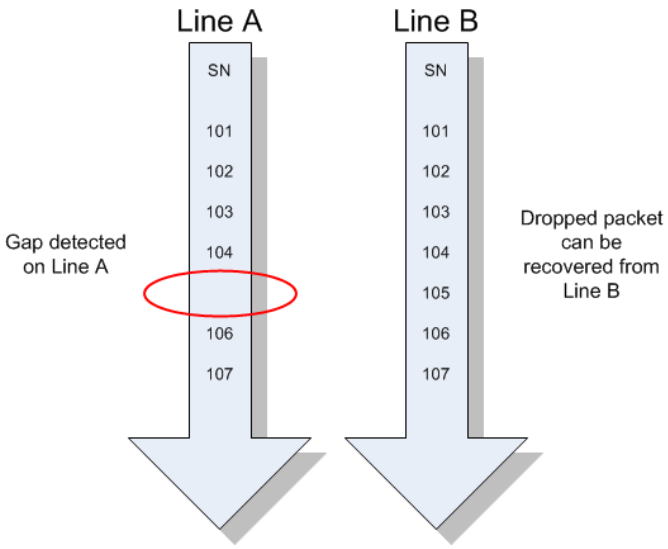


Figure 3: Detecting Missing Packets

Additional Notes;

- The above example of a dropped packet is a simplified example assuming 1 message per packet, in reality each packet is likely to contain multiple messages.
- Whilst the order of individual messages between Line A and Line B will be identical, there is no guarantee that the packets will contain exactly the same messages.

- In the example below, three packets are sent on each line, but message 'OrderUpdate3' appears in one packet from Line A but in the subsequent packet on Line B.

Primary		
Messages	**MC**	**SN**
OrderUpdate1 OrderUpdate2 OrderUpdate3	3	101
Trade1 OrderUpdate4	2	104
Trade2 Statistics1	2	106

Secondary		
SN	**MC**	**Messages**
101	2	OrderUpdate1 OrderUpdate2
103	3	OrderUpdate3 Trade1 OrderUpdate4
106	2	Trade2 Statistics1

Figure 4: Normal Message Delivery

4.3 Retransmission Service

The retransmission service is provided via the TCP/IP protocol and is designed to allow clients to recapture a small number of missed messages already published on the real time channels.

It is not intended that clients use the retransmission server to recover data after long outages or on late start up (in these situations, clients should use the Refresh service). To that end, it aims to support the retransmission of the data covering the market activities for the last 15-30 seconds only. This figure is indicative only and may be shorter than 15 seconds if a spike happens in the market. The sequence range of messages that a client can request and the number of retransmission requests permitted per day is also limited.

The following diagram illustrates the message flow during a retransmission session:

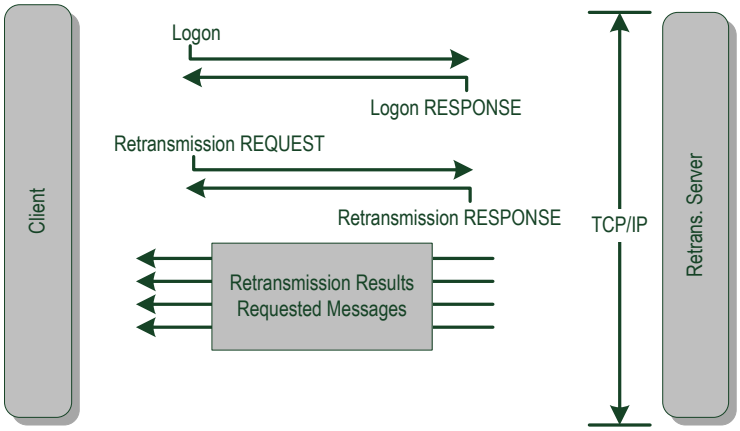


Figure 5: Retransmission Request

Logon

The client establishes a TCP/IP connection and initiates a session by sending the Logon message. Once the client is authenticated, the server will respond immediately with the Logon Response message. If the client does not send a Logon message within the logon timeout interval, the server will close the connection.

Logons may be rejected for the following reasons:

- Invalid username
- User already connected

In all cases the server will close the connection after sending the Logon Response message.

Making a request

The client can make a retransmission request by sending the Retrans Request message. The server will respond with a Retrans Response message to indicate whether the request has been accepted or not.

In the case of a successful request, the server will send the requested messages immediately after the Retrans Response message.

The sequence numbers will be the same as when they were first sent on the real time multicast channel. The framing of the retransmitted messages into a packet may differ from the original transmission.

Retransmission requests may be rejected for the following reasons:

- Unknown channel ID or illegal (not authorized)
- Messages not available
- Exceeds maximum sequence range
- Exceeds maximum requests in a day

In the case where the client has exceeded the maximum number of requests allowed in a day, the server will close the connection after sending the Retrans Response message.

The following diagram is a guideline of the flow of logic when making a request:

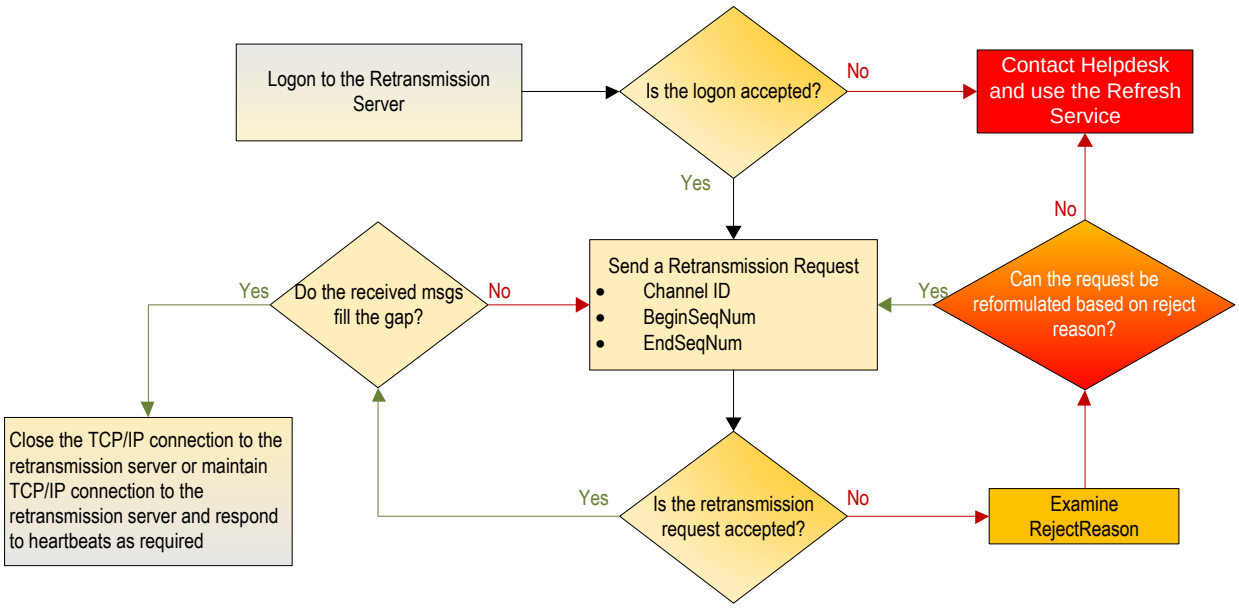


Figure 6: Requesting Dropped Packets

Multiple requests and concurrent sessions

Clients can send multiple requests during a session and can keep the session open during idle periods by responding to heartbeats sent by the server. Concurrent sessions however will not be supported. Each user can only have one session open at a time.

If a client makes multiple requests, the server will process them serially. Clients are unable to cancel outstanding requests.

Heartbeats

To determine the health of the user connection on the TCP/IP channel, the Retransmission Server will send regular heartbeat packets to the user. The heartbeat frequency is 30 seconds. The client application must respond with a “Heartbeat Response” packet. The time out for this heartbeat response packet is set at 5 seconds. If no response is received by the server within this timeframe, the TCP/IP session will be disconnected.

Figure 7: Retransmission Server Heartbeat Message

A “heartbeat response” packet consists in an exact copy of the incoming heartbeat packet.

Closing the session

Sessions should be terminated by gracefully closing the TCP/IP connection.

System limits

The system limits mentioned above are set as follows:

System Limit	Value
Maximum sequence range that can be requested	10,000
Maximum number of requests per day	1,000
Logon timeout (seconds)	5
Heartbeat interval (seconds)	30
Heartbeat response timeout (seconds)	5

Please note that the maximum number of requests per day limit is across all channels.

High availability

The retransmission service is comprised of a high availability pair of retransmission servers at the Active Production site. There is a corresponding pair of retransmission servers at the Standby Production site.

The LME will provide a Fully Qualified Domain Name (FQDN) to access the retransmission service. Under normal operation the FQDN will resolve to the high availability retransmission service at the Active Production site. Clients may connect to the retransmission service at the start of the day and maintain the connection during the day by responding to heartbeats.

Disaster recovery

Under normal operation the retransmission service at the Standby Production site is unavailable.

In the unlikely event of a disaster recovery situation, the retransmission service at the Standby Production site will take over. In this scenario the FQDN will automatically resolve to the high availability retransmission service at the Standby Production site.

4.4 Refresh Service

The refresh service is designed to allow clients to recover from a large-scale data loss. This can happen after a late start or during a major outage.

Synchronisation is on a per channel basis. For each real time multicast channel (besides those for News which are not recoverable via the Refresh service), there exists a corresponding refresh multicast channel on

which snapshots of the market state are sent at regular intervals throughout the business day. No ordering should be assumed between the various different data types unless otherwise stated – this is due to the nature of using multiple different multicast channels for refresh.

Snapshot

A snapshot of the market state is described in the table below:

Message	Snapshot description
Series Definition	A full list of all security definition, which includes any modifications or additions made intraday. The order is sent as: • Instrument Definition (300) • Security Definition (301) • Combo Leg Definition (302) • Strike Price Table Definition (303)
Security Status & EOD Trade Statistics	The most recent Security Status message(s) and EOD Trade Statistic message(s)
Orders	For M1 clients: the latest level 1 Price book via Top of Book messages. The refresh snapshot includes a top of book message for every instrument. The top of book message will be empty for instruments without any active orders. For M15 and MM clients: The latest 15 levels of Price book via Aggregate Order Book (353) messages. Only currently active order books are published, no orderbooks for instruments without any currently active orders are included in the refresh snapshot.
Trade Statistics	The latest Trade Statistics message
Trade	Full day Trade message(s) history from start of day
Asian Reference	The most recent Asian Reference message(s)

The ordering of refresh messages types within the multicast channels is detailed below:

Channel	Refresh Sequence
Static Base	Instrument definition (300), Security Definition (301), Combo Leg Definition (302), StrikePrice Table Definition (303)
Order (M1)	Top of Book (355)

Order (M15)	Aggregate Order Book Update (353)
Security Status	Security Status (310), EOD Trade Statistic (351)
Asian reference	Asian Reference (361)
Trade Statistics	Trade Statistics (352)
Trade	Trade (350)

Refresh complete

A Refresh Complete message is sent at the end of a snapshot indicating the sequence number with which the snapshot is synchronized.

Snapshot processing

Below is an overview of the steps to carry out in order to process a channel snapshot.

- Subscribe to the real time multicast channel and cache received messages.
- Subscribe to the corresponding refresh multicast channel and discard messages until the Refresh Complete message is received.
- Process received messages until the next Refresh Complete message is received.
- Store the LastSeqNum sequence number provided in the Refresh Complete.
- Unsubscribe to the refresh multicast channel.
- Discard the cached real time messages with sequence number less than or equal to LastSeqNum.
- Process the remaining cached real-time messages and resume normal processing.

Missed messages

The retransmission server does not support refresh channels. If a client misses messages, it must wait for the next snapshot. Similarly, if a client starts listening during the middle of a snapshot, it must wait for the next snapshot.

5 Aggregate Order Book Management

The information supplied in this section and its sub-sections applies to the data feed(s) marked with [●]

Section	LME Top of Book (M1)	LME 15 levels Pricebook (M15)	LME Member Pricebook (MM)
5		●	●

5.1 Book Identification

A book is uniquely identified by an OrderbookID. An OrderbookID is an integer representation of 4 bytes, Shortname is a longer String representation (32 bytes) that provides a human readable descriptive name for the instrument. The Shortname is included in the Security Definition (301) message.

For reasons of efficiency, OrderbookID is used as the identifier that appears on every instrument's order and trade messages.

5.2 Partial Price Depth

The price level within the Aggregate Order Book Update message determines the number of price levels the order price is away from the best price for a given order book. An order with price level 1 means the order's price is the best price, a price level of 2 signifies orders at the next best price, etc.

LMEsource provides a view of 15 price depths of aggregate order book for the LME Metal Exchange Markets. This view can be visualized as a number of rows in a table for each of the bid and ask sides. On each side, there are a number of rows showing the aggregate quantity available at a number of price levels.

For brevity, the examples in section 5.3 use 5 levels of price depths in order to demonstrate the aggregate orderbook update mechanism=, however the same principles apply to 15 levels of price depth.

The table below shows the starting position of the orderbook.

Bid Side					Ask Side				
Price Level	No. Of Implieds	No. Of Orders	Aggregate Quantity	Price	Price	Aggregate Quantity	No. Of Orders	No. Of Implieds	Price Level
1	1	3	700	9730	9760	500	3	2	1
2	1	1	350	9720	9770	300	2	1	2
3	0	1	150	9710	9780	100	1	0	3
4	0	1	250	9700	9790	150	1	0	4
5	-	-	-	-	-	-	-	-	5

5.3 Book Updates

LMEsource published book update messages as delta messages as defined in section 3 (Aggregate Order Book Update (353)). Each message may contain any combination of new, changed, deleted or orderbook clear entries for a book. The UpdateAction field defines the nature of an entry:

UpdateAction	Meaning	Value
New	to create/insert a new price level	0
Change	to update aggregate quantity at a price level	1
Delete	to remove a price level	2
Orderbook Clear	to inform users that all price levels should be cleared	74

5.3.1 Example 1 – An Existing Order has its Quantity Reduced and a New Order is Added

For example suppose the Ask order at price level 9770 is reduced in quantity and at the same time a new order is added at price level 9850, then the following message is sent;

Offset	Field Name	Value
0	MsgSize	77
2	MsgType	353
4	MDSource	EL
6	TimeOfEvent	123456789
14	OrderbookID	1234
22	NoEntries	2
23	AggregateQuantity	200
31	Price	9770
39	NumberOfOrders	1
43	NumberOfImplieds	1
47	Side	1 (Ask)

48	PriceLevel	2
49	UpdateAction	1
50	AggregateQuantity	300
58	Price	9850
66	NumberOfOrders	1
70	NumberOfImplieds	0
74	Side	1 (Ask)
75	PriceLevel	5
76	UpdateAction	0

The resulting book should now be as follows:

Bid Side					Ask Side				
Price Level	No. Of Implieds	No. Of Orders	Aggregate Quantity	Price	Price	Aggregate Quantity	No. Of Orders	No. Of Implieds	Price Level
1	1	3	700	9730	9760	500	3	2	1
2	1	1	350	9720	9770	200	1	1	2
3	0	1	150	9710	9780	100	1	0	3
4	0	1	250	9700	9790	150	1	0	4
5	-	-	-	-	9850	300	1	0	5

5.3.2 Example 2 – Implicit Level Adjustments

The client must adjust the price level of entries below deleted or inserted entries. Potential level adjustments must be carried out after each single entry in Aggregate Order Book message.

For example, if a bid order with price 9740 and quantity 50 is added to the order book above, it will cause the following message to be sent:

Offset	Field Name	Value
0	MsgSize	50
2	MsgType	353
4	MDSource	EL
6	TimeOfEvent	123456789
14	OrderbookID	1234
22	NoEntries	1
23	AggregateQuantity	50
31	Price	9740
39	NumberOfOrders	1
43	NumberOfImplieds	0
47	Side	0 (Bid)
48	PriceLevel	1
49	UpdateAction	0

After processing this message, the client's book should look as follows:

Bid Side					Ask Side				
Price Level	No. Of Implieds	No. Of Orders	Aggregate Quantity	Price	Price	Aggregate Quantity	No. Of Orders	No. Of Implieds	Price Level
1	0	1	50	9740	9760	500	3	2	1
2	1	3	700	9730	9770	200	1	1	2
3	1	1	350	9720	9780	100	1	0	3
4	0	1	150	9710	9790	150	1	0	4
5	0	1	250	9700	9850	300	1	0	5

Price levels of the other four Bid orders must all be incremented although there will not be Aggregate Order Book Update messages sent for the increment.

5.3.3 Example 3 – Implicit Deletions

If a new book entry causes the bottom entry of a book to be shifted out of the book (i.e. more than 5 price levels away from the best price), the client must delete the excess entry. If the book shrinks again, LMEsource resends the entries that have temporarily fallen out.

For example, if a bid order with price 9750 and quantity 250 is added to the book above, and the bid quantity at price 9710 is reduced from 150 to 110, it will cause the following message to be sent:

Offset	Field Name	Value
0	MsgSize	77
2	MsgType	353
4	MDSource	EL
6	TimeOfEvent	123456789
14	OrderbookID	1234
22	NoEntries	2
23	AggregateQuantity	250
31	Price	9750
39	NumberOfOrders	1
43	NumberOfImplieds	0
47	Side	1 (Bid)
48	PriceLevel	1
49	UpdateAction	0
50	AggregateQuantity	110
58	Price	9710
66	NumberOfOrders	1
70	NumberOfImplieds	0
74	Side	0 (Bid)
75	PriceLevel	5
76	UpdateAction	1

After processing this message, the client's book should look as follows:

Bid Side					Ask Side				
Price Level	No. Of Implieds	No. Of Orders	Aggregate Quantity	Price	Price	Aggregate Quantity	No. Of Orders	No. Of Implieds	Price Level
1	0	1	250	9750	9760	500	3	2	1
2	0	1	50	9740	9770	200	1	1	2
3	1	3	700	9730	9780	100	1	0	3
4	1	1	350	9720	9790	150	1	0	4
5	0	1	110	9710	9850	300	1	0	5

- Price 9750 and quantity 250 is added according to the message.
- Price 9700 and quantity 250 must be deleted by the client.
- Price 9710 quantity must be reduced to 110 – Price Level 5 is used in the incoming message to reflect the new price level of the price 9710 after the addition of the price 9750.

5.3.4 Example 4 – Explicit Additions

If orders are removed so that there are now less than 5 levels visible then the server will also automatically send the additional level(s) that are now revealed.

For example, if the bid order with price 9750 and quantity 250 is now removed from the book above and this reveals an 5th level which needs to be disseminated then it will cause the following message to be sent:

Offset	Field Name	Value
0	MsgSize	77
2	MsgType	353
4	MDSource	EL
6	TimeOfEvent	123456789
14	OrderbookID	1234
22	NoEntries	2
23	AggregateQuantity	250
31	Price	9750

Offset	Field Name	Value
39	NumberOfOrders	1
43	NumberOfImplieds	1
47	Side	1 (Bid)
48	PriceLevel	1
49	UpdateAction	2
50	AggregateQuantity	250
58	Price	9700
66	NumberOfOrders	1
70	NumberOfImplieds	1
74	Side	0 (Bid)
75	PriceLevel	5
76	UpdateAction	0

The resulting order book should now be:

Bid Side					Ask Side				
Price Level	No. Of Implieds	No. Of Orders	Aggregate Quantity	Price	Price	Aggregate Quantity	No. Of Orders	No. Of Implieds	Price Level
1	0	1	50	9740	9760	500	3	2	1
2	1	3	700	9730	9770	200	1	1	2
3	1	1	350	9720	9780	100	1	0	3
4	0	1	110	9710	9790	150	1	0	4
5	0	1	250	9700	9850	300	1	0	5

5.3.5 Example 5 – Additional Order at an Existing Price Level

If a new order is entered into the book at an existing price level, the number of orders and the quantity at that level is incremented.

For example, if an ask order with price 9780 and quantity 200 is added to the book above the following message will be sent:

Offset	Field Name	Value
0	MsgSize	50
2	MsgType	353
4	MDSource	EL
6	TimeOfEvent	123456789
14	OrderbookID	1234
22	NoEntries	1
23	AggregateQuantity	300
31	Price	9780
39	NumberOfOrders	2
43	NumberOfImplieds	0
47	Side	2 (Ask)
48	PriceLevel	3
49	UpdateAction	1

The resulting order book should now be:

Bid Side					Ask Side				
Price Level	No. Of Implieds	No. Of Orders	Aggregate Quantity	Price	Price	Aggregate Quantity	No. Of Orders	No. Of Implieds	Price Level
1	0	1	50	9740	9760	500	3	2	1
2	1	3	700	9730	9770	200	1	1	2
3	1	1	350	9720	9780	300	2	0	3
4	0	1	110	9710	9790	150	1	0	4
5	0	1	250	9700	9850	300	1	0	5

5.3.6 Example 6 – An Existing Order has its Quantity Increased Where it is the Only Order at the Price Level

If an existing order is revised with its quantity increased at a price level where it is the only order, this is treated as a delete of the existing order, and a new order with the new, increased quantity.

For example, if the bid order with price 9710 is revised to have a quantity of 150, the following message will be sent:

Offset	Field Name	Value
0	MsgSize	77
2	MsgType	353
4	MDSource	EL
6	TimeOfEvent	123456789
14	OrderbookID	1234
22	NoEntries	2
23	AggregateQuantity	110
31	Price	9710
39	NumberOfOrders	0
43	NumberOfImplieds	0
47	Side	1 (Bid)
48	PriceLevel	4
49	UpdateAction	2
50	AggregateQuantity	150
58	Price	9710
66	NumberOfOrders	1
70	NumberOfImplieds	0
74	Side	0 (Bid)
75	PriceLevel	4
76	UpdateAction	0

The resulting order book should now be:

Bid Side					Ask Side				
Price Level	No. Of Implieds	No. Of Orders	Aggregate Quantity	Price	Price	Aggregate Quantity	No. Of Orders	No. Of Implieds	Price Level
1	0	1	50	9740	9760	500	3	2	1
2	1	3	700	9730	9770	200	1	1	2
3	1	1	350	9720	9780	300	2	0	3
4	0	1	150	9710	9790	150	1	0	4
5	0	1	250	9700	9850	300	1	0	5

5.3.7 Example 7 – An Existing Order has its Quantity Increased When There are Multiple Orders at the Price Level

If an existing order is revised with its quantity increased at a price level where there are multiple orders at the price level, this is treated as an update.

For example, if one of the Bid orders at price 9730 is increased resulting in a total aggregate quantity of 800, the following message will be sent:

Offset	Field Name	Value
0	MsgSize	50
2	MsgType	353
4	MDSource	EL
6	TimeOfEvent	123456789
14	OrderbookID	1234
22	NoEntries	2
23	AggregateQuantity	800
31	Price	9730
39	NumberOfOrders	3
43	NumberOfImplieds	1
47	Side	0 (Bid)
48	PriceLevel	2
49	UpdateAction	1

The resulting order book should now be:

Bid Side					Ask Side				
Price Level	No. Of Implieds	No. Of Orders	Aggregate Quantity	Price	Price	Aggregate Quantity	No. Of Orders	No. Of Implieds	Price Level
1	0	1	50	9740	9760	500	3	2	1
2	1	3	800	9730	9770	200	1	1	2
3	1	1	350	9720	9780	300	2	0	3

4	0	1	150	9710	9790	150	1	0	4
5	0	1	250	9700	9850	300	1	0	5

5.3.8 Example 8 – Orderbook Clear

In certain failure scenarios, the system may send an 'Orderbook Clear' message at which point clients should clear both Bid and Ask side orderbooks for the specified series. An example message is shown below.

Following an 'Orderbook Clear' message, any existing orders for the series will be resent as normal to rebuild the current image.

Offset	Field Name	Value
0	MsgSize	50
2	MsgType	353
4	MDSource	EL
6	TimeOfEvent	123456789
14	OrderbookID	1234
22	NoEntries	1
23	AggregateQuantity	0
31	Price	0
39	NumberOfOrders	0
43	NumberOfImplieds	0
47	Side	0
48	PriceLevel	0
49	UpdateAction	74

6 Appendix A – Reference Data Values

This section lists the possible values that could be seen in the messages received from LMEsource.

6.1 Instrument Type

Constant Name	Type	Value	Comment
FUTURE_SINGLE	String	"FU_SI"	A Future instrument of outright type (i.e. a future single)
FUTURE_AVERAGE	String	"FU_AV"	An Average Future instrument
FUTURE_CARRY	String	"FU_CA"	A Carry Future instrument
OPTION_SINGLE	String	"OP_SI"	A Single Option instrument.
OPTION_AVERAGE	String	"OP_AV"	An Average Option instrument.
TAPO	String	"TAPO"	A TAPO Option instrument.
UNDERLYING	String	"UL"	An underlying instrument.

6.2 Contract Type

Constant Name	Type	Value (Hex)	Comment
OUTRIGHT_PHYSICAL	long	0000 0000 0000 0001	Future Outright Contract, physical settlement (1)
CARRY_PHYSICAL	long	0000 0000 0000 0002	Future Carry Contract, physical settlement (2)
AVERAGE_PHYSICAL	long	0000 0000 0000 0004	Future Average Contract, physical settlement (4)
OPTION_PHYSICAL	long	0000 0000 0000 0008	Option Contract, physical settlement (8)
OPTION_STRIP_PHYSICAL	long	0000 0000 0000 0010	Option Strip Contract, physical settlement (16)
TAPO_PHYSICAL	long	0000 0000 0000 0020	TAPO Option Contract, physical settlement (32)
OUTRIGHT_CASH	long	0000 0000 0001 0000	Future Outright Contract, cash settlement (65536)
CARRY_CASH	long	0000 0000 0002 0000	Future Carry Contract, cash settlement (131072)
AVERAGE_CASH	long	0000 0000 0004 0000	Future Average Contract, cash settlement (262144)
OPTION_CASH	long	0000 0000 0008 0000	Option Contract, cash settlement (524288)

Constant Name	Type	Value (Hex)	Comment
OPTION_STRIP_CASH	long	0000 0000 0010 0000	Option Strip Contract, cash settlement (1048576)
TAPO_CASH	long	0000 0000 0020 0000	TAPO Option Contract, cash settlement (2097152)
TOM	long	0000 0001 0000 0000	TOM Contract (4294967296)
CASH	long	0000 0002 0000 0000	CASH Contract (8589934592)
M3	long	0000 0004 0000 0000	3M Contract (17179869184)
M15	long	0000 0008 0000 0000	15M Contract (34359738368)
M27	long	0000 0010 0000 0000	27M Contract (68719476736)
M63	long	0000 0020 0000 0000	63M Contract (137438953472)
M123	long	0000 0040 0000 0000	123M Contract (274877906944)
Y	long	0000 0080 0000 0000	Year Contract (549755813888)
H	long	0000 0100 0000 0000	Half-year Contract (1099511627776)
Q	long	0000 0200 0000 0000	Quarterly Contract (2199023255552)
M	long	0000 0400 0000 0000	Monthly Contract (4398046511104)
W	long	0000 0800 0000 0000	Weekly Contract, (8796093022208)
D	long	0000 1000 0000 0000	Daily Contract (17592186044416)
COMBO	long	0004 0000 0000 0000	For backward compatibility (1125899906842624)
CARRY_TAS	long	0040 0000 0000 0000	Carry Tas (18014398509481984)
OUTRIGHT_TAS	long	0080 0000 0000 0000	Outright Tas (36028797018963968)

6.2.1 Example Contract Types

Decimal Value	Hex Value	Contract Type
4,294,967,297	0000 0001 0000 0001	Outright TOM contract, physically settled
8,589,934,593	0000 0002 0000 0001	Outright CASH contract, physically settled

Decimal Value	Hex Value	Contract Type
17,179,869,185	0000 0004 0000 0001	Outright 3M contract, physically settled
4,398,046,511,105	0000 0400 0000 0001	Outright Monthly contract, physically settled
4,398,046,511,112	0000 0400 0000 0008	Outright Monthly Option contract, physically settled
4,398,046,576,640	0000 0400 0001 0000	Outright Monthly contract, cash settled (LMEmini)
4,398,048,608,256	0000 0400 0020 0000	Monthly TAPO Option contract, cash settled
4,432,406,249,473	0000 0408 0000 0001	Outright Monthly 15M contract, physically settled
4,466,765,987,841	0000 0410 0000 0001	Outright Monthly 27M contract, physically settled
4,535,485,464,577	0000 0420 0000 0001	Outright Monthly 63M contract, physically settled
4,672,924,418,049	0000 0440 0000 0001	Outright Monthly 123M contract, physically settled
8,796,093,022,209	0000 0800 0000 0001	Outright Weekly contract, physically settled
17,592,186,044,417	0000 1000 0000 0001	Outright Daily contract, physically settled
1,125,904,201,809,922	0004 0001 0000 0002	Combo TOM future carry contract, physically settled. E.g. TOMNEXT
1,125,908,496,777,218	0004 0002 0000 0002	Combo CASH future carry contract, physically settled. E.g. C-FEB18
1,125,917,086,711,810	0004 0004 0000 0002	Combo 3M future carry contract, physically settled. E.g. 3M-1H18
1,126,449,662,656,516	0004 0080 0000 0004	Combo, Yearly, Future Average Contract, physically settled. E.g. AAD1Y18
1,126,999,418,470,404	0004 0100 0000 0004	Combo, Half-Yearly, Future Average Contract, physically settled. E.g. AAD1H18
1,128,098,930,098,180	0004 0200 0000 0004	Combo, Quarterly, Future Average Contract, physically settled. E.g. AAD1Q18
1,128,098,930,098,192	0004 0200 0000 0010	Combo, Quarterly, Option Average, physically settled E.g. AAD1Q17

Decimal Value	Hex Value	Contract Type
1,130,297,953,353,730	0004 0400 0000 0002	Combo monthly future carry contract, physically settled. E.g. AADFEB17-MAR17
1,143,492,092,887,042	0004 1000 0000 0002	Combo daily future carry contract, physically settled. E.g. AHD020617-050917

6.3 Prompt Type

Constant Name	Type	Value	Comment
NO_PROMPT	int	0	Not a prompt.
TOM	int	1	The TOM prompt.
CASH	int	2	The CASH prompt.
THREE_MONTHS	int	3	The 3M prompt.
MONTHLY_15	int	9	The monthly contract that falls in the month 15 months from the current month.
MONTHLY_27	int	10	The monthly contract that falls in the month 27 months from the current month.
MONTHLY_63	int	11	The monthly contract that falls in the month 63 months from the current month.
MONTHLY_123	int	14	The monthly contract that falls in the month 123 months from the current month.
MONTHLY	int	15	A monthly constant, for this case there is a need to specify the explicit month too.
COMBO	int	16	A monthly constant, for this case there is a need to specify the explicit month too.
Q	int	17	A monthly constant, for this case there is a need to specify the explicit month too.
W	int	18	A weekly constant
D	int	19	A daily constant

6.4 State Event

Constant Name	Type	Value	Comment
STATE_CHANGE_OB	int	1	New state. An order book changed state.

Constant Name	Type	Value	Comment
HALT_EVENT	int	7	This orderbook state change message is related to halt; either halt being imposed or halt being lifted.

6.4.1 New State

These values will only be present when the Type of State Event is equal to STATE_CHANGE_OB.

Constant Name	Type	Value	Comment
INIT	String	"Init"	
PRE_OPEN	String	"Pre-Open"	
OPEN	String	"Open"	
POST_TRADE	String	"Post Trade"	
CLOSED	String	"Closed"	
PRE_OPEN_TH	String	"Pre-OpenTH"	This state is only seen after a trading halt, and occurs when Market Operations have scheduled a time (in the future) to lift the trade halt and re-open the market (or cease the halt on an instrument). The previously halted Security(ies) will transition to Pre-OpenTH until the pre-defined period has ended. At market open their state will change to Open.

6.5 Sub-Type of Trade

Constant Name	Type	Value	Comment
MARKET_ON_OPEN	Int	0x00000002	Market on Open Trade.
TRANSPARENT_TO_TRANSPARENT	int	0x00000010	Two transparent orders executed.
COMBINATION_TO_OUTRIGHT	int	0x00200000	Indicates that the trade is created as part of an implied scenario.

6.6 VWAP Price Calculation Type

Constant Name	Type	Value	Comment
NOT_STARTED	int	1	Calculation is running.
CALC_RUNNING	int	2	Calculation is running.
PEND_APPROVAL	int	3	Calculation is done and pending approval.
PROVISIONAL	int	5	Provisional price has been set
CONFIRMED	int	6	Definite price has been set.
RECONFIRMED	int	8	Definite price has been set again/corrected.

6.7 Segment ID

Value	Comment
OUTRIGHT	Used for outright futures instruments, including base metal futures (excluding rolling prompt futures), precious futures (excluding rolling prompt precious futures), monthly average futures, ferrous futures and LMEminis, e.g. AADFEB20
OUTRIGHT_**XX**	Used for certain outright instruments where **XX** is the two character contract code, e.g. HC. Contracts that used this format are: HC, HE, HU, AM, EA, UP, CB, MD
OPTION	Used for base metal option instruments, e.g. AADJAN20_1775C. (The last past of the label refers to the strike price and call/put).
TAPO	Used for base metal TAPO (Traded Average Price Option) instruments, e.g. CADAUG18_6500TP. (The last past of the label refers to the strike price and call/put).
ROLLING_PROMPTS	Used for base metal future instruments and precious future instruments that are identified by a rolling prompt, e.g. TOM, CASH, 3M.
CARRY	Used for carry instruments, including those instruments where one or more of the legs is a rolling prompt or average instrument, e.g. AADC-3M, CAD3M-1Q20, ZSDDEC19-JAN20
CARRY_**XX**	Used for an certain carry instruments where **XX** is the two character contract code, e.g. HC Contracts that used this format are: HC, HE, HU, AM, EA, UP, CB, MD
AVERAGE	A futures average instrument where the instrument is comprised of multiple prompt dates, e.g. AAD1Q20, MOD2H21

Value	Comment
OPTIONSTRIP	An option strip instrument where the instrument is comprised of multiple expiry dates, e.g. NID3Q20_2000P, ZSD4Q19_400C. (The last past of the label refers to the strike price and call/put).
XXTASOUTRIGHT**TT**	Used for an outright TAS instrument where **XX** is the two character contract code, e.g. AU, and **TT** is the two character TAS code, e.g. TA

6.8 Trade Halt Type

Value	Comment
NO_MATCH	Orders are removed from Public Orderbook and placed in Local Orderbook. They are not inactivated and will be placed back into the Public Orderbook when halt is lifted
FULL_HALT	Orders are removed from Public Orderbook and placed in Local Orderbook in inactivated state

7 Appendix B – Reference Data Message Examples

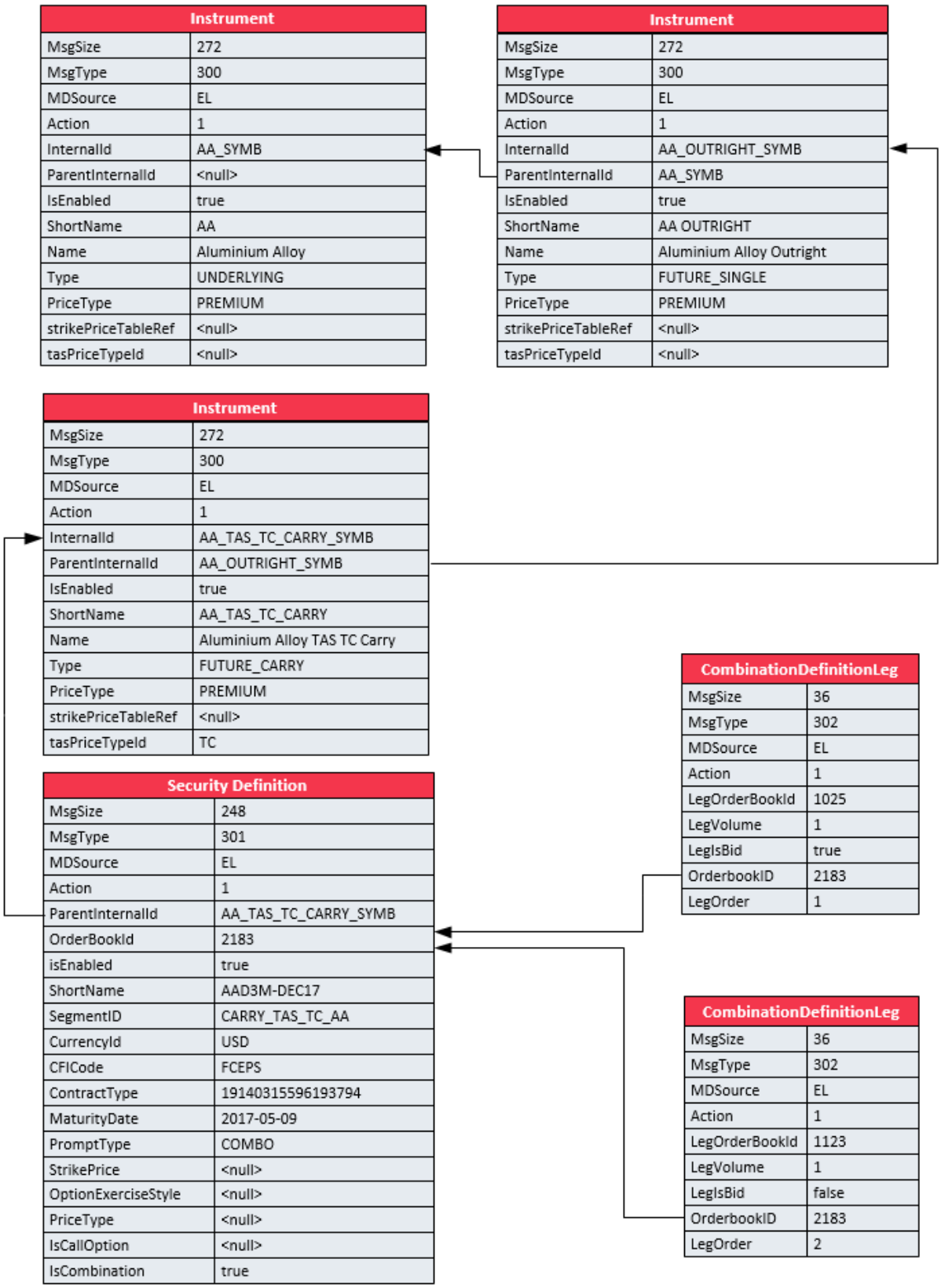
7.1 Metal Future

Instrument	
MsgSize	272
MsgType	300
MDSource	EL
Action	1
InternalId	AA_SYMB
ParentInternalId	<null>
IsEnabled	True
ShortName	AA
Name	Aluminium Alloy
Type	UNDERLYING
PriceType	PREMIUM
strikePriceTableRef	<null>
tasPriceTypeId	<null>

Instrument	
MsgSize	272
MsgType	300
MDSource	EL
Action	1
InternalId	AA_TAS_TC_OUTRIGHT_SYMB
ParentInternalId	AA_SYMB
IsEnabled	True
ShortName	AA_TAS_TC_OUTRIGHT
Name	Aluminium Alloy TAS TC Outright
Type	FUTURE_SINGLE
PriceType	PREMIUM
strikePriceTableRef	<null>
tasPriceTypeId	TC

Security Definition	
MsgSize	248
MsgType	301
MDSource	EL
Action	1
ParentInternalId	AA_TAS_TC_OUTRIGHT_SYMB
OrderBookId	1026
isEnabled	true
ShortName	AADC_TAS_TC
SegmentID	ROLLING_PROMPT_TAS_TC_AA
CurrencyId	USD
CFICode	FCEPS
ContractType	36028805608898560
MaturityDate	2017-02-13
PromptType	CASH
StrikePrice	<null>
OptionExerciseStyle	<null>
PriceType	<null>
IsCallOption	<null>
IsCombination	false

7.2 Future Carry



Instrument	
MsgSize	272
MsgType	300
MDSource	EL
Action	1
InternalId	AA_SYMB
ParentInternalId	<null>
IsEnabled	true
ShortName	AA
Name	Aluminium Alloy
Type	UNDERLYING
PriceType	PREMIUM
strikePriceTableRef	<null>
tasPriceTypeId	<null>

Instrument	
MsgSize	272
MsgType	300
MDSource	EL
Action	1
InternalId	AA_OUTRIGHT_SYMB
ParentInternalId	AA_SYMB
IsEnabled	true
ShortName	AA OUTRIGHT
Name	Aluminium Alloy Outright
Type	FUTURE_SINGLE
PriceType	PREMIUM
strikePriceTableRef	<null>
tasPriceTypeId	<null>

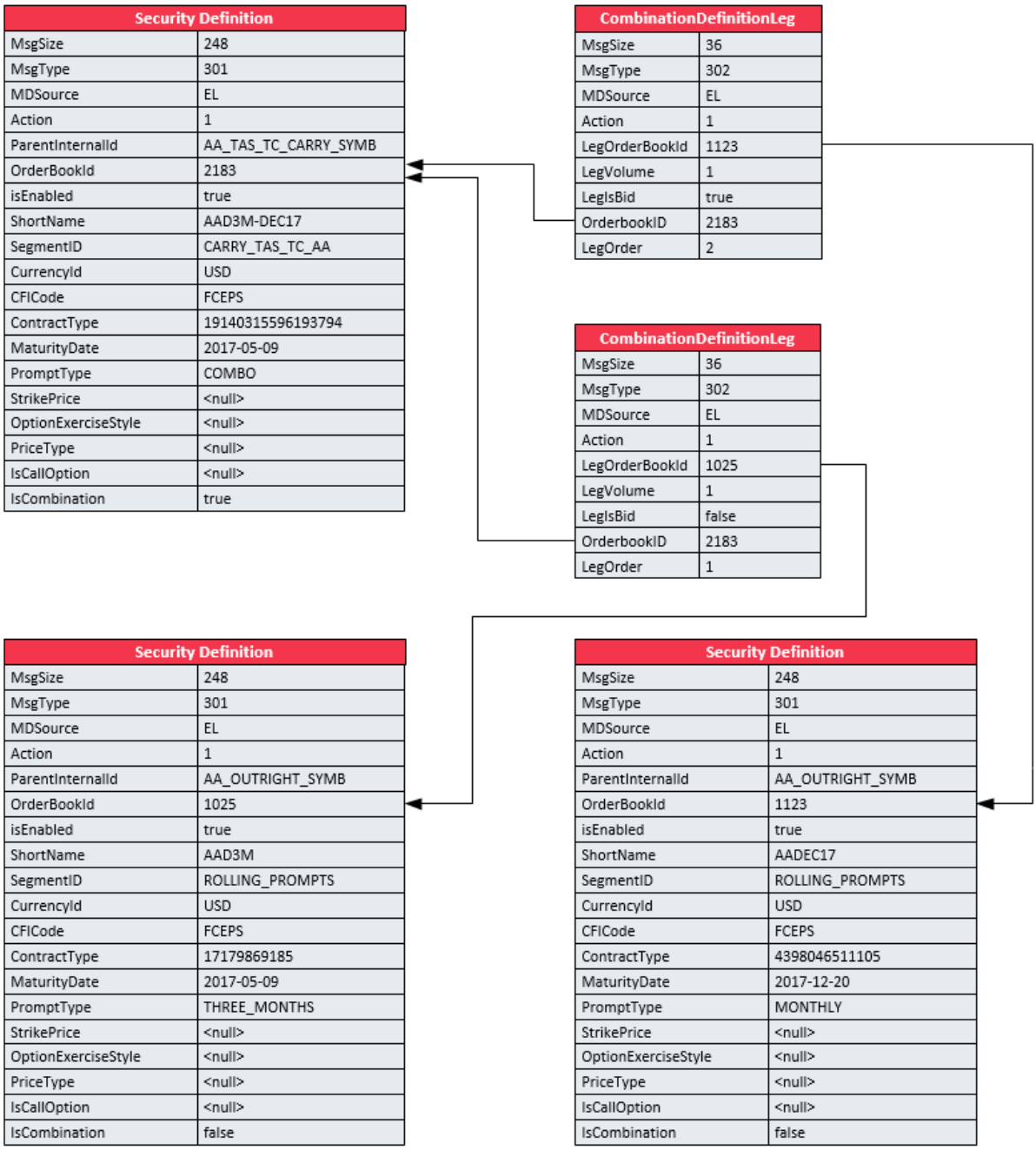
Instrument	
MsgSize	272
MsgType	300
MDSource	EL
Action	1
InternalId	AA_TAS_TC_CARRY_SYMB
ParentInternalId	AA_OUTRIGHT_SYMB
IsEnabled	true
ShortName	AA_TAS_TC_CARRY
Name	Aluminium Alloy TAS TC Carry
Type	FUTURE_CARRY
PriceType	PREMIUM
strikePriceTableRef	<null>
tasPriceTypeId	TC

CombinationDefinitionLeg	
MsgSize	36
MsgType	302
MDSource	EL
Action	1
LegOrderBookId	1025
LegVolume	1
LegIsBid	true
OrderbookID	2183
LegOrder	1

Security Definition	
MsgSize	248
MsgType	301
MDSource	EL
Action	1
ParentInternalId	AA_TAS_TC_CARRY_SYMB
OrderBookId	2183
isEnabled	true
ShortName	AAD3M-DEC17
SegmentID	CARRY_TAS_TC_AA
CurrencyId	USD
CFICode	FCEPS
ContractType	19140315596193794
MaturityDate	2017-05-09
PromptType	COMBO
StrikePrice	<null>
OptionExerciseStyle	<null>
PriceType	<null>
IsCallOption	<null>
IsCombination	true

CombinationDefinitionLeg	
MsgSize	36
MsgType	302
MDSource	EL
Action	1
LegOrderBookId	1123
LegVolume	1
LegIsBid	false
OrderbookID	2183
LegOrder	2

7.2.1 Future Carry Legs



Security Definition	
MsgSize	248
MsgType	301
MDSource	EL
Action	1
ParentInternalId	AA_TAS_TC_CARRY_SYMB
OrderBookId	2183
isEnabled	true
ShortName	AAD3M-DEC17
SegmentID	CARRY_TAS_TC_AA
CurrencyId	USD
CFICode	FCEPS
ContractType	19140315596193794
MaturityDate	2017-05-09
PromptType	COMBO
StrikePrice	<null>
OptionExerciseStyle	<null>
PriceType	<null>
IsCallOption	<null>
IsCombination	true

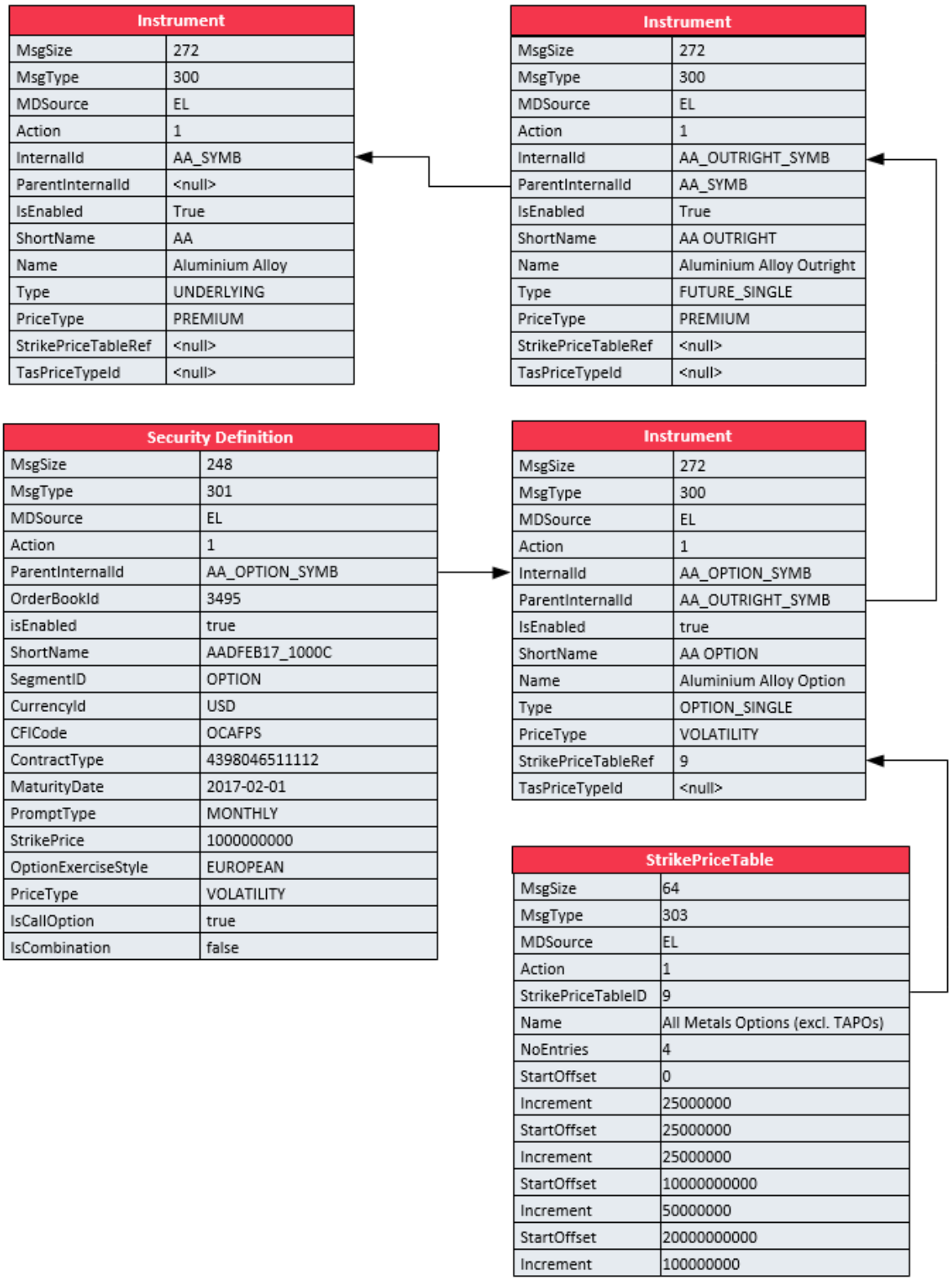
CombinationDefinitionLeg	
MsgSize	36
MsgType	302
MDSource	EL
Action	1
LegOrderBookId	1123
LegVolume	1
LegIsBid	true
OrderbookID	2183
LegOrder	2

CombinationDefinitionLeg	
MsgSize	36
MsgType	302
MDSource	EL
Action	1
LegOrderBookId	1025
LegVolume	1
LegIsBid	false
OrderbookID	2183
LegOrder	1

Security Definition	
MsgSize	248
MsgType	301
MDSource	EL
Action	1
ParentInternalId	AA_OUTRIGHT_SYMB
OrderBookId	1025
isEnabled	true
ShortName	AAD3M
SegmentID	ROLLING_PROMPTS
CurrencyId	USD
CFICode	FCEPS
ContractType	17179869185
MaturityDate	2017-05-09
PromptType	THREE_MONTHS
StrikePrice	<null>
OptionExerciseStyle	<null>
PriceType	<null>
IsCallOption	<null>
IsCombination	false

Security Definition	
MsgSize	248
MsgType	301
MDSource	EL
Action	1
ParentInternalId	AA_OUTRIGHT_SYMB
OrderBookId	1123
isEnabled	true
ShortName	AADEC17
SegmentID	ROLLING_PROMPTS
CurrencyId	USD
CFICode	FCEPS
ContractType	4398046511105
MaturityDate	2017-12-20
PromptType	MONTHLY
StrikePrice	<null>
OptionExerciseStyle	<null>
PriceType	<null>
IsCallOption	<null>
IsCombination	false

7.3 Metal Option



Instrument	
MsgSize	272
MsgType	300
MDSource	EL
Action	1
InternalId	AA_SYMB
ParentInternalId	<null>
IsEnabled	True
ShortName	AA
Name	Aluminium Alloy
Type	UNDERLYING
PriceType	PREMIUM
StrikePriceTableRef	<null>
TasPriceTypeId	<null>

Instrument	
MsgSize	272
MsgType	300
MDSource	EL
Action	1
InternalId	AA_OUTRIGHT_SYMB
ParentInternalId	AA_SYMB
IsEnabled	True
ShortName	AA OUTRIGHT
Name	Aluminium Alloy Outright
Type	FUTURE_SINGLE
PriceType	PREMIUM
StrikePriceTableRef	<null>
TasPriceTypeId	<null>

Security Definition	
MsgSize	248
MsgType	301
MDSource	EL
Action	1
ParentInternalId	AA_OPTION_SYMB
OrderBookId	3495
isEnabled	true
ShortName	AADFEB17_1000C
SegmentID	OPTION
CurrencyId	USD
CFICode	OCAFPS
ContractType	4398046511112
MaturityDate	2017-02-01
PromptType	MONTHLY
StrikePrice	1000000000
OptionExerciseStyle	EUROPEAN
PriceType	VOLATILITY
IsCallOption	true
IsCombination	false

Instrument	
MsgSize	272
MsgType	300
MDSource	EL
Action	1
InternalId	AA_OPTION_SYMB
ParentInternalId	AA_OUTRIGHT_SYMB
IsEnabled	true
ShortName	AA OPTION
Name	Aluminium Alloy Option
Type	OPTION_SINGLE
PriceType	VOLATILITY
StrikePriceTableRef	9
TasPriceTypeId	<null>

StrikePriceTable	
MsgSize	64
MsgType	303
MDSource	EL
Action	1
StrikePriceTableID	9
Name	All Metals Options (excl. TAPOs)
NoEntries	4
StartOffset	0
Increment	25000000
StartOffset	25000000
Increment	25000000
StartOffset	10000000000
Increment	50000000
StartOffset	20000000000
Increment	100000000

8 Appendix C - Example Messages

8.1 Security Status Update Message (310)

8.1.1 Security Status Changed to Open

Field	Value	Description
MsgSize	60	Size of the message
MsgType	310	310 Security Status
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1477643700884000	
TypeOfStateEvent	1	STATE_CHANGE_OB
OrderbookID	1036	
NewState	Open	
TradeHaltEventType	<null>	
TradeHaltReason	<null>	
TradeHaltType	<null>	
Filler	<null>	

8.1.2 Security Status Changed to Closed

Field	Value	Description
MsgSize	60	Size of the message
MsgType	310	310 Security Status
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1477640760091000	
TypeOfStateEvent	1	STATE_CHANGE_OB
OrderbookID	1036	
NewState	Closed	
TradeHaltEventType	<null>	
TradeHaltReason	<null>	
TradeHaltType	<null>	
Filler	<null>	

8.3 Aggregate Order Book Update Message (353)

Field	Value	Description
MsgSize	131	Size of the message
MsgType	353	Type of message
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1477400685607000	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.
OrderbookID	1037	The order book ID
NoEntries	4	Number of book entries within the message
AggregateQuantity	700	Aggregated quantity.
Price	9730	Price
NumberOfOrders	2	Number of orders
NumberOfImplieds	0	Number of implied orders
Side	0	Side of the order 0 – Bid, 1 - Ask
PriceLevel	1	Indicates the price level (within top 15) of the information carried in the message
UpdateAction	0	Type of market data update action
AggregateQuantity	350	Aggregated quantity.
Price	9720	Price
NumberOfOrders	2	Number of orders
NumberOfImplieds	0	Number of implied orders
Side	0	Side of the order 0 – Bid, 1 - Ask
PriceLevel	2	Indicates the price level (within top 15) of the information carried in the message
UpdateAction	1	Type of market data update action
AggregateQuantity	700	Aggregated quantity.
Price	9760	Price
NumberOfOrders	3	Number of orders
NumberOfImplieds	0	Number of implied orders

Field	Value	Description
Side	1	Side of the order 0 – Bid, 1 - Ask
PriceLevel	1	Indicates the price level (within top 15) of the information carried in the message
UpdateAction	1	Type of market data update action
AggregateQuantity	700	Aggregated quantity.
Price	9770	Price
NumberOfOrders	2	Number of orders
NumberOfImplieds	0	Number of implied orders
Side	1	Side of the order 0 – Bid, 1 - Ask
PriceLevel	2	Indicates the price level (within top 15) of the information carried in the message
UpdateAction	0	Type of market data update action

8.4 Top of Book Message (355)

Field	Value	Description
MsgSize		Size of the message
MsgType	355	Type of message.
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1477400700761000	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.
OrderbookID	3493	The order book ID
AggregateBidQuantity	10	Aggregated quantity available on the bid side
AggregateAskQuantity	5	Aggregated quantity available on the ask side
BidPrice	2200	The bid price
AskPrice	2250	The ask price.
NumberBidOrders	1	Number of bid orders.
NumberAskOrders	1	Number of ask orders.
NumberBidImplieds	0	Number of bid implied orders

Field	Value	Description
NumberAskImplieds	0	Number of ask implied orders

8.5 Trade Message (350)

8.5.1 New Matched Trade

Field	Value	Description
MsgSize	75	Size of the message
MsgType	350	Type of message
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1479139755364000	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.
TimeOfTrade	1479139755364000	Time of trade. Specified as microseconds from midnight, January 1, 1970 UTC.
OrderbookID	1042	The order book ID
Price	2400000000	The price of the trade.
Quantity	50	Trade volume.
TypeOfTrade	1	1 New 2 Busted
SubTypeOfTrade	16	TRANSPARENT_TO_TRANSPARENT
TradeID	6203961792482263041	An id is assigned to each individual trade. This id is guaranteed to be unique within the system and over time.
DealID	6203961792482263041	An id is assigned to each deal. A deal is defined as all trades generated by a single event. An event is for example an incoming order or an uncross. Thus all trades resulting from the same event will have the same deal number. This id is guaranteed to be unique with the system and over time.
ReferenceTradeID	<null>	The reference trade id is used to tie two trades together. It can be used to tie related trades together.

8.5.2 New Matched Implied Trade

Field	Value	Description
MsgSize	75	Size of the message
MsgType	350	Type of message
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1506684354275000	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.
TimeOfTrade	1506684354275000	Time of trade. Specified as microseconds from midnight, January 1, 1970 UTC.
OrderbookID	6445	The order book ID
Price	-1000000	The price of the trade.
Quantity	1000	Trade volume.
TypeOfTrade	1	1 New 2 Busted
SubTypeOfTrade	2097168	TRANSPARENT_TO_TRANSPARENT & COMBINATION_TO_OUTRIGHT
TradeID	6319492213873082369	An id is assigned to each individual trade. This id is guaranteed to be unique within the system and over time.
DealID	6319492213873082369	An id is assigned to each deal. A deal is defined as all trades generated by a single event. An event is for example an incoming order or an uncross. Thus all trades resulting from the same event will have the same deal number. This id is guaranteed to be unique with the system and over time.
ReferenceTradeID	<null>	The reference trade id is used to tie two trades together. It can be used to tie related trades together.

8.5.3 Busted Trade

8.5.3.1 Original Trade

Field	Value	Description
MsgSize	75	Size of the message
MsgType	350	Type of message
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1477400391135000	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.
TimeOfTrade	1477400391135000	Time of trade. Specified as microseconds from midnight, January 1, 1970 UTC.
OrderbookID	1037	The order book ID
Price	1200000000	The price of the trade.
Quantity	100	Trade volume.

Field	Value	Description
TypeOfTrade	1	1 New 2 Busted
SubTypeOfTrade	16	TRANSPARENT_TO_TRANSPARENT
TradeID	6196666370139111427	An id is assigned to each individual trade. This id is guaranteed to be unique within the system and over time.
DealID	6196666370139111425	An id is assigned to each deal. A deal is defined as all trades generated by a single event. An event is for example an incoming order or an uncross. Thus all trades resulting from the same event will have the same deal number. This id is guaranteed to be unique with the system and over time.
ReferenceTradeID	<null>	The reference trade id is used to tie two trades together. It can be used to tie related trades together.

8.5.3.2 Busted Trade

Field	Value	Description
MsgSize	75	Size of the message
MsgType	350	Type of message
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1477404898060000	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.
TimeOfTrade	1477400391135000	Time of trade. Specified as microseconds from midnight, January 1, 1970 UTC.
OrderbookID	1037	The order book ID
Price	1200000000	The price of the trade.
Quantity	100	Trade volume.
TypeOfTrade	2	1 New 2 Busted
SubTypeOfTrade	16	TRANSPARENT_TO_TRANSPARENT
TradeID	6196666370139111427	An id is assigned to each individual trade. This will match the trade ID of the original trade. This id is guaranteed to be unique within the system and over time.
DealID	6196666370139111425	An id is assigned to each deal. A deal is defined as all trades generated by a single event. An event is for example an incoming order or an uncross. Thus all trades resulting from the same event will have the same deal number. The deal ID will match the trade ID of the original trade. This id is guaranteed to be unique with the system and over time.
ReferenceTradeID	<null>	The reference trade id is used to tie two trades together. It can be used to tie related trades together.

Highs, lows and last trade price statistics are reset following a busted trade.

8.5.4 Trade Statistics

Field	Values	Description
MsgSize	78	Size of the message
MsgType	352	Type of message
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1479140871669000	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.
OrderbookID	3486	The order book ID
OpenPrice	1637750000	Opening trade price for the current day.
HighPrice	1637780000	Highest trade price for the current day.
LowPrice	1637740000	Lowest trade price for the current day.
AveragePrice	1637760000	Volume-weighted average price (VWAP) so far during the current day.
LastTradePrice	1637780000	Reflects the price of the last non-busted trade (price from the same trade that set lastTradeVolume).
LastTradeVolume	300	Reflects the volume of the last non-busted trade (volume from the same trade that set lastTradePrice)

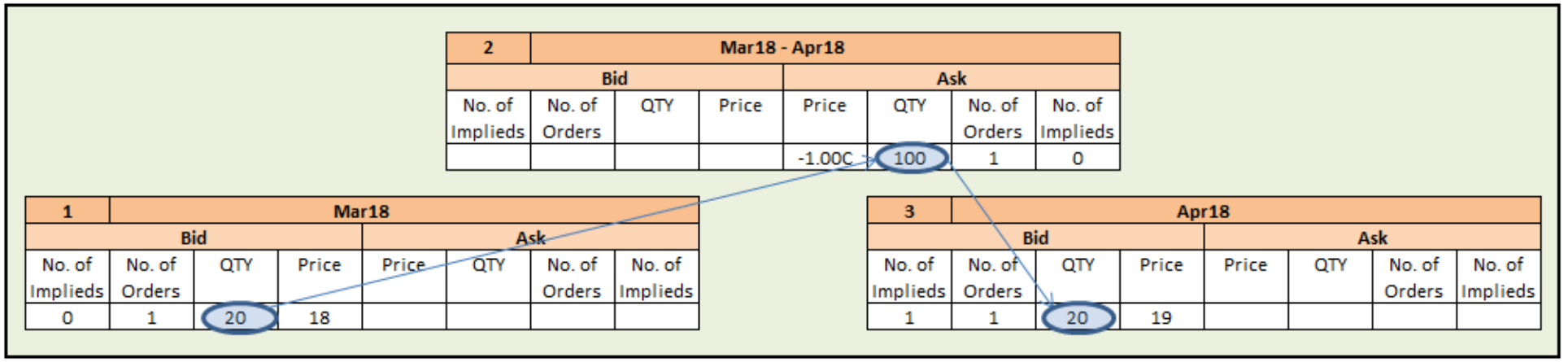
8.5.5 EOD Trade Statistics

Field	Values	Description
MsgSize	54	Size of the message
MsgType	351	Type of message
MDSource	EL	Data Source of the message EL - Electronic
TimeOfEvent	1490209200000000	Time of event. Set by the system when the event occurs. Specified as microseconds from midnight, January 1, 1970 UTC. N.B.
OrderbookID	3486	The order book ID
OpenPrice	1675500000	Opening trade price for the current day.
HighPrice	1725500000	Highest trade price for the current day.
LowPrice	1675500000	Lowest trade price for the current day.
ClosingPrice	1700500000	Volume-weighted average price (VWAP) so far during the current day.

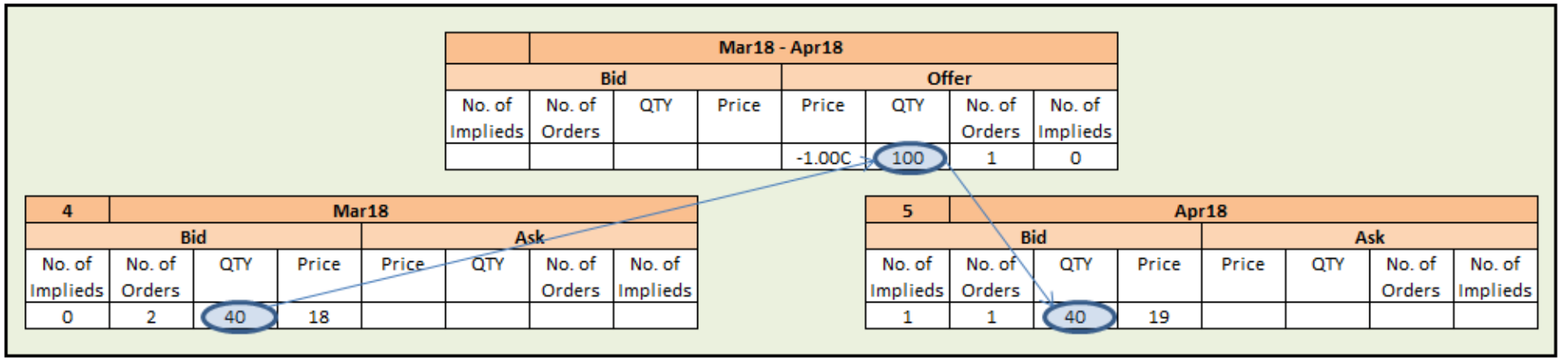
8.6 Implied Order Examples

8.6.1 Example 1

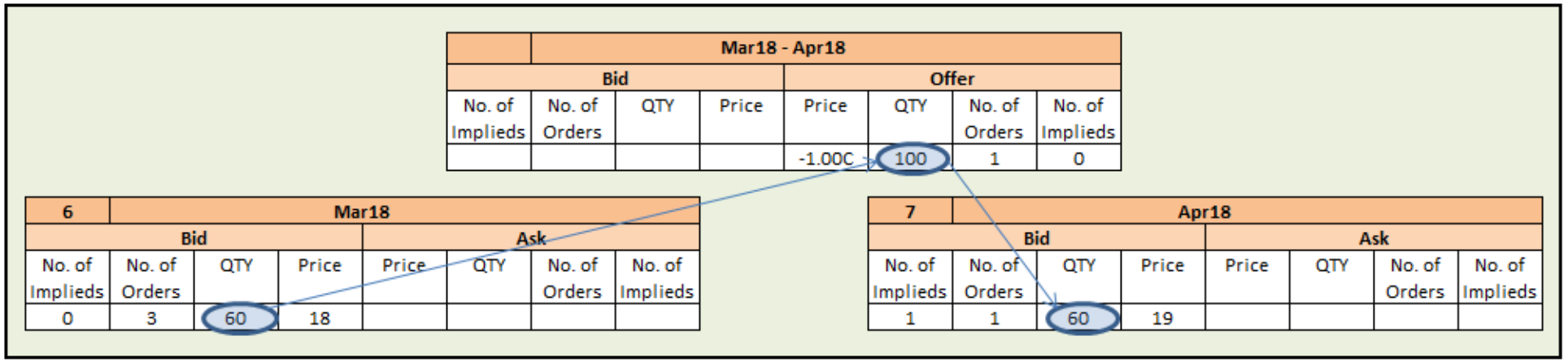
Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
1	Mar18	20	18	1	0	Bid	New buy order for Mar18 for quantity 20
2	Mar18 – Apr18	100	-1.00C	1	0	Ask	New sell order for Mar18 – Apr18 carry for quantity 100
3	Apr18	20	19	1	1	Bid	Implied out order generated for Apr18 for quantity 20



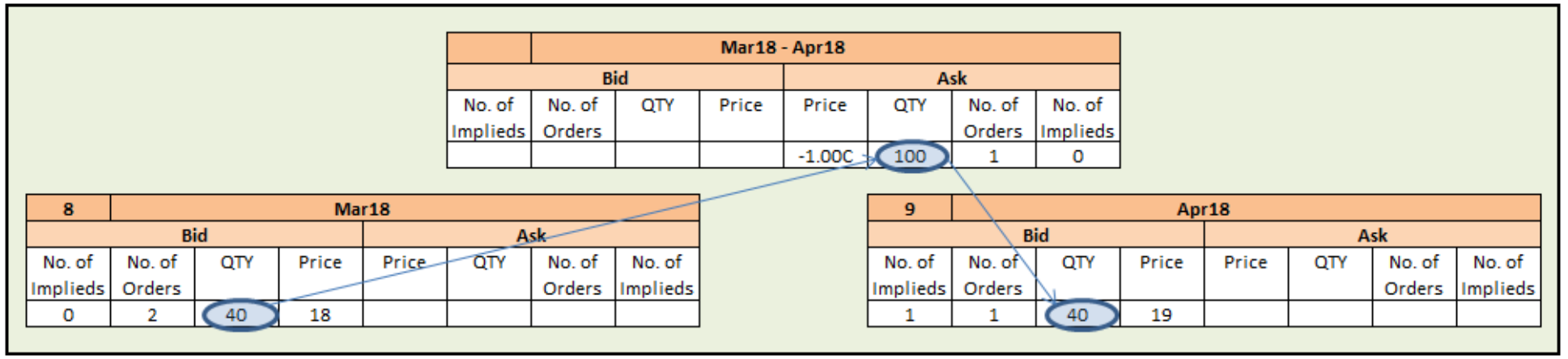
Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
4	Mar18	40	18	2	0	Bid	Additional order for Mar18 for quantity 20 received. Total aggregate quantity equals 40.
5	Apr18	40	19	1	1	Bid	Implied out order for Apr18 updated with aggregate quantity of 40. Number of orders / implieds remains at 1 due to the single route to the implied order.



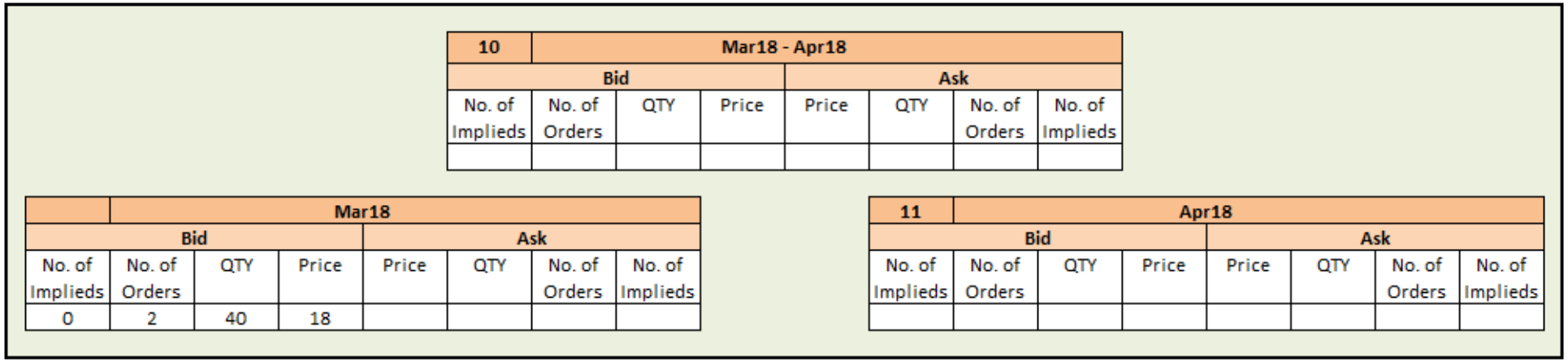
Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
6	Mar18	60	18	3	0	Bid	Additional order for Mar18 for quantity 20 received. Total aggregate quantity equals 60.
7	Apr18	60	19	1	1	Bid	Implied out order for Apr18 updated with aggregate quantity of 60. Number of orders / implieds remains at 1 due to the single route to the implied order.



Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
8	Mar18	40	18	2	0	Bid	Initial Bid order of quantity 20 deleted from Mar18 order book.
9	Apr18	40	19	1	1	Bid	Implied out order for Apr18 updated with a reduced aggregate quantity of 40.



Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
10	Mar18 – Apr18	0	-	0	0	-	Sell order for Mar18 – Apr18 carry deleted
11	Apr18	0	-	0	0	-	Implied out order for Apr18 deleted



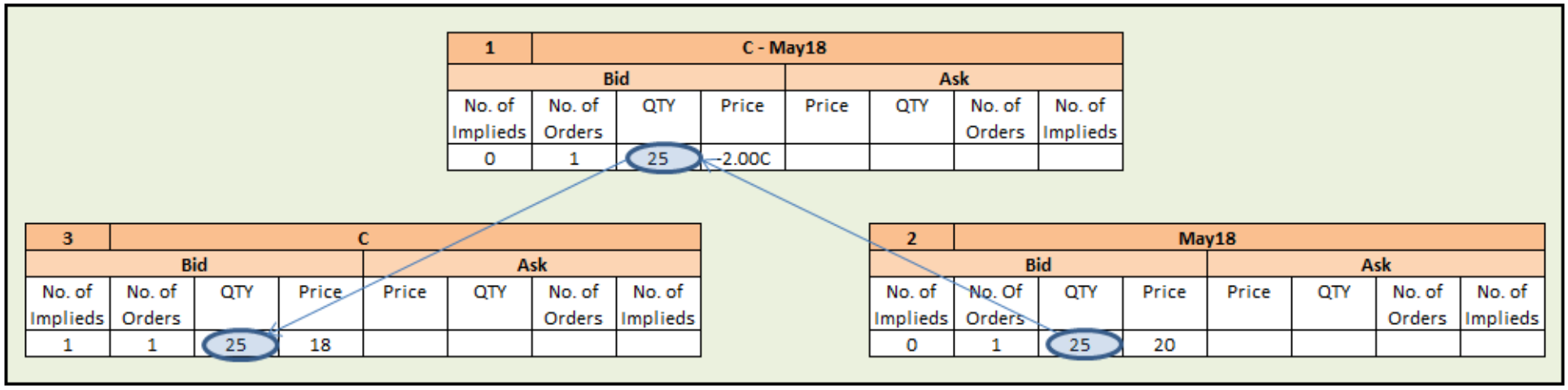
10	Mar18 - Apr18						
Bid				Ask			
No. of Implieds	No. of Orders	QTY	Price	Price	QTY	No. of Orders	No. of Implieds

	Mar18						
Bid				Ask			
No. of Implieds	No. of Orders	QTY	Price	Price	QTY	No. of Orders	No. of Implieds
0	2	40	18				

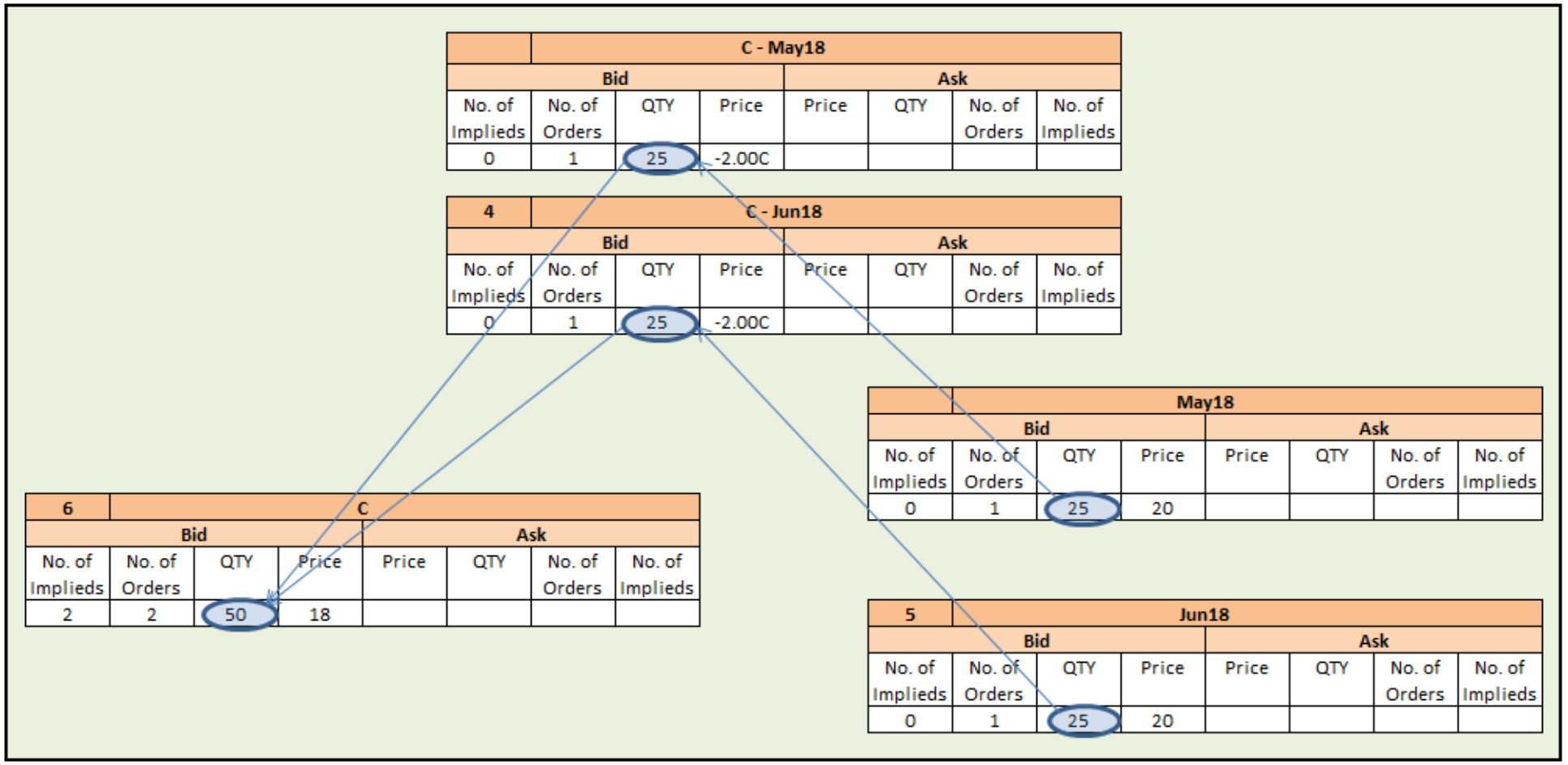
11	Apr18						
Bid				Ask			
No. of Implieds	No. of Orders	QTY	Price	Price	QTY	No. of Orders	No. of Implieds

8.6.2 Example 2

Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
1	C - May18	25	-2.00C	1	0	Bid	New buy order for C - May18 carry for quantity 25
2	May18	25	20	1	0	Bid	New bid order for May18 for quantity 25
3	C	25	18	1	1	Bid	Implied out order generated for C for quantity 25



Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
4	C - Jun18	25	-2.00C	1	0	Bid	New buy order for C - Jun18 carry for quantity 25
5	Jun18	25	20	1	0	Bid	New bid order for Jun18 for quantity 25
6	C	50	18	2	2	Bid	Implied out order updated for C with quantity 50. The number of implied orders increases to 2 as there are two routes.



	C - May18						
Bid				Ask			
No. of Implieds	No. of Orders	QTY	Price	Price	QTY	No. of Orders	No. of Implieds
0	1	25	-2.00C				

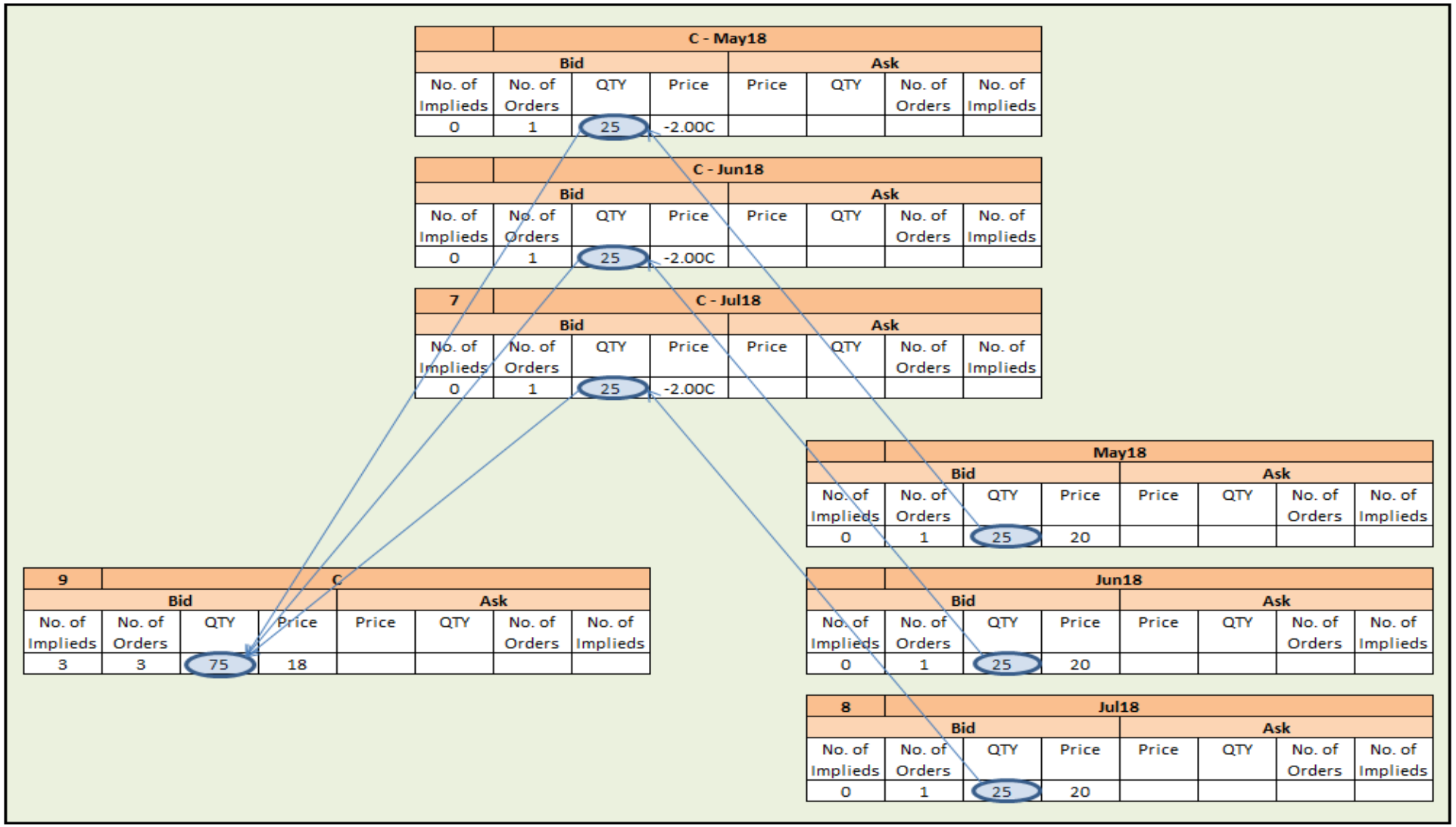
4	C - Jun18						
Bid				Ask			
No. of Implieds	No. of Orders	QTY	Price	Price	QTY	No. of Orders	No. of Implieds
0	1	25	-2.00C				

	May18						
Bid				Ask			
No. of Implieds	No. of Orders	QTY	Price	Price	QTY	No. of Orders	No. of Implieds
0	1	25	20				

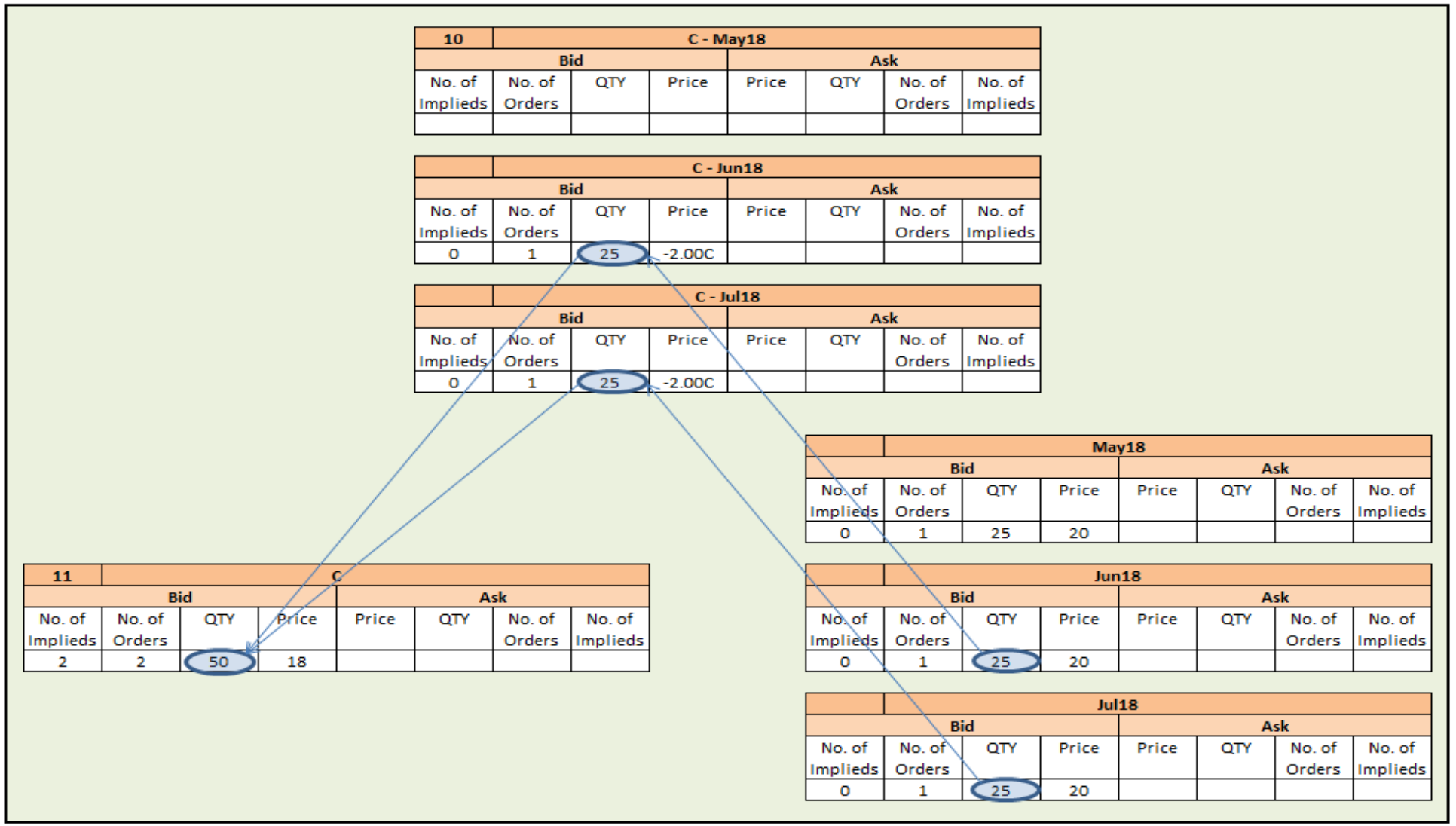
6	C						
Bid				Ask			
No. of Implieds	No. of Orders	QTY	Price	Price	QTY	No. of Orders	No. of Implieds
2	2	50	18				

5	Jun18						
Bid				Ask			
No. of Implieds	No. of Orders	QTY	Price	Price	QTY	No. of Orders	No. of Implieds
0	1	25	20				

Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
7	C - Jul18	25	-2.00C	1	0	Bid	New buy order for C - Jul18 carry for quantity 25
8	Jul18	25	20	1	0	Bid	New bid order for Jul18 for quantity 25
9	C	75	18	3	3	Bid	Implied out order updated for C with quantity 75. The number of implied orders increases to 3 as there are three routes.

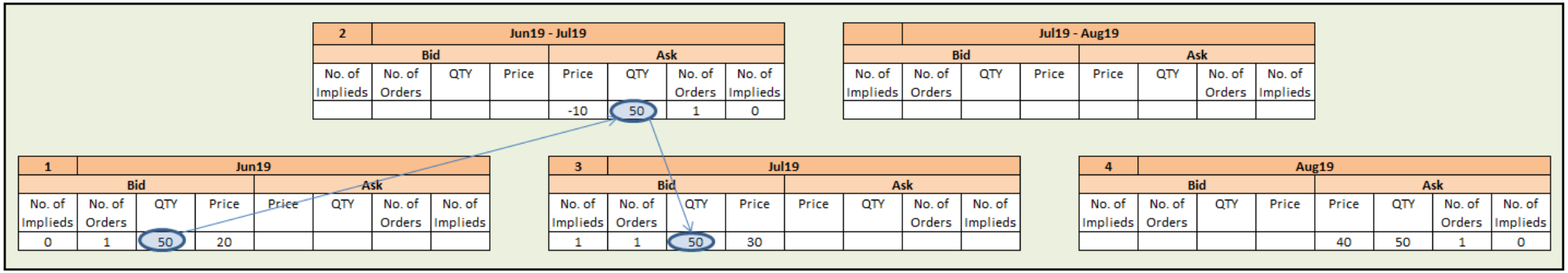

C - May18
Bid
Ask
No. of Implieds
No. of Orders
QTY
Price
Price
QTY
No. of Orders
No. of Implieds
0
1
25
-2.00C
C - Jun18
Bid
Ask
No. of Implieds
No. of Orders
QTY
Price
Price
QTY
No. of Orders
No. of Implieds
0
1
25
-2.00C
7
C - Jul18
Bid
Ask
No. of Implieds
No. of Orders
QTY
Price
Price
QTY
No. of Orders
No. of Implieds
0
1
25
-2.00C
May18
Bid
Ask
No. of Implieds
No. of Orders
QTY
Price
Price
QTY
No. of Orders
No. of Implieds
0
1
25
20
9
C
Bid
Ask
No. of Implieds
No. of Orders
QTY
Price
Price
QTY
No. of Orders
No. of Implieds
3
3
75
18
Jun18
Bid
Ask
No. of Implieds
No. of Orders
QTY
Price
Price
QTY
No. of Orders
No. of Implieds
0
1
25
20
8
Jul18
Bid
Ask
No. of Implieds
No. of Orders
QTY
Price
Price
QTY
No. of Orders
No. of Implieds
0
1
25
20

Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
10	C - May18	0	-	0	0	-	Order for C - May18 carry deleted
11	C	50	18	2	2	Bid	Implied out order updated for C with quantity 50. The number of implied orders decreases to 2 as there are two routes.

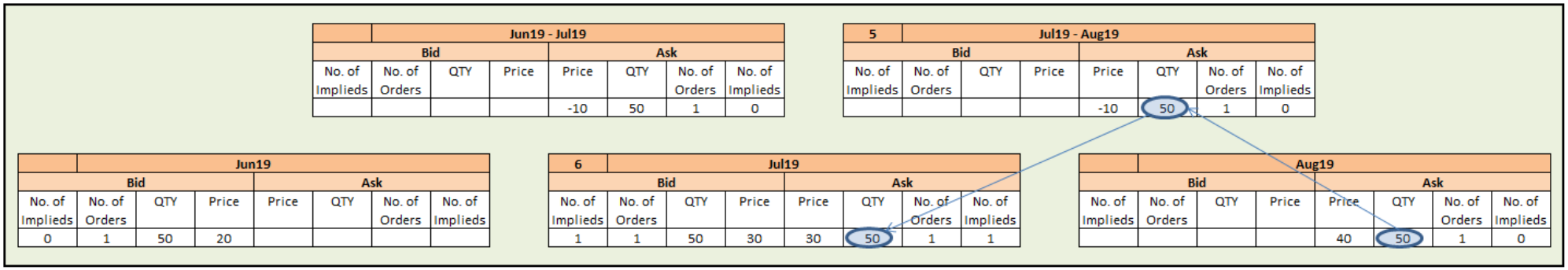

10
C - May18
Bid
Ask
No. of Implieds
No. of Orders
QTY
Price
Price
QTY
No. of Orders
No. of Implieds
C - Jun18
0
1
25
-2.00C
C - Jul18
0
1
25
-2.00C
May18
0
1
25
20
11
C
2
2
50
18
Jun18
0
1
25
20
Jul18
0
1
25
20

8.6.3 Example 3

Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
1	Jun19	50	20	1	0	Bid	New bid order for Jun19 for quantity 50
2	Jun19-Jul19	50	-10	1	0	Ask	New ask order for Jun19-Jul19 for quantity 50
3	Jul19	50	30	1	1	Bid	New implied bid order for Jul19 for quantity 50 created
4	Aug19	50	40	1	0	Ask	New ask order for Aug19 for quantity 50

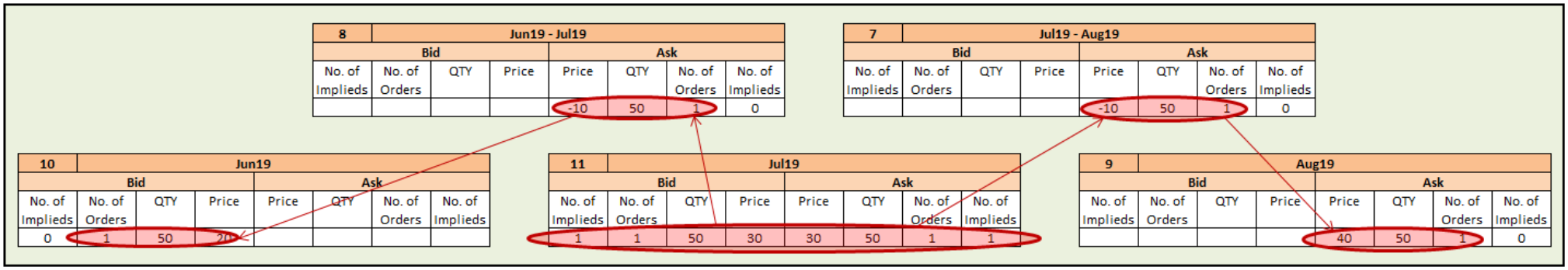


Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
5	Jul19-Aug19	50	-10	1	0	Ask	New ask order for Jul19-Aug19 for quantity 50
6	Jul19	50	30	1	1	Ask	New implied ask order for Jul19 for quantity 50 created



Event	Instrument	Aggregate Quantity	Price	No of Orders	No Of Implieds	Side	Description
7	Jul19-Aug19	50	-10			Ask	Ask order for Jul19-Aug19 filled
8	Jun19-Jul19	50	-10			Ask	Ask order for Jun19-Jul19 filled

9	Aug19	50	40			Ask	Ask order for Aug19 filled
10	Jun19	50	20			Bid	Bid order for Jun 19 filled
11	Jul19	50	30			Both	Implied bid and ask orders for Jul 19 filled



9 Appendix D – Maturity Dates

9.1 Futures

An LME future is defined by a symbol and a maturity date, the *prompt date*. There are three different types of prompt dates for futures:

- Rolling prompt dates – these prompt dates are relative to the current trading day. When trades in these contracts are sent to clearing, the date is "frozen" into a calendar date. The principle rolling prompts are:
    1) 3M (Three months) – this prompt date represents the settlement business day three months from today.
    2) C (Cash) – this prompt date represents the settlement business day after tomorrow.
    3) TOM (Tomorrow) – this prompt date represents tomorrow.
    4) Near Month 1 – this is the first monthly prompt date after the Cash date
    5) Near Month 2 – this is the second monthly prompt date after the Cash date
    6) Near Month 3 - this is the third monthly prompt date after the Cash date. This date must fall before the 3M date, and will not always be present.

  Rolling prompt codes are present in the PromptType field in the security definition message. Not all LME Metal Futures have rolling prompt dates

  The 3M date is not applicable to LME Precious Futures.

- Single prompt dates - these prompt dates are calendar dates, written in the format YYYY-MM-DD, where YYYY is the year, MM is the month (01-12) and DD is the day (01-31). The LME uses the concept of "Monthly", "Weekly", "Daily" contracts, but all these contract types represent a single prompt date, and there is no difference between them in LMEsource. (For "Monthly" contracts, the prompt date is the 3rd Wednesday in the month, for "Weekly" contracts, the prompt date is the Wednesday in each week.)

  Single prompt dates are present in the MaturityDate field in the Security Definition message.

  LMEprecious Future "Quarterly" prompt dates are considered "Monthly" contracts in LMEsource.

- Average prompt dates – these prompt dates represent several calendar dates. There are three types of average prompts:
    1) Quarterly prompts – These are written NQYY, where N is 1, 2, 3 or 4, and YY are the two last figures in the year. A quarterly prompt represents three calendar dates, namely the monthly contracts (i.e. the 3rd Wednesdays in the months) in the quarter.
    2) Half-year prompts – These are written NHYY where N is 1 or 2, and YY are the two last figures in the year. A half-year prompt represents six calendar dates, namely the monthly contracts (i.e. the 3rd Wednesdays in the months) in the half-year.
    3) Full-year prompts – These are written 1YY'Y' where Y'Y' are the two last figures in the year. A full-year prompt represents twelve calendar dates, namely the monthly contracts (i.e. the 3rd Wednesdays in the months) in the year.

Average prompt codes are present in the ShortName field in the Security Definition message.

To know what prompt dates that are available, it is necessary to have access to an LME trading calendar. A quick and incomplete summary of the trading calendar is:

For a base Metal Future, 3M and C are always present, and TOM is usually present. TOM is not present if that date is a US national holiday. There is one prompt date per settlement business day between the TOM and the 3M contract, thereafter a prompt date every Wednesday for 3 months, and then prompt dates on the 3rd Wednesday of each month for a number of months, depending on the underlying commodity. Average contracts are present that span the months after the 3M contract.

For LMEprecious Futures, C is always present, and TOM is usually present. TOM is not present if that date is a US national holiday. There is an additional daily prompt on the settlement business day after the C date. Thereafter there is a monthly prompt date on the 3rd Wednesday of each month for 24/25 months, followed by 12 quarterly prompts on the 3rd Wednesday of the third month (Mar, Jun, Sep, Dec) in each quarter.

For the index, there is one prompt date every 2nd Wednesday in the month for 12 months. There are no rolling prompts and no average prompts for the index.

For LMEminis, there exist one prompt date every 3rd Wednesday in the month for 12 months. There are no rolling prompts for LMEminis.

For LME Monthly Average Futures (MAFs), there is one prompt date on the last working day of each month. The MAF prompt date does not need to fall on a settlement business day.

9.2 Base Metal Options

A base metal option is defined by a symbol, an option type, a strike price and an *expiration date*. There are two types of expiration dates:

- Single expiration dates – these are calendar dates, written in the format YYYYMMDD, where YYYY is the year, mm is the month (01-12) and DD is the day (01-31). For metals, there is one expiration date per month: the first Wednesday in the month. For the index, the expiration date is the second Wednesday in the month. For both metals and the index, the expiration date is rolled forward one day if the expiration date is a non-business day. The expiration date for Metal Options does not need to fall on a settlement business day.
- Average expiration dates - these expiration dates represent several calendar dates. They are only available for metals. There are three types of average dates:
    1) Quarterly expiration dates – These are written NQYY, where N is 1, 2, 3 or 4, and YY are the two last figures in the year. A quarterly date represents three calendar dates, namely the 1st Wednesdays in the months in the quarter.
    2) Half-year expiration dates – These are written NHYY where N is 1 or 2, and YY are the two last figures in the year. A half-year date represents six calendar dates, namely the 1st Wednesdays in the months in the half-year.
    3) Full-year expiration dates – These are written 1YY'Y' where Y'Y' are the two last figures in the year. A full-year date represents twelve calendar dates, namely the 1st Wednesdays in the months in the year.

9.3 Precious Options

A Precious Option is defined by a symbol, an option type, a strike price and an *expiration date*. There are two types of expiration dates:

- Single expiration dates – these are calendar dates, written in the format YYYYMMDD, where YYYY is the year, mm is the month (01-12) and DD is the day (01-31). For precious metals, there is one expiration date per month, the date of which is the business day that is two business days before the 3rd Wednesday in the month. The expiration date for Precious Metal Options does not need to fall on a settlement business day.

9.4 TAPOS

A TAPO is defined by a symbol (only metals), an option type, a strike price and an expiration date. For TAPOS, the only allowed expiration date is the single expiration date in format YYYYMMDD. There is one expiration date per month on the last trading day of the month.

10 Appendix E – Known Issues

10.1 MAF Contract Type

As of LMEselect 9.2, there is a known error in the Contract Type values for Monthly Average Futures (MAFs). The contract type is being reported as Decimal: 4,398,046,511,105 – Hex: 0000 0400 0000 0001, which corresponds to an outright monthly, physically settled future. MAFs are cash settled.

10.2 Publication of Asian Reference Prices during BST

During the months when BST applies, LMEsource will disseminate the Asian Reference Prices from the previous business day when it starts up at 00:30 local time, and a price type of 3 – PEND_APPROVAL. The Asian Reference Prices for the current business day will be disseminated as expected at around 07:55 – 08:00 BST.

10.3 Instruments Created Intra-day

When the following types of instruments are created intraday:

- Carries
- Options
- Option Strips

A security definition (301) message will be published as expected, however the field 'Action' will be set to the value '2' – Update, rather than '1' – Add.

10.4 Incorrect Intraday Trade Statistics for Option Strip Instrument following a Busted Trade

When a trade in an Option Strip Instrument is busted, the intraday trade statistics published with the busted trade message are not reset to the correct values. They still report the values as if the busted trade was still valid, rather than reverting to the values from the previous matched trade.

10.5 Additional Instrument Security Status Messages for Instruments that coincide with a Rolling Prompt Date

10.5.1 LME Base Metal Market

When an instrument that coincides with a Rolling Prompt Date (TOM, CASH, 3M) falls on a date that was previously a regular Prompt Date (e.g. a Daily, Weekly, Monthly prompt), security status (310) messages will be disseminated at start of day for both the regular prompt date instrument, and the rolling prompt instrument.

The SOD state change statuses for the regular prompt date instrument will be:

Init --> Halt

The SOD state change statuses for the rolling prompt instrument will be as expected:

Init --> Pre-Open --> Open

No order book update messages or trade messages will be disseminated for the regular prompt date instrument and all orders are added to the rolling prompt instrument's order book.

10.5.2 LMEprecious Market

When an instrument that coincides with a Rolling Prompt Date (TOM, CASH) falls on a date that was previously a regular Prompt Date (e.g. a Daily or Monthly prompt), security status (310) messages will be disseminated at start of day for both the regular prompt date instrument, and the rolling prompt instrument.

The SOD state change statuses for both the regular prompt date instrument and the rolling prompt instrument will be:

Init --> Pre-Open --> Open

No order book update messages or trade messages will be disseminated for the regular prompt date instrument and all orders are added to the rolling prompt instrument's order book.

10.6 Additional Instrument Security Status Messages for TOM Carry contracts at Market Close

When Last Trading Time for the prompt that comprises the near leg of a TOM Carry contract is reached, (12:30 for Base Metal Futures, 16:00 for Precious Futures), a Security Status (310) message with a TypeOfStateChangeEvent of STATE_CHANGE_OB and a NewState Post_Trade of Closed for the carry is disseminated as expected, along with EOD Trade Statistics (351) if the Carry has traded for the day.

A Security Status (310) message with a TypeOfStateChangeEvent of STATE_CHANGE_OB and a NewState of Closed for the carry will be disseminated at market close (19:00 for the Base Metals market, 20:00 for the Precious Metals market), and an additional (or same) EOD Trade Statistics (351) if the Carry has traded for the day will be disseminated.