INTERFACE SPECIFICATIONS

HKEX Orion Market Data Platform
Mainland Market Data Hub
Securities Market & Index Datafeed Products
(OMD-C MMDH)

Version:V1.22
12 Sep 2018

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DOCUMENT HISTORY

Version	Date of Issue	Comments
v1.0	Nov 13, 2012	First Distribution Version – internal date 21st Nov 2012
v1.1	Dec 31, 2012	Revised Edition with the following updates: -Section 3.3.1: Additional notes on heartbeat added -Section 3.4.4: Added 3-byte filler -Section 3.10.1: Additional notes on the short sell field updates -Section 5.5 – Updated diagram -Appendix A: Added 1 new index and more information to the table
v1.2	May 24, 2013	Revised Edition with the following updates: - Section 1.3 – Message Formats column added - Section 3.1 – ASCII clarification added - Section 3.4.2 – Username field Description updated - Section 3.4.23 – Value "7" removed in 2nd bullet point and the table - Section 3.4.4 – Value "4" & "7" removed - Section 3.6.2 – Values column for field 'UnderlyingSecurityWeight' added with a note - Section 3.6.2 – Note (1) clarification added - Section 3.8.1 – 3.8.2 – Revise wordings for description of OrderID - Section 3.10.2 – Clarification added in the first paragraph - Section 3.10.2 – Values column of field "Currency Code" added with a note - Section 3.11.1 – Clarification on the second paragraph added - Section 4.2 – Revise snapshot description for Security Status - Section 5.7 – Phrase "6 consecutive unsuccessful logon attempts" in paragraph 1 removed - Sections related to Service Unavailable (previously 5.8 and 5.9) removed - Appendix A – Index table adjusted with 2 new indices and more content
v1.3	Aug 1, 2013	Revised Edition with the following updates: - 3.3.1 – Revised wording for description on sending heartbeat message - Section 4.2 – Clarification of order book for emptied books - Appendix A – CES China HK Mainland Index code adjusted
V1.4	Oct 11, 2013	Revised Edition with the following updates: - Section 2.2.2 – Updated system startup time - Section 3.9.3 – Add notes on Nominal Price - Section 3.10.1 – Add notes on trading statistics during auction session - Section 4.2 – Updated snapshot notes for market turnover
V1.5	Nov 28, 2013	Revised Edition with the following updates: - Section 3.9.3 – Updated note on Nominal Price - Section 3.10.2 – Clarification added in the first paragraph - Section 5.1 – Updated hyperlinks of the section numbers for Logon and Logon Response - Section 5.7 – Update note in paragraph 1
V1.5A	Jun 30, 2014	Revised Edition with the following updates: - Appendix A – adding one new indices CES China 280 Index
V1.6	Jul 04, 2014	Revised Edition with the following updates: - Sections 1.1 and 1.4 - Add description and section for Scope of Information - Sections 2.1.2 - Add clarifications on Connection Options - Section 2.2 - Add notes on the possible test data transmission during non-production hours - Section 2.2.2 – Updated the OMD-C MMDH normal startup time from 2:00am to 6:00am - Sections 3.12, 3.12.1, 3.12.2 & Appendix A - Add information on new market information (Northbound Daily Quota Balance) via IndexSource "C"
V1.7	Jul25, 2014	Revised Edition with the following updates: - Sections 3.12.2 –Update the Note for Northbound Daily Quota Balance and add note to the value of IndexVolume field
V1.8	21 Nov 2014	Revised Edition with the following updates: - Appendix A – adding two new indices CES Stock Connect Hong Kong Select 100 Index and CES Shanghai-Hong Kong Stock Connect 300 Index
V1.9	3 Feb 2015	Revised Edition with the following updates: - Section 3.12.1 – Add description for index definition dissemination

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<tr><td></td><td></td><td>- Section 3.12.2 – Add note to IndexVolume field for Northbound Daily Quota Balance value</td></tr>
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- Section 3.10.1 – Update description for Statistics (60) message</td></tr>
<tr><td>V1.10A</td><td>12 Aug 2015</td><td>Revised Edition with the following updates:
- Section 3.8.2 – Typo Correction
- Appendix A – Update the index name “CSI HK Mainland Enterprises 50 Index” and add six new HSI indices</td></tr>
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VCM on 22 Aug 2016</td><td>Introduction of Closing Auction Session (CAS) & Volatility Control Mechanism (VCM)
- Section 1.3 – Add new messages Order Imbalance (56), Reference Price (43), VCM Trigger (23)
- Section 3.2 – Add New MsgType for Order Imbalance (56), Reference Price (43), VCM Trigger (23)
- Section 3.6.2 – Introduce two fields “VCM Flag” and “CAS Flag” in Securities Definition
- Section 3.7.1 – New field values for new trading sessions in CAS
- Section 3.8.5 – Add new Order Imbalance (56) message
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- Section 3.6.2 – Format change to Security Definition (11) message to insert a number of fillers inside the message
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• Section 3.7.2 – Rename the data field “SecurityTradingStatus” (at Offset#8) to “SuspensionIndicator” and revise its description</td></tr>
<tr><td>18 Apr 2016</td><td>Launch of new Index
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<tr><td>Phrase 1 of CAS on 25 Jul 2016</td><td>Clarifications
• Section 3.9.5 – Revise description for Reference Price message</td></tr>
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<tr><td>Immediate</td><td>Clarifications
• Sections 3.7.1 and 3.9.6 – Revise descriptions for Time fields to align across the document</td></tr>
<tr><td>23 May 2016</td><td>Renaming of CES Shanghai-Hong Kong Stock Connect 300 Index
• Appendix A – Rename “CES Shanghai-Hong Kong Stock Connect 300 Index” to “CES Stock Connect 300 Index”</td></tr>
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• Section 3.12.2 – Add TR under descriptions of PreviousSesClose
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• Appendix A – HKEX and Thomson Reuters co-branded indices are listed as Third Party Content under the Licence Agreement</td></tr>
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Section 3.10.2 – Revise description for Market Turnover message</td></tr>
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• Section 1.3 – Include Stock Connect Data in Summary Table
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• Section 3.2 – Include Stock Connect Daily Quota Balance (80) and Stock Connect Market Turnover (81) in MsgType list
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<tr><td>30 Oct 2017</td><td>Remove Daily Quota Balance (DQB) from Index
• Section 3.12.2 – Remove all description related to “CSCSHQ Northbound Daily Quota Balance of Shanghai-Hong Kong Stock Connect” and “CSCSZQ Northbound Daily Quota Balance of Shenzhen-Hong Kong Stock Connect”
• Appendix A – Remove “CSCSHQ Northbound Daily Quota Balance of Shanghai-Hong Kong Stock Connect” and “CSCSZQ Northbound Daily Quota Balance of Shenzhen-Hong Kong Stock Connect”</td></tr>
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<tr><td>30 April 2018</td><td>OMD-C Reference Data Enrichment :

More product attributes are added to Security Definition (11)
• Section 3.6.2 – Redefine Securities Definition (11) message with the following changes:
a) Replace reserved fillers with new reference data :
- Product Type;
- Upper Strike Price;
- Warrant Type;
- Call Price;
- Entitlement; and
- Number of Warrants per Entitlement
b) Revise description of existing attributes to reflect the enlarged coverage after the enrichment
- Conversion Ratio
- Style
c) Replace obsolete data fields with fillers
- Test Security Flag
- Underlying Security Weight
d) Remove reference to basket warrants

Include more indices in the Index Feed
• Appendix A – Add Index Code for the following new index/indices:
a) CES Stock Connect Hong Kong Premier 50 Index

Other housekeeping changes:
• Section 2.4 – Revise the example of race conditions
• Section 3.1.1 – Present Null Values in table format
• Section 3.1.2 – Present Currency Codes in table format
• Section 3.1.3 – Remove Section 3.1.3 Decimal Value, related information have been included in Developer Guide
• Section 3.6.1, 3.6.2, 3.10.2, 3.11.1 – Change all references to “market” to “market segment”
• Section 3.7.1 – Replace obsolete Trading Session ID with filler
• Section 3.9.1 – Update reference to Public trade type</td></tr>
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<tr><td>V1.22</td><td>12 Sep 2018</td><td>Revised Edition with the following updates
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<tr><td>Immediate</td><td>Clarifications
• Section 3.1.2 – Revise description for Currency Value
• Appendix A – Update the note for CSI and CES index data</td></tr>
<tr><td>27 Oct 2018</td><td>Include more indices in the Index Feed
• Appendix A – Add Index Code for the following new index/indices:
a) Hang Seng Index (Gross Total Return Index)
b) Hang Seng Finance Sub-Index (Gross Total Return Index)
c) Hang Seng Utilities Sub-Index (Gross Total Return Index)
d) Hang Seng Properties Sub-Index (Gross Total Return Index)
e) Hang Seng Index Commerce & Industry Sub-Index (Gross Total Return Index)
f) Hang Seng China Enterprises Index (Gross Total Return Index)
g) Hang Seng Index (Net Total Return Index)
h) Hang Seng Finance Sub-Index (Net Total Return Index)</td></tr>
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				i) Hang Seng Utilities Sub-Index (Net Total Return Index) j) Hang Seng Properties Sub-Index (Net Total Return Index) k) Hang Seng Index Commerce & Industry Sub-Index (Net Total Return Index) l) Hang Seng China Enterprises Index (Net Total Return Index)

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1. INTRODUCTION

1.1 PURPOSE

This document specifies the Binary interface of the HKEX Orion Market Data Platform ("OMD") for the MMDH (Mainland Market Data Hub).

This document is the Transmission Specification(s) of the relevant Datafeed(s) under your Market Data Vendor License Agreement or the Market Data End-User License Agreement ("License Agreement"). Please refer to Section 1.2 and the summary table at Section 1.3 and Section 1.4 for the information applicable to the Datafeed(s) under your License Agreement.

HKEX endeavors to ensure the accuracy and reliability of the information provided in this interface specification, but takes no responsibility for any errors or omissions or for any losses arising from decisions, action, or inaction based on this information. The Licensee shall not use such interface specifications for any purpose other than as expressly permitted under the Licence Agreement. No part of this document may be copied, distributed, transmitted, transcribed, stored in a retrieval system, translated into any human or computer language, or disclosed to third parties without written permission from HKEX-IS.

1.2 READING GUIDE

The chapters following this introduction are:

Chapter 2: System Overview

Chapter 3: Message Formats

Chapter 4: Recovery

Chapter 5: Message Scenarios

Chapter 6: Aggregated Order Book Management

Appendix A: List of Indices under OMD Index

All chapters and appendices except Chapter 3 and Appendix A are applicable to all Datafeeds unless otherwise specified. In Chapter 3, there are indications* in individual sections/sub-sections for their applicability to individual Datafeeds, and Appendix A is applicable to OMD Index only. The information is also summarised in Section 1.3 Summary Table.

* Example

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.3.1	●	●

1.3 SUMMARY TABLE

Section	Message Formats	OMD Securities Standard (SS)	OMD Index (Index)
3.1	Data Types	●	●
3.2	Message Header	●	●
3.3	Control Messages	●	●
3.4	Logon	●	●
3.5	Refresh	●	●
3.6	Reference Data	●	

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3.7	Status Data	●	
3.8.1	Add Odd Lot Order (33)	▲	
3.8.2	Delete Odd Lot Order (34)	▲	
3.8.3	Aggregate Order Book Update (53)	●	
3.8.4	Broker Queue (54)	●	
3.8.5	Order Imbalance (56)	●	
3.9.1	Trade Ticker (52)	●	
3.9.2	Closing Price (62)	●	
3.9.3	Nominal Price (40)	●	
3.9.4	Indicative Equilibrium Price (41)	●	
3.9.5	Reference Price (43)	●	
3.9.6	VCM Trigger (23)	●	
3.10.1	Statistics (60)	●	
3.10.2	Market Turnover (61)	●	
3.10.3	Yield (44)	●	
3.11.1	News (22)	●	
3.12	Index Data		●
3.13	Stock Connect Data	▲	

● The information supplied in the corresponding sub-section applies to the Datafeed(s)
▲ Complimentary service to the Datafeed(s).

Complimentary service
Odd Lot order information and Stock Connect Market Information will be provided in streaming mode as complementary services to clients subscribing to SS. Please refer to 3.8.1 and 3.8.2 for details on the odd lot order message; and refer to 3.13 for details on Stock Connect Data messages.

1.4 SCOPE OF INFORMATION

HKEX Orion Market Data Platform – Securities Market & Index Datafeed Products ("OMD-C") MMDH provides real time trading information of all instruments listed and traded on the securities market, indices and market information to the Licensees. The information can be grouped into the following categories:

Securities Products
- Equity Securities
- Depository Receipts
- Stapled Securities
- Debt Securities
- Unit Trusts/Mutual Funds
  - Exchange Traded Funds
  - Real Estate Investment Trusts
  - Other Unit Trusts/Mutual Funds
- Structured Products
  - Derivatives Warrants
  - Callable Bull/Bear Contracts
  - Listed Equity Linked Instruments
- Trading Only Securities

Indices and Market Information
Stock Connect Market Information

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2. SYSTEM OVERVIEW

2.1 SCOPE

Mainland Market Data Hub ("MMDH") is a remote hub of the HKEX Orion Market Data Platform ("OMD") in Mainland China providing market data to local clients.

Data is represented in an efficient binary message format for all instruments listed on the Securities Market. It has been designed for high throughput and low latency.

2.1.1 TCP Protocol

In contrast to the OMD central system in Hong Kong which disseminates market real-time data to clients via multicast, MMDH provides real-time market data to clients in Mainland China via TCP.

Figure 1 - MMDH Connections

2.1.2 Connection Options

Client may choose one of the following connection options at MMDH:

<u>Standard Configuration (with one live feed):</u>

Under the standard configuration, each client is required to have a set of 3 leased lines, two connecting to the Primary Site and one connecting to the Secondary Site, to receive MMDH market data. An optional 4th connection can allow clients to connect two lines to the MMDH Secondary Site if desired. It should be noted that whilst 3 connections should be possible only one connection will ever be live at any one time. Multiple logons to MMDH are not permitted.

<u>Non-Standard Configuration (with two live feeds):</u>

Each client is required to have a set of 4 leased lines, two connecting to the Primary Site and two connecting to the Secondary Site, to receive MMDH market data. Clients can adopt to receive data transmission concurrently from both links to OMD Primary production system by using two distinct usernames to logon MMDH. OMD will operate the two links separately as if they were two primary links connected to two independent systems. Though clients can receive data concurrently from the two logons, multiple logons with same username is not allowed. Client who will supply OMD feeds to indirectly connected real-time vendors, subject to the Exchange's prior approval, is required to adopt the non-standard configuration with two live feeds.

A configuration document for client's network setup will be provided when the client has established the leased lines to the MMDH sites.

2.1.3 Recovery Mechanisms

The system provides two mechanisms for clients to recover possible data loss from disconnections, namely, Restart and Refresh. Please refer to section 4 (Recovery) for an explanation or sections 5.2 and 5.3 for examples.

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2.1.4 Server Disconnection

In rare situations the MMDH Server may initiate a disconnection which may require clients to re-load all static data for all instruments. Clients should re-establish connection and logon again and then use the 'SessionStatus' field within the Logon Response message to determine appropriate recovery action. See section 3.4.3 (Logon Response) and section 4 (Recovery) for details.

2.2 SESSION MANAGEMENT

OMD-C MMDH does not operate on non-trading days of the Hong Kong Securities Market except those days when there are real-time index data calculated and disseminated by the index compiler. HKEX may perform system testing on Saturdays, Sundays or days when OMD-C MMDH is not in operation. Clients should treat data transmitted via OMD-C MMDH on those days as non production data and disregard them.

2.2.1 Password Policy

- Password shall contain at least 8 characters
- Password shall contain a combination of letters (both upper & lower case) and numbers(0-9)
- New password shall not be the same as any of the last 5 passwords
- Client should not change password again within 24 hours
- Client account shall be locked for at least 30 minutes upon 6 consecutive unsuccessful logon attempts
- Passwords will expire after 90 calendar days
- Client must change their password on the first logon attempt after the password is reset by HKEX due to whatever reason (e.g. client forgets the old password)

2.2.2 Start of Day

OMD-C MMDH is normally ready for a new business day at 6:00am. However, the Exchange has the right to adjust the system ready time in the future according to the different trading situations.

After a client has established a TCP connection the first message received will be a SendKey (1105) message with sequence number 1, and then following successful logon the client should expect to receive a Logon Response (1102) message with sequence number 2. On receipt of this message, the client must clear all cached data for all instruments. The static data for all markets, securities, liquidity providers and currency rates is published each day shortly after successful logon.

If a client connects to OMD-C MMDH after the start of business day and the amount of market data missed by the client is too large to be recovered through the Restart recovery mechanism, OMD-C MMDH will return a logon response to indicate they need to refresh.

2.2.3 Normal Transmission

Normal message transmission is expected between the time whenever there is any update either in OMD Securities Standard (SS) or OMD Index (Index)*. Heartbeats are sent regularly when there is no activity – the length of time between heartbeats being specified in the Logon Response (1102) message. Under normal transmission the "SeqNum" field values in the message headers received (except heartbeats) by clients are consecutive and increasing. Reliable transmission is guaranteed by the TCP/IP protocol and gaps in transmission will not happen as long as the TCP connection is intact.

* Message transmission in SS is expected between when the market opens for trading and when the market is closed whereas message transmission in INDEX is expected between 8:00am to 11:45pm.

2.2.4 End of Day

OMD-C MMDH will normally be shut down at 11:45pm thereupon will stop sending messages (including heartbeats) on each channel. This shutdown time, however, is not rigid and the Exchange has the right to adjust this time according to the different trading situations.

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2.2.5 Error Recovery

2.2.5.1 System Component Failure

If a system component fails and requires a failover or restart, there will be a short interruption in dissemination of data.

When MMDH resumes operation, clients can reconnect based on the last sequence number received and in this way receive all messages during the outage period if those messages are still held in MMDH for Restart recovery or, otherwise, the latest market snapshot from Refresh.

Standard Configuration clients are recommended to attempt connecting in a round robin fashion via the 2 leased lines to MMDH Primary Site. Normally the clients can connect via any of the 2 leased lines to MMDH in the Primary Site unless MMDH failovers to the Secondary Site, by then the clients can connect via the leased line(s) to the MMDH in the Secondary Site.

Similarly, Non-Standard Configuration clients are recommended to connect separately via the 2 leased lines to MMDH Primary Site for the 2 live connections. When MMDH fails over to the Secondary Site, the clients can connect separately via the 2 leased lines to MMDH Secondary Site for the 2 live connections.

2.2.5.2 Disaster Recovery

Disaster Recovery services do exist and clients will be provided with a set of IP addresses for both the MMDH Primary and Secondary sites. The same username and password will apply to both.

Since sequence numbers between the Primary site and the Secondary site are not guaranteed to be the same a Refresh may be required. Clients should specify the 'InternalSeqNum' as 0 during their first Logon to the Secondary site and the MMDH system at Secondary site will respond with Restart recovery required or indicate the need for a Refresh. Any subsequent disconnects should continue to use the last seen number the same as for the MMDH Primary.

2.3 TRADING SESSIONS

Normally, trading is conducted in auction trading session(s) and continuous trading session(s) every trading day. However, there are situations where there is only half day trading with fewer trading session(s) (Christmas eve, New Year eve and Chinese New Year eve), or a trading session is suspended due to a typhoon etc. MMDH 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.

2.4 RACE CONDITIONS

The information supplied in this section does not apply to OMD Index.

Since order, trade and reference data are transmitted to MMDH via separate paths this may lead to a race condition.

As an example the Trading Session Status (20) messages and market activity are decoupled; e.g. for a short time after a TradSesStatus of "Halted" is reported real-time data for that same market may continue to arrive.

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3. MESSAGE FORMATS

3.1 DATA TYPES

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.1	●	●

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

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 Int64 fields of the Index Data (71) message.

Data Type	Null Representation	Example of Usage
Int64	0x8000000000000000 (Hex 2's complement) or -9223372036854775808 (Decimal)	HighValue, LowValue of Index Data (71)

3.1.2 Currency Values

Please refer to the Third Schedule of Rules of the Exchange in HKEX website for possible ISO-4217 Currency Codes used in OMD-C. Apart from the Currency Codes listed in the aforesaid Schedule, OMD-C will also use the Currency Code listed below:

Currency Code	Currency
CNH	Chinese Renminbi (Offshore)

HKEX may add or delete currency code(s), whenever applicable, in the future.

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3.2 MESSAGE HEADER

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.2	●	●

TCP Header and Data sample layout:

TCP Header	Message Header + Message 1	Message Header + Message 2	…	Message Header + Message N

All messages will begin with the standard TCP Header followed by a variable number of Messages. This is true both for messages disseminated by OMD and client messages sent to the MMDH.

Message Header

Offset	Field	Format	Len	Description
0	MsgLength	Uint16	2	Size of the message (including the header)
2	Filler	String	2	
4	SeqNum	Uint32	4	Sequence number of the message and is consecutive
8	InternalSeqNum	Uint32	4	Internal MMDH sequence number
12	SendTime	Uint64	8	The number of nanoseconds since midnight Coordinated Universal Time (UTC) of January 1, 1970, precision is provided to the nearest millisecond
Header length			20	

SeqNum starts from 1 for each logon and increases with sequential consecutive sequence numbers.

InternalSeqNum should only be used in the event of intraday disconnection and in this case the last received InternalSeqNum should be provided in the Logon (1101) message – see section 3.4.2 Logon (1101) for details. This field is populated on every message except during refresh – refresh messages do not have an internal sequence number – see section 5.3 for details. InternalSeqNum is incremental but not necessarily consecutive. Client may find gaps in the InternalSeqNum values of consecutive messages.

When sending messages to the MMDH (e.g. Logon (1101) or Refresh Request (1201)), the same message header must also be used by clients. In this event the 'SeqNum' and 'InternalSeqNum' fields within the Message Header need not be populated. Note however the 'InternalSeqNum' field within the Logon message would need to be provided.

The format of each message 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.

Table 1: MsgSize and MsgType Fields

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: Logon (1101)

Field	Format	Le n	Description
			Logon Response (1102)- MMDH Response Logout (1103) SendKey (1105) Refresh Request (1201) Refresh Response (1202) Refresh Complete (203) Market Definition (10) Security Definition (11) Liquidity Provider (13) Currency Rate (14) Trading Session Status (20) Security Status (21) Add Odd Lot Oder (33) Delete Odd Lot Order (34) Aggregate Order Book Update (53) Broker Queue (54) Order Imbalance (56) Trade Ticker (52) Closing Price (62) Nominal Price (40) Indicative Equilibrium Price (41) Reference Price (43) VCM Trigger (23) Statistics (60) Market Turnover (61) Yield (44) News (22) Index Definition (70) Index Data (71) Stock Connect Daily Quota Balance (80) Stock Connect Market Turnover (81)

3.3 CONTROL MESSAGES

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.3	●	●

3.3.1 Heartbeat

Heartbeats consist of a message header with length set to the message header length. They do not increment the sequence number. SeqNum is set to the sequence number of the previous message. The Heartbeat message will be identical for all the services.

When not sending data the Server will repeatedly send heartbeat messages every few seconds and the period is communicated by the HeartBtInterval sent in the Logon Response (1102) message.

Also, clients should repeatedly send a heartbeat message to the Server at all times to maintain the TCP connection. The heartbeat should be periodic – as defined by the HeartBtInterval field received in the Logon Response (1102) message. If the server does not receive the expected heartbeat messages from the client two times in a row, then the server will logout the client and the client will receive the Logout (1103) message. See section 3.4.4 Logout (1103).

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3.4 LOGON

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.4	●	●

Refer to Logon 5.1 within Message Scenarios for details on the restart messages.

3.4.1 Send Key (1105)

Prior to commencing Logon, MMDH clients must first exchange cryptographic keys with the OMD system and this is achieved using the Diffie-Hellman key exchange algorithm. The keys are then used to encrypt the password or new password fields during logon.

Prime, Generator, Public Key and Initialization Vector parameters are required by the client to complete the key exchange, which are sent by the MMDH server to the client once a TCP session is established. These parameters are sent in the 'SendKey' message.

The following diagram shows the first three messages transferred during all Logon scenarios:

Figure 1 - SendKey and Logon

Step 1	Client opens connection to Server

- On connection the Client is sent a SendKey (1105) message containing the Diffie-Hellman parameters and a concatenated public key and random Initialisation Vector "IV"

Step 2	Client calculates parameters and sends a Logon (1101) message

- Client sets Diffie-Hellman parameters (prime, generator, subgroup order) from the values contained in the SendKey (1105) message
- Client generates a random public and private key pair
- Client creates a shared secret based on the OMD public key and the client private key
- Client uses SHA-256 to hash the shared secret to enable the creation of an AES Key
- Client encrypts the password using the generated AES Key in CFB mode, with the IV passed by the Server to the client (contained in the OMDPublicKey field)

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- Client populates a Logon (1101) message containing the encrypted password and the client public key
- *Note: the same method is used to encrypt the 'newpassword' field if password change is required*

Step 3	Client sends Logon to Server

- Server creates a shared secret based on the Client public key and the OMD private key
- Uses SHA-256 to hash the shared secret to enable the creation of an AES Key
- Decrypts the password using the generated AES Key in CFB mode, with the server stored IV
- Continues normal logon procedure: e.g. authenticates the password against the password hash stored in the database, and checks for dual logon, etc.
- Populates a LogonResponse message

Step 4	Client receives LogonResponse from Server

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	1105 Send Key
4	Prime	Data	128	A large Prime number in hexadecimal format	
132	Generator	Data	128	Generator – A primitive root modulo the value of Prime in hexadecimal format	
260	PrimeOrderSubgroup	Data	128		
388	OMDPublicKey	Data	144	First 128 bytes: the Public Key being shared Last 16 bytes: the Initialization Vector	
Total Length			532		

3.4.2 Logon (1101)

The Logon (1101) message for clients enables both the mechanism for client authentication and password management.

Password length is between 8 and 20 characters.

Normal operation is as follows:-

Client sends Logon (1101) message containing username and encrypted password to the MMDH Publisher, which responds with the SessionStatus of 0 (Session active). The InternalSeqNum field will be used to assist with intra-day recovery but at start of day, should be set to 0. In the case of intra-day recovery the user can set the 'InternalSeqNum' field to the last received internal sequence number (this is one of the fields in the message header).

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If the fields EncryptedNewPasswordLen and EncryptedNewPassword are populated, the logon attempt is seen as a password change attempt. During normal logon these fields should be empty.

See sections 5.1, 5.2, 5.3, 5.4 and 5.5 for diagrams showing the scenarios where this message is used.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	1101 Logon
4	Username	String	12	Username to log on, padded with binary null characters	
16	InternalSeqNum	Uint32	4	Set to the last received internal sequence number; Or 0 at the start of the day	
20	ClientPublicKey	Data	128	Generated according to the algorithm shown above	
148	EncryptedPasswordLen	Uint8	1	Length of the EncryptedPassword in bytes	Integer
149	EncryptedPassword	Data	20	AES Encrypted password	
169	EncryptedNewPasswordLen	Uint8	1	Length of the EncryptedNewPassword in bytes	Integer
170	EncryptedNewPassword	Data	20	AES Encrypted new password	
Total Length			190		

3.4.3 Logon Response (1102)

If the password is reset by HKEX Operations then the user should specify this password as well as their new password details during their next logon attempt – see Change Password Message scenario in Section 5.5 for details. If the user does not specify their new password details then the user will receive a Logon Response (1102) message "SessionStatus" set to "Password expired".

Further attempts to use an expired password will be rejected with reason of "password expired". If this happens, the Subscriber has to reattempt logon until a correct new password has been specified and accepted.

Notes:

- The client is expected to adhere to the HeartBtInterval populated within the logon response provided by MMDH to avoid disconnection – see section 3.3.1 for details.
- A TCP disconnection will follow SessionStatus return values of 5, 6, 100, 104 or 105. In these cases clients should reconnect and wait for a new SendKey(1105) message before re-attempting Logon.
- A user account may be locked by HKEX Operations or when users exceed the maximum number of logins permitted per day – indicated by a SessionStatus return value of 6.

See sections 5.1, 5.2, 5.3, 5.4 and 5.5 for diagrams showing the scenarios where this message is used.

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Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	1102 Logon Response
4	HeartBtInterval	Uint16	2	Heartbeat Interval	
6	SessionStatus	Uint8	1	Status of the session	0 Session active 1 Session password changed 2 Session password due to expire 3 New session password does not comply with policy 5 Invalid username or password 6 Account locked 8 Password expired 100 Password not changed (changed within 24 hrs) 101 Session Active - refresh required 104 Already Connected 105 Client Public Key Generation Issue
7	PasswordExpiryDays	Uint8	1	Number of days left before password expires	Numerical
Total Length			8		

3.4.4 Logout (1103)

The logout message is issued from the MMDH to inform clients when they have been logged out. The server will follow with a TCP disconnect. See sections 5.6 and 5.7 for diagrams showing the scenarios where this message is used.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	1103 Logout
4	SessionStatus	Uint8	1	Session Status	6 Account locked 102 Logon from second connection 103 Heartbeat timeout
5	Filler	String	3		
Total Length			8		

3.5 REFRESH

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.5	●	●

Refer to Refresh and restart scenarios within Message Scenarios, Section 5, for details on the Refresh and Restart messages.

3.5.1 Refresh Request (1201)

Used to request a Refresh of all market state from MMDH – for content detail refer to section 4.2 Refresh Service.

See section 5.3 for a diagram showing the scenario where this message is used.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	1201 Refresh Request
Total Length			4		

3.5.2 Refresh Response (1202)

Used to acknowledge an application refresh request.

See section 5.3 for a diagram showing the scenario where this message is used.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	1202 Refresh Response
4	RefreshStatus	Uint8	1	Status of the refresh response	0 Request fully processed
5	Filler	String	3		
Total Length			8		

3.5.3 Refresh Complete (203)

This message is published at the end of a refresh cycle to demonstrate that the system has re-sent all messages. Once all refresh data is sent, the client is up to date and will continue to receive normal data flow as messages arrive.

See section 5.3 for a diagram showing the scenario where this message is used.

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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	LastInternalSeqNum	Uint32	4	The internal sequence number with this refresh (matches the Message Header)	Numerical
Total Length			8		

3.6 REFERENCE DATA

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.6	●	

3.6.1 Market Definition (10)

The Market Definition message is generated at the start of the business day for each market segment.

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message.	10 Market Definition
4	MarketCode	String	4	Market segment identifier	MAIN GEM NASD ETS
8	MarketName	String	25	Market segment name	Alphanumerical
33	CurrencyCode	String	3	Base currency code of the market segment.	See Currency Values in section 3.1.2 for full details.
36	NumberOfSecurities	Uint32	4	Number of securities within the market segment	
Total Length.....			40		

3.6.2 Security Definition (11)

This Security Definition (11) message contains all the reference data for a security.

Security Definition (11) messages may be received intraday – for example the 'FreeText' field may be updated during the day.

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Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	11 Security Definition
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	MarketCode	String	4	Market segment identifier	MAIN GEM NASD ETS
12	ISINCode	String	12	ISIN code of the security	
24	InstrumentType	String	4	Instrument type of the security	BOND Bonds EQTY Equities TRST Trusts WRNT Warrants & structured products
28	ProductType	Uint8	1	Product type of the security	1 Equity – Ordinary Shares 2 Equity – Preference Shares 7 Equity – Depository Receipt (HDR) – Ordinary Shares 12 Equity – Depository Receipt (HDR) – Preference Shares 6 Equity – Rights 13 Warrant – Equity Warrant 3 Warrant – Derivative Warrant (DW) 14 Warrant – Equity Linked Instrument (ELI) 11 Warrant – Callable Bull/Bear Contract (CBBC) 4 Bond – Debt Security 5 Trust – Exchange Traded Fund (ETF) 8 Trust – Real Estate Investment Trust (REIT) 9 Trust – Other Unit Trusts 10 Trust – Leveraged and Inverse Product (LIP) 99 Others – None of the above
29	Filler	String	1		
30	SpreadTableCode	String	2	Spread table code of the security	Spread table as per Second Schedule of Rules of the Exchange: '01' Part A '03' Part B
32	SecurityShortName	String	40	Security short name	
72	CurrencyCode	String	3	Security currency code of the market	See Currency Values in section 3.1.2 for full details.
75	SecurityNameGCCS	Binary	60	Security name in Traditional Chinese using Unicode	**Unicode UTF-16LE encoded**
135	SecurityNameGB	Binary	60	Security name in Simplified Chinese using Unicode	**Unicode UTF-16LE encoded**
195	LotSize	Uint32	4	Board lot size for the security	
199	Filler	String	4		

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Offset	Field	Format	Len	Description	Values
203	PreviousClosingPrice	Int32	4	Previous closing price of the security	3 implied decimal places
207	VCMFlag	String	1	Indicates whether Volatility Control Mechanism (VCM) is applicable to the security	Y VCM applicable N VCM not applicable
208	ShortSellFlag	String	1	Indicator for short-sell authorization	Y Short-sell allowed N Short-sell not allowed
209	CASFlag	String	1	Indicates whether Closing Auction Session (CAS) is applicable to the security	Y CAS applicable N CAS not applicable
210	CCASSFlag	String	1	Indicates whether or not the security is a CCASS security	Y CCASS security N Non CCASS security
211	DummySecurityFlag	String	1	Dummy Security Flag	Y Dummy security N Normal security
212	Filler	String	1		
213	StampDutyFlag	String	1	Indicator for stamp duty requirement	Y Stamp duty required N Stamp duty not required
214	Filler	String	1		
215	ListingDate	Uint32	4	Date of security listing	The representation is YYYYMMDD Value is 19000101 for unknown listing date
219	DelistingDate	Uint32	4	Date of security delisting	The representation is YYYYMMDD. Value is 0 if no date exists.
223	FreeText	String	38	Free text associated to the security	Fixed length array of free text. When there is no free text, spaces will be present instead.
261	Filler	String	82		
Bonds Specific Data					
343	EFNFlag	String	1	EFN Indicator	Y EFN N Non-EFN
344	AccruedInterest	Uint32	4	Accrued interest of the security	3 implied decimal places
348	CouponRate	Uint32	4	Coupon rate of a bond security	3 implied decimal places
352	Filler	String	42		
Warrants, Basket Warrants and Structured Product specific data					
394	ConversionRatio	Uint32	4	Conversion ratio for Structured Product	3 implied decimal places
398	StrikePrice1	Int32	4	Strike price of the security if it has only one strike price, or Lower strike price of the security if it has lower and upper strike prices (i.e. upper strike price not = 0)	3 implied decimal places
402	StrikePrice2	Int32	4	Upper strike price of the security if it has lower and upper strike prices	3 implied decimal places Value is 0 if the securities has only one strike price
406	MaturityDate	Uint32	4	Date of maturity of a warrant or structured security	The representation is YYYYMMDD

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Offset	Field	Format	Len	Description	Values
410	CallPutFlag	String	1	Indicator of whether the warrant or structured product is a call or put option	For Derivative Warrants: C Call P Put O Others For ELI & CBBC: C Bull P Bear / Rang
411	Style	String	1	Style of the warrant	A American style E European style <blank> Other
412	Filler	String	2		
414	WarrantType	String	1	Warrant type of the warrant	N Normal instrument X Exotic instrument "0" Not available
415	CallPrice	Int32	4	Call price for CBBC	See DecimalsInCallPrice for the number of decimal places defined 0 Not available
419	DecimalsInCallPrice	Uint8	1	Number of decimal places in Call Price	Not applicable if CallPrice = 0
420	Entitlement	Int32	4	Entitlement of the warrant	See DecimalsInEntitlement for the number of decimal places defined 0 Not available
424	DecimalsInEntitlement	Uint8	1	Number of decimal places in Entitlement	Not applicable if Entitlement = 0
425	NoWarrantsPerEntitlement	Uint32	4	Number of warrants per entitlement	Not applicable if Entitlement = 0
429	Filler	String	33		
462	NoUnderlyingSecurities	Uint16	2	Number of underlying security codes within this message	0 for structured product of which the underlying is not a security defined in Security Definition (11) message 1 for structured product of which the underlying is defined in Security Definition (11) message
464	UnderlyingSecurityCode	Uint32	4	5-digit code identifying the underlying security	
468	Filler	Uint32	4		
Total Length.....		464 + $8n_U$			

(n_U = value of NoUnderlyingSecurities)

Note:

(1) PreviousClosingPrice may be set to 0, for example on the first day of listing (no existing previous closing price)

(2) Fields in Bonds Specific Data & Warrants and Structured Product Specific Data should be ignored if they are not applicable to the InstrumentType

3.6.3 Liquidity Provider (13)

The Liquidity Provider (13) message is generated at the start of the business day for securities that have at least one liquidity provider.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	13 Liquidity Provider
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	NoLiquidityProviders	Uint16	2	Number of liquidity providers within this message	1 to 50
10	LPBrokerNumber	Uint16	2	Broker number of the liquidity provider	
Total Length.....		10 + $2n_T$			

(n_T = value of NoLiquidityProviders)

3.6.4 Currency Rate (14)

The Currency Rate message provides the foreign exchange conversion rates between various foreign currencies and the Hong Kong dollar.

The Currency Factor and Currency Rate fields should be interpreted as below:

For example if 1 Euro is valued 10.22 HKD
- Currency Factor will be 0 (1 EUR)
- Currency Rate will be 102200 *(4 decimals implied)*

For example if 1000 Japanese Yen is worth 90.678 HKD
- Currency Factor will be 3 *(1000 JPY)*
- Currency Rate will be 906780 (*4 decimals implied*)

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	14 Currency Rate
4	CurrencyCode	String	3	Currency code.	See Currency Values in section 3.1.2 for full details.
7	Filler		1		
8	CurrencyFactor	Uint16	2	Currency factor conversion.	A non-zero value n means all price fields for this security should be interpreted as a value equal to the price multiplied by 10^n.
10	Filler		2		
12	CurrencyRate	Uint32	4	Currency rate	Rate, expressed in HKD for one foreign currency unit. 4 decimals implied.
Total Length.....			16		

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3.7 STATUS DATA

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.7	●	

3.7.1 Trading Session Status (20)

The Trading Session Status provides information on the status of a market segment. It is sent whenever there is change of trading session.

This message may not be synchronized with order and trade data.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	20 Trading Session Status
4	MarketCode	String	4	Market segment identifier	MAIN GEM NASD ETS
8	Filler	Uint8	1		
9	TradingSessionSubID	Uint8	1	Trading session sub-identifier	0 Day Close (DC) 1 Pre-trading [Pre-Opening Session (POS)] Order Input (OI) 2 Opening or Opening Auction [POS] Matching (MA) 3 Continuous trading (CT) 4 Closing or Closing Auction [Closing Auction Session (CAS)] Matching (MA) 5 Post-trading [CAS] Order Input (OI) 7 Quiescent (i.e. Blocking) (BL) 100 Not Yet Open (NO) 101 No Cancel/Modification [POS] (NC) 102 Exchange Intervention (EI) 103 Close (CL) 104 Order Cancel (OC) 105 Reference Price Fixing [CAS] (RP) 106 No Cancellation [CAS] (NW) 107 Random Close [CAS] (RC)
10	TradingSesStatus	Uint8	1	Status of the current trading session	0 Unknown (for NO) 1 Halted (for BL, EI) 2 Open (for POS OI,POS NC, POS MA, CT, OC) 3 Closed (for CL) 5 Pre-Close (for [CAS] RP, [CAS] NW, [CAS] RC, [CAS] MA, [CAS] OI)[1] 100 Day Closed (for DC)

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Offset	Field	Format	Len	Description	Values
11	TradingSesControlFlag	String	1	Indicates how control of trading session and sub-session transitions are performed	0 Automatic (Default) 1 Manual (this invalidates the normal schedule for the day)
12	Filler	String	4		
16	StartDateTime	Uint64	8	Start time of the trading status	The number of nanoseconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970, precision is provided to the nearest second. Set to 0 if no time is available.
24	EndDateTime	Uint64	8	End time of the trading status	The number of nanoseconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970, precision is provided to the nearest second. Set to 0 if no time is available.
Total Length.....			32		

3.7.2 Security Status (21)

The Security Status message is generated

- At the start of the business day if the security is not available for trading..
- Whenever a security state changes.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	21 Security Status
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	SuspensionIndicator	Uint8	1	Indicate whether the security is currently halted/ suspended for trading	2 Trading Halt or Suspend 3 Resume
9	Filler	String	3		
Total Length.....			12		

Note: ‘Resume’ in Suspension Indicator means the security is now available for trading,

3.8 ORDER BOOK DATA

This section includes definition of the following messages:

- Add / Delete Odd Lot Order – for odd lot orders
- Aggregate Order Book Update – for board lot orders
- Broker Queue – for board lot orders

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3.8.1 Add Odd Lot Order (33)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.8.1	▲ (via complimentary odd lot order feed)	

▲ Complimentary service to the Datafeed(s)

The Add Odd Lot Order message is generated when a new odd lot order is inserted into the order book.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	33 Add Odd Lot Order
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	OrderId	Uint64	8	Unique identifier for each order performed within the trading day	Values may not be consecutive
16	Price	Int32	4	Price	3 implied decimal places
20	Quantity	Uint32	4	Number of shares	
24	BrokerID	Uint16	2	Integer identifier uniquely identifying the Broker	Integer
26	Side	Uint16	2	Side of the order	0 Bid 1 Offer
Total Length.....			28		

3.8.2 Delete Odd Lot Order (34)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.8.2	▲ (via complimentary odd lot order feed)	

▲ Complimentary service to the Datafeed(s)

The Delete Odd Lot Order message is generated when an existing odd lot order identified by the OrderId is deleted.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	34 Delete Odd Lot Order

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Offset	Field	Format	Len	Description	Values
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	OrderId	Uint64	8	Unique identifier for each order performed within the trading day	Values may not be consecutive
16	BrokerID	Uint16	2	Integer identifier uniquely identifying the Broker	Integer
18	Side	Uint16	2	Side of the order	0 Bid 1 Offer
Total Length.....			20		

3.8.3 Aggregate Order Book Update (53)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.8.3	●	

Refer to Section 6 - Aggregate Order Book Management for details on the Aggregate Order Book Update message. The Aggregate Order Book Update message only applies to Board Lots.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	53 Aggregate Order Book Update
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	Filler	String	3		
11	NoEntries	Uint8	1	Number of book entries within the message	
12	AggregateQuantity	Uint64	8	Aggregated number of shares.	
20	Price	Int32	4	Price	3 implied decimal places
24	NumberOfOrders	Uint32	4	Number of orders	
28	Side	Uint16	2	Side of the order	0 Bid 1 Offer
30	PriceLevel	Uint8	1	Price level	
31	UpdateAction	Uint8	1	Type of market data update action	0 New 1 Change 2 Delete 74 Orderbook Clear
32	Filler	String	4		
Total Length			$12 + 24n_O$		

(n_O = value of NoEntries)

3.8.4 Broker Queue (54)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.8.4	●	

The Broker Queue message contains the priority list of the (max) top 40 broker IDs for a given side, and is generated whenever any of the entries in the list are modified. Entries are ordered according to distance away from the best price with best price brokers being at the front of the queue. The queue will also include spread level entries between each price level, which are marked when the Type field is set to 'S'. When the Type field is set to 'S', there are two possibilities;

- The Item is non-zero – indicating the number of spread levels away from the best price
- The Item is zero – indicating that there are no brokers with orders at the spread level indicated by the previous entry of Type set to 'S'

Example: if the active offers are as below, and assuming a spread level is 0.01:

Ask Price	Broker ID
20.28	2137
20.28	4138
20.29	2141
20.29	5123
20.31	3145

Then the resulting Ask side Broker Queue will be represented as below:

Entry	1	2	3	4	5	6	7	8	9
Item	2137	4138	1	2141	5123	2	0	3	3145
Type	B	B	S	B	B	S	S	S	B

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	54 Broker Queue
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	ItemCount	Uint8	1	This field contains the number of items in the message – repeating items are shown indented below	0 to 40
9	Side	Uint16	2	Side of the order	1 Buy 2 Sell
11	BQMoreFlag	String	1	Flag indicating if there are more broker numbers in the queue	Y More broker numbers exist in the queue N No more exist

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Offset	Field	Format	Len	Description	Values
12	Item	Uint16	2	This field contains either the broker number or the number of spreads away from the best price	
14	Type	String	1	Indicates the type of information contained in the item	B Broker number S Number of Spread
15	Filler	String	1		
Total Length			$12 + 4n_I$		

(n_I = value of ItemCount)

3.8.5 Order Imbalance (56)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.8.5	●	

The Order Imbalance message provides order imbalance information at the Indicative Equilibrium Price (IEP) during the Closing Auction Session (CAS).

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	56 Order Imbalance
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	OrderImbalanceDirection	String	1	Indicates the imbalance direction when the matchable buy quantity and sell quantity at IEP are not equal	N Buy = Sell B Buy Surplus S Sell Surplus <space> Not applicable, i.e. when IEP is not available
9	Filler	String	1		
10	OrderImbalanceQuantity	Uint64	8	The absolute difference between the matchable buy quantity and the sell quantity at IEP Value should be ignored if Order Imbalance Direction is <space>	
18	Filler	String	2		
Total Length.....			20		

3.9 Trade And Price Data

3.9.1 Trade Ticker (52)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.9.1	●	

The Trade Ticker is an aggregation of several trades into one message, combining quantities of subsequent trades made on a given instrument at a given fixed price.

When a trade is cancelled, a Trade Ticker message will be generated with the TickerID set to the ticker which contains the cancelled trade, and with the AggregateQuantity set to remaining quantity outstanding.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	52 Trade ticker
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	TickerID	Uint32	4	Unique identifier per security for each trade ticker generated within the trading system. The ID is unique per security for each trading day	Starting from 1, incrementing by 1 for each trade ticker
12	Price	Int32	4	Price	3 implied decimal places
16	AggregateQuantity	Uint64	8	Aggregated number of shares	Remaining quantity if TrdCancelFlag = Y
24	TradeTime	Uint64	8	Time of trade	The number of nanoseconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970 TradeTime is up to seconds Not applicable when TrdCancelFlag = Y
32	TrdType	Int16	2	Public trade type	0 Automatch normal (Public Trade Type <space>) 4 Late Trade (Off-exchange previous day) (Public Trade Type "P") 22 Non-direct Off-Exchange Trade (Public Trade Type "M") 100 Automatch internalized (Public Trade Type "Y") 101 Direct off-exchange Trade (Public Trade Type "X") 102 Odd-Lot Trade (Public Trade Type "D") 103 Auction Trade (Public Trade Type "U")

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Offset	Field	Format	Len	Description	Values
					Not applicable when TrdCancelFlag = Y
34	TrdCancelFlag	String	1	Indicates that a trade covered in the original Trade Ticker has been cancelled	Y Cancelled N Not cancelled
35	Filler	String	1		
Total Length			36		

3.9.2 Closing Price (62)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.9.2	●	

The Closing Price message is generated near the end of the business day for each security. If the closing price is not available, the field 'ClosingPrice' is set to 0.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	62 Closing Price
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	ClosingPrice	Int32	4	Current Day Closing Price	3 implied decimal places
12	Filler	String	4		
Total Length			16		

3.9.3 Nominal Price (40)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.9.3	●	

The Nominal Price message may be generated when an order is added, deleted or modified in a book or when trade or trade cancel is performed. Before the arrival of the first Nominal Price message, the nominal price should be the same as the previous closing price provided in the Security Definition (11) message.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	40 Nominal Price

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Offset	Field	Format	Len	Description	Values
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	NominalPrice	Int32	4	Nominal price of a security	3 implied decimal places
Total Length.....			12		

Note: Nominal Price may be 0 in specific cases (e.g. no reference price)

3.9.4 Indicative Equilibrium Price (41)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.9.4	●	

The Indicative Equilibrium Price (IEP) message is generated whenever there is change of the Indicative Equilibrium Price (IEP) or Indicative Equilibrium Volume (IEV) during the Pre-Opening Session (POS) or Closing Auction Session (CAS). The IEP will become 0 when IEP does not exist.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	41 Indicative Equilibrium Price
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	Price	Int32	4	IEP	3 implied decimal places Value is 0 if IEP is not available
12	AggregateQuantity	Uint64	8	IEV	
Total Length.....			20		

3.9.5 Reference Price (43)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.9.5	●	

This message provides the reference price, lower and upper price limits for order input during an applicable auction session and will be sent again when there is any change of the reference price, lower and upper price limits during the session. Also the same information may be resent during the auction session.

For Closing Auction Session (CAS), a Reference Price message is generated at the start of the session for all the securities tradable on the day, regardless of whether it is a CAS applicable security or not.

For Pre-Opening Session (POS), no Reference Price messages are sent.

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Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	43 Reference Price
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	ReferencePrice	Int32	4	Reference price of the security for order input	3 implied decimal places Value is 0 if the reference price is not available
12	LowerPrice	Int32	4	Lower price of the allowed price band for order input	3 implied decimal places 0 means N/A
16	UpperPrice	Int32	4	Upper price of the allowed price band for order input	3 implied decimal places 0 means N/A
Total Length.....			20		

Note: Reference Price may be 0 in special cases (e.g. no nominal price).

3.9.6 VCM Trigger (23)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.9.6	●	

The VCM Trigger message is generated whenever a cooling off period is triggered by Volatility Control Mechanism (VCM).

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	23 VCM Trigger
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	CoolingOffStartTime	Uint64	8	Time when the cooling off period starts	The number of nanoseconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970, precision is provided to the nearest second.
16	CoolingOffEndTime	Uint64	8	Time when the cooling off period ends	The number of nanoseconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970, precision is provided to the nearest second.
24	VCMReferencePrice	Int32	4	Reference Price for the cooling off period	3 implied decimal places
28	VCMLowerPrice	Int32	4	Lower price in the price band allowed during the cooling off	3 implied decimal places

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Offset	Field	Format	Len	Description	Values
				period	
32	VCMUpperPrice	Int32	4	Upper price in the price band allowed during the cooling off period	3 implied decimal places
Total Length.....			36		

3.10 VALUE ADDED DATA

3.10.1 Statistics (60)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.10.1	●	

The Statistics message provides statistics including high/low prices and turnover. It is generated following trading activity.

The ShortSellSharesTraded and ShortSellTurnover fields (the shortsell fields) are only updated twice each day at most for securities with shortselling activities - at the end of the morning session if the shortsell fields are non-zero and at the end of the afternoon session if the value of any of the shortsell fields are different from that disseminated at the end of the morning session.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	60 Statistics
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	SharesTraded	Uint64	8	Number of shares traded for a security	
16	Turnover	Int64	8	Current turnover	3 implied decimal places
24	HighPrice	Int32	4	Highest trade price currently performed for a security	3 implied decimal places
28	LowPrice	Int32	4	Lowest trade price currently performed for a security	3 implied decimal places
32	LastPrice	Int32	4	Last trade price for a security	3 implied decimal places
36	Filler	String	4		
40	ShortSellSharesTraded	Uint32	4	Number of short-sell shares traded for a security	
44	ShortSellTurnover	Int64	8	Current short-sell turnover for a security	3 implied decimal places
Total Length			52		

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3.10.2 Market Turnover (61)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.10.2	●	

The Market Turnover message contains the total turnover (excluding the turnover of overseas trades) for all securities on a given market segment for a given trading currency. It also provides the total turnover (excluding the turnover of overseas trades) for all securities regardless of trading currency on a given market segment in HKD equivalent. Under normal circumstances, the updates are disseminated around every 2 seconds during the trading hours.

When the CurrencyCode is blank, the turnover represents the total turnover traded on the given market segment for all trading currencies, expressed in HKD.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	61 Market Turnover
4	MarketCode	String	4	Market segment identifier	MAIN GEM NASD ETS
8	CurrencyCode	String	3	Currency code of all securities of which the market turnover is derived	See Currency Values in section 3.1.2 for full details. Blank for total turnover for the Market Segment (i.e. MarketCode) in HKD equivalent.
11	Filler	String	1		
12	Turnover	Int64	8	Total Traded Turnover of the stocks traded on the market segment in the respective currency	3 implied decimal places
Total Length			20		

3.10.3 Yield (44)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.10.3	●	

The Yield message is generated for bond securities when their yield percentage changes.

Message Fields

Offset	Field	Format	Len	Description	Values

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	44 Yield
4	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
8	Yield	Int32	4	Current yield of the bond security based on its coupon rate and nominal price	3 implied decimal places 0 means Not available
Total Length.....			12		

3.11 NEWS

3.11.1 News (22)

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.11.1	●	

The News message is generated whenever a news update occurs. The message indicates which markets and/or securities the news is applied to. If NoMarketCode and NoSecurityCodes are both set to zero, the news applies to all markets.

The news may be fragmented across multiple consecutive messages. The LastFragment field will be set to 'Y' in the message that contains the last fragment. The "Headline" will only be carried in the first message and blanked from the second message onwards.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	22 News
4	NewsType	String	3	Type of Exchange news	EXN Exchange news EXC Chinese Exchange news
7	NewsID	String	3	Unique number for the news page within each NewsType	
10	Headline	String / Binary	320	News headline	If NewsType is EXN the Headline is ASCII encoded If NewsType is EXC the Headline is Unicode UTF-16LE encoded
330	CancelFlag	String	1	Indicator of whether previously released exchange news (identified by NewsType and NewsID) has been cancelled	Y Cancelled N Not cancelled
331	LastFragment	String	1	Indicates whether this message is the last in a sequence of messages	Y Complete N Not complete

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Offset	Field	Format	Len	Description	Values
332	Filler	String	4		
336	ReleaseTime	Uint64	8	Release time of the news	The number of nanoseconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970 ReleaseTime precision is currently provided to the nearest second.
344	Filler	String	2		
346	NoMarketCodes	Uint16	2	Number of market codes within this message	0 to 4
348	MarketCode	String	4	Market segment identifier	MAIN GEM NASD ETS
$348 + 4n_M$	Filler	String	2		
$350 + 4n_M$	NoSecurityCodes	Uint16	2	Number of security codes within this message	0 to 200
$352 + 4n_M$	SecurityCode	Uint32	4	Uniquely identifies a security available for trading	5 digit security codes with possible values 1 – 99999
$352 + 4n_M + 4n_S$	Filler	String	2		
$354 + 4n_M + 4n_S$	NoNewsLines	Uint16	2	Number of news lines	Maximum of 10 lines per "news page" is currently supported
$356 + 4n_M + 4n_S$	NewsLine	String / Binary	160	News line	If NewsType is EXN the NewsLine is ASCII encoded If NewsType is EXC the NewsLine is Unicode UTF-16LE encoded
Total Length.....		$356 + 4n_M + 4n_S + 160n_p$			

(n_M = value of NoMarketCodes)
(n_S = value of NoSecurityCodes)
(n_p = value of NoNewsLines)

3.12 Index Data and Market Information

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.12		●

The indices and market information supplied under the OMD Index are described in more detail in Appendix A, as it may be amended from time to time.

3.12.1 Index Definition (70)

The Index Definition message contains the static referential data for the given index and market information and is generated at the start of the business day and may be re-disseminated during the trading hours.

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Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	70 Index and Market Information Definition
4	IndexCode	String	11	Upstream source's index code or market information identifier	See Index Code in Appendix A for full details.
15	IndexSource	String	1	Index source	C CSI or other source of market information H HSI S S&P T TR
16	CurrencyCode	String	3	Currency code of Index Turnover	See Currency Values in section 3.1.2 for full details.
19	Filler	String	1		
Total Length			20		

3.12.2 Index Data (71)

The Index Data message contains all the real-time data for a given index and real-time market information. Fields within this message may be populated with null values to identify when an update is not provided. See section 3. 1.1 (Null Values) for more information about null values.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	71 Index Data and Market Information
4	IndexCode	String	11	Upstream source's index code or market information identifier	See Index Code in Appendix A for full details
15	IndexStatus	String	1	Index status	C Closing value I Indicative O Opening index P Last close value (prev. ses.) R Preliminary close S Stop loss index T Real-time index value IndexStatus can be blank if not defined by third party index compilers
16	IndexTime	Int64	8	Publisher timestamp	The number of nanoseconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970 IndexTime precision is currently provided to the nearest second.

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Offset	Field	Format	Len	Description	Values
24	IndexValue	Int64	8	Current value of the index	4 implied decimal places
32	NetChgPrevDay	Int64	8	Net change of IndexValue from the previous close, as provided in index source	4 implied decimal places
40	HighValue	Int64	8	Highest value for an index	4 implied decimal places
48	LowValue	Int64	8	Lowest value for an index	4 implied decimal places
56	EASValue	Int64	8	Estimated Average Settlement Value	2 implied decimal places
64	IndexTurnover	Int64	8	Current turnover of underlying constituents	4 implied decimal places
72	OpeningValue	Int64	8	First value for an index	4 implied decimal places
80	ClosingValue	Int64	8	Last value for an index	4 implied decimal places
88	PreviousSesClose	Int64	8	Previous session closing value (previous day's closing value for CSI and S&P, previous session's closing value for HSI and TR)	4 implied decimal places
96	IndexVolume	Int64	8	Index volume of underlying constituents. Only applicable for CSI	
104	NetChgPrevDayPct	Int32	4	Percentage change of IndexValue from the previous close, as provided in index source	4 implied decimal places
108	Exception	String	1	Exception indicator	# Index with HSIL defined exceptional rule applied ' ' Normal index (empty string)
109	Filler	String	3		
Total Length			112		

3.13 Stock Connect Data

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

Section	OMD Securities Standard (SS)	OMD Index (Index)
3.13	▲	

▲ Complimentary service to the Datafeed(s)

3.13.1 Stock Connect Daily Quota Balance (80)

The Stock Connect Daily Quota Balance message provides updates on the Northbound Daily Quota Balance (DQB) for Shanghai-Hong Kong Stock Connect and Shenzhen-Hong Kong Stock Connect separately. Under normal circumstances, the updates are disseminated around every 5 seconds during the trading hours.

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Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	80 Stock Connect Daily Quota Balance
4	StockConnectMarket	String	2	Market connected under Stock Connect Program	SH Shanghai Stock Exchange SZ Shenzhen Stock Exchange
6	TradingDirection	String	2	Trading Direction	NB Northbound trading
8	DailyQuotaBalance	Int64	8	Northbound Daily Quota Balance (DQB) value for specified Stock Connect Program	DQB in Renminbi (RMB) 0 when the respective DQB is used up
16	DailyQuotaBalanceTime	Uint64	8	Time of DailyQuotaBalance	The number of nanoseconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970 DailyQuotaBalanceTime precision is currently provided to the nearest second.
Total Length			24		

3.13.2 Stock Connect Market Turnover (81)

The Stock Connect Market Turnover message provides aggregate turnover under Shanghai-Hong Kong Stock Connect and Shenzhen-Hong Kong Stock Connect ("the Stock Connect programs"). The aggregate turnover is provided for the Northbound trading and the Southbound trading separately under each of the Stock Connect programs. Under normal circumstances, the updates are disseminated around every one minute during the trading hours.

Message Fields

Offset	Field	Format	Len	Description	Values
0	MsgSize	Uint16	2	Size of the message	
2	MsgType	Uint16	2	Type of message	81 Stock Connect Market Turnover
4	StockConnectMarket	String	2	Market connected under Stock Connect Program	SH Shanghai Stock Exchange SZ Shenzhen Stock Exchange
6	TradingDirection	String	2	Trading Direction	NB Northbound trading SB Southbound trading
8	BuyTurnover	Int64	8	Total turnover of Buy trades from the Northbound or Southbound trading (as specified in TradingDirection) under the Stock Connect Program rounded down to integer	Turnover in RMB for Northbound trading and HKD for Southbound trading
16	SellTurnover	Int64	8	Total turnover of Sell trades from the Northbound or	Turnover in RMB for Northbound trading and HKD for Southbound

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Offset	Field	Format	Len	Description	Values
				Southbound trading (as specified in TradingDirection) under the Stock Connect Program rounded down to integer	trading
24	Buy+SellTurnover	Int64	8	Sum of the values of BuyTurnover and SellTurnover rounded down to integer	Turnover in RMB for Northbound trading and HKD for Southbound trading
Total Length			32		

4. RECOVERY

The system provides 2 mechanisms for clients to recover possible data loss from disconnections, namely, Restart and Refresh. On reconnection, clients should always present the InternalSeqNum received in the last message from the server in the InternalSeqNum in the Logon message. The decision to perform a Restart or Refresh, however, is determined by the server and users should use the SessionStatus field within the Logon Response message to determine whether Restart or Refresh is required.

4.1 RESTART

For short outages where the lost messages are still held in MMDH for Restart recovery, when clients reconnect as above and following successful logon, the system will resume data dissemination from the next message following the message associated with InternalSeqNum supplied in Logon.

However, if the requested message indicated by InternalSeqNum is no longer available in MMDH, MMDH will provide a logon response message with the Session Status value set to '101' (Session Active - Refresh required) and the user should use the Refresh service which is described below.

4.2 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. Clients should clear all market data received from MMDH for the day from their systems before processing Refresh messages. The refresh service is request based and in order to initiate a refresh the client must send a Refresh Request (1201) message after successful logon – see section 3.5.1 for details. The messages provided and processing of the refresh messages are described below.

Snapshot Processing

See the sequence diagram shown in section 5.3 (Refresh (Data Out Of Range)) to understand the messaging scenario. A Refresh Complete message is sent at the end of a snapshot and following this message the real time data will resume automatically.

Latest Market Snapshot

Data available in the Latest Market Snapshot is described in the table below. During refresh the static data for all markets, securities, liquidity providers and currency rates will be sent first.

Message	Snapshot description
Market Definition	Latest market static message for each market.
Security Definition	Latest security static message for each security.
Liquidity Provider	Latest liquidity provider message for each security.
Trading Session Status	Latest trading session status message for each market.
Security Status	Security Status message for halted securities and securities resumed trading with status changed to 'resumed' on the current trading day.
Add Odd Lot Order	Snapshot for all non-empty books (for odd lot orders).
Aggregate Order Book Update	Snapshot for all non-empty books (for board lot orders). Occasionally Aggregated Order Book Update messages will be sent for emptied order books after cancellation or matching of all outstanding orders. In such cases the value of the NoEntries will be "0".
Broker Queue	Snapshot for all non-empty books (for board lot orders). Occasionally Broker Queue messages will be sent for emptied broker queues after cancellation or matching of all outstanding orders. In such cases the value of the ItemCount will be "0".
Order Imbalance	Latest Order Imbalance message for each CAS applicable security.
Closing Price	Closing Price message if available for each security.
Indicative Equilibrium Price	Latest Indicative Equilibrium Price message for each security.
Nominal Price	Latest nominal price message for each security.
Reference Price	Latest Reference Price for each security.

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Message	Snapshot description
VCM Trigger	Latest VCM Trigger message for each VCM applicable security with cooling off period trigged by VCM.
Statistics	Latest Statistics message for each security.
Market Turnover	Latest Market Turnover message per market / currency pair.
Currency Rate	Latest Currency Rate message for each currency.
News	All News messages.
Index Definition	Latest Index Definition message for each index.
Index Data	Latest Index Data message for each index.
Yield	Latest Yield message generated for bond securities when their yield percentage last changed.
Stock Connect Daily Quota Balance	Latest Stock Connect Daily Quota Balance for each Stock Connect Program.
Stock Connect Market Turnover	Latest Stock Connect Market Turnover for each Stock Connect Program and trading direction.

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5. MESSAGE SCENARIOS

There are a number of scenarios described in this section. For each scenario, a pictorial representation of the flow of the messages is provided.

5.1 LOGON (START OF DAY)

When logon is attempted there are a number of responses possible from the MMDH Publisher. The scenario below shows 5 possible responses. In each case the 'SessionStatus' field is used to indicate the result.

See sections 3.4.2 Logon (1101) and 3.4.3 Logon Response (1102) for message fields that are used for this scenario.

Figure 2 - Logon

5.2 RESTART (DATA IN RANGE)

The server maintains a short history of recent messages which are available for Restart. If the InternalSeqNum provided during Logon is available within this history then the server will simply provide all messages between InternalSeqNum up to the current latest real-time message. Normal data flow continues thereafter.

Typically a restart is possible at the beginning of the day or very soon after a service interruption (where the client is reconnecting).

See sections 3.4.2 Logon (1101) and 3.4.3 Logon Response (1102) for message fields that are used for this scenario

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Figure 3 - Restart

5.3 REFRESH (DATA OUT OF RANGE)

The Logon (1101) message includes the 'InternalSeqNum' field. If the sequence number specified is too old then clients will be prompted to request a Refresh (the server only maintains a limited number of recent messages). The need for Refresh is indicated by a Logon Response with Session Status value of 101. On receiving this message clients should clear all cached data for all instruments and then send a Refresh Request (1202) message to the server. The server will respond with the Latest Market Snapshot.

The Latest Market Snapshot contains all messages defined in section 4.2 (Refresh Service). Once all Latest Market Snapshot data is sent the client is up to date and will continue to receive normal data flow as it arrives. Note that messages within the Latest Market Snapshot do not carry any internal sequence number. The new latest internal sequence number will be provided in the Refresh Complete message.

See sections 3.4.2 Logon (1101), 3.4.3 Logon Response (1102), 3.5.1 Refresh Request (1201), 3.5.2 Refresh Response (1202) and 3.5.3 Refresh Complete (203) for message fields that are used for this scenario.

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Figure 4 – Restart (Intraday)

5.4 Password Close To Expiry

When a valid Logon (1101) message is sent but there are only a few days left before expiry of the password, the system will allow the user to logon normally but the Logon Response message will have SessionStatus set to 2 ("Session password due to expire"). Data will continue to flow as normal but the user should change their password as soon as possible – see section 5.5 (Change Password) for details.

See sections 3.4.2 Logon (1101) and 3.4.3 Logon Response (1102) for message fields that are used for this scenario.

Figure 5 - Expiry Warning

5.5 CHANGE PASSWORD

A change of password may be attempted by specifying two fields within the Logon (1101) message, these fields are:

- EncryptedNewPasswordLen
- EncryptedNewPassword

Successful password changes will be indicated with a 'SessionStatus' value of 1 in the Logon Response. Other values indicate policy violations. If successful the Client should then send a new Logon (1101) message with the new password value to resume normal data flow.

Another alternative is that the HKEX Operations team have manually changed the password. This temporary password is valid only for the next logon attempt, and the user must change their password at the next logon. If the user doesn't specify new password credentials correctly they will receive a 'Password expired' response, or possibly an 'Against Policy' response if the new password doesn't meet HKEX policy criteria (see section 2.2.1 for policy details). The message flow for changing a password that has been reset by HKEX Operations is identical to the above but the user must use the temporary password during the first Logon (1101) message and at the same time also send values within the EncryptedNewPassword and EncryptedNewPasswordLen fields.

See sections 3.4.2 Logon (1101) and 3.4.3 Logon Response (1102) for message fields that are used for this scenario.

Figure 6 - Change Password

5.6 TWO LOGONS FROM SAME CLIENT

Multiple logons are not permitted. In this scenario a 2nd logon is attempted, which is rejected and additionally the first client is also disconnected. Notice that the TCP/IP session is broken and must be re-established by the client – the server always forces disconnect after sending the Logout(1103) message.

See sections 3.4.2 Logon (1101), 3.4.3 Logon Response (1102) and 3.4.4 Logout (1103) for message fields that are used for this scenario.

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Figure 7 - Dual Logons

5.7 Account Locked (Intraday)

If an account is locked by the MMDH Operations Team, the Client will receive a Logout message.

See section 3.4.4 Logout (1103) for message fields that are used for this scenario.

Figure 8 - Account Locked

6. AGGREGATE ORDER BOOK MANAGEMENT

Book Identification

For each security there exists an odd lot book and a board lot book in the trading system. A book is therefore uniquely identified by SecurityCode.

Partial Price Depth

Securities shall be traded in accordance with the scale of spreads set out in the Second Schedule of the Rules of the Exchange respective to the Spread Table Code specified in their Securities Definition message. The tick level provides information on how many spreads from the best price for an order price whereas a price level is assigned to each price existing in the OMD order book. An order price with tick level 1 means the order price is the best price, a tick level of 2 means the order price is one spread from the best price, etc. The Aggregate Order Book Update message sends out the price level but not the tick level.

The concept of tick and price levels is illustrated in the table below, assuming that the best bid price of a security is 9800 and the spread is 10 for this price range. In the table there are orders in 5 bid prices so the number of price levels is 5 (contiguous price levels from 1 to 5); these orders are distributed over 10 spreads (tick levels) so the tick levels are from 1 to 10. Taking orders with bid price 9710 as example, it is the 5th price in the book so the price level will be 5 and it is 9 spreads from the best bid price so the tick level will be 10.

Bid Side			
Tick	**PriceLevel**	**AggregateQuantity**	**Price**
1	1	700	9800
2	2	350	9790
3			
4			
5	3	150	9760
6			
7			
8			
9	4	250	9720
10	5	100	9710

OMD provides a view of 10 tick depths of the aggregate order book for securities market and does not provide updates on price levels which are more than 9 spreads away from the best price. 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 and tick levels.

Bid Side				Ask Side			
Tick	**PriceLevel**	**AggregateQuantity**	**Price**	**Price**	**AggregateQuantity**	**PriceLevel**	**Tick**
1	1	700	9730	9760	500	1	1
2	2	350	9720	9770	300	2	2
3	3	150	9710	9780	100	3	3
4	4	250	9700	9790	150	4	4
5	5	100	9690				5
6	6	150	9680				6
7	7	50	9670				7
8	8	200	9660				8
9	9	100	9650				9
10							10

OMD only sends updates within the 10 tick levels in the aggregate order book except for Explicit Deletion (please refer Example 5 illustrated below for details)

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Book Updates

Book update messages are generated by OMD as delta messages defined in section 3.8.3 (Aggregate Order Book Update (53)). Each message may contain any combination of new, changed or deleted entries for a book. The nature of an entry is defined by its UpdateAction.

New, to create/insert a new price level
Delete, to remove a price level
Change, to update aggregate quantity at a price level
Orderbook Clear, to inform users that all price levels should be cleared

Example 1 – Quantity Reduction and Explicit Addition

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	60
2	MsgType	53
4	SecurityCode	1234
8	Filler	NULL
11	NoEntries	**2**
12	AggregateQuantity	200
20	Price	9770
24	NumberOfOrders	1
28	Side	1 (Offer)
30	PriceLevel	2
31	UpdateAction	1
32	Filler	NULL
36	AggregateQuantity	300
44	Price	9850
48	NumberOfOrders	1
52	Side	1 (Offer)
54	PriceLevel	5
55	UpdateAction	0
56	Filler	NULL

The resulting book should now be as follows:

Bid Side				Ask Side			
Tick	PriceLevel	AggregateQuantity	Price	Price	AggregateQuantity	PriceLevel	Tick
1	1	700	9730	9760	500	1	1
2	2	350	9720	9770	200	2	2
3	3	150	9710	9780	100	3	3
4	4	250	9700	9790	150	4	4
5	5	100	9690				5
6	6	150	9680				6
7	7	50	9670				7
8	8	200	9660				8
9	9	100	9650				9
10				9850	300	5	10

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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	36
2	MsgType	53
4	SecurityCode	1234
8	Filler	NULL
11	NoEntries	1
12	AggregateQuantity	50
20	Price	9740
24	NumberOfOrders	1
28	Side	0 (Bid)
30	PriceLevel	1
31	UpdateAction	0
32	Filler	NULL

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

Bid Side				Ask Side			
Tick	PriceLevel	AggregateQuantity	Price	Price	AggregateQuantity	PriceLevel	Tick
1	1	50	9740	9760	500	1	1
2	2	700	9730	9770	200	2	2
3	3	350	9720	9780	100	3	3
4	4	150	9710	9790	150	4	4
5	5	250	9700				5
6	6	100	9690				6
7	7	150	9680				7
8	8	50	9670				8
9	9	200	9660				9
10	10	100	9650	9850	300	5	10

Price levels of the other 9 Bid orders must all be incremented although there will not be Aggregate Order Book Update messages sent for the increment.

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 9 spreads away from the best price), the client must delete the excess entry. If the book shrinks again, the server 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 9660 is reduced from 200 to 150, it will cause the following message to be sent:

Offset	Field Name	Value
0	MsgSize	60
2	MsgType	53

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	4	SecurityCode	1234	
	8	Filler	NULL	
	11	NoEntries	2	
	12	AggregateQuantity	250	
	20	Price	9750	
	24	NumberOfOrders	1	
	28	Side	0 (Bid)	
	30	PriceLevel	1	
	31	UpdateAction	0	
	32	Filler	NULL	
	36	AggregateQuantity	150	
	44	Price	9660	
	48	NumberOfOrders	1	
	52	Side	0 (Bid)	
	54	PriceLevel	10	
	55	UpdateAction	1	
	56	Filler	NULL	

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

Bid Side				Ask Side			
Tick	**PriceLevel**	**AggregateQuantity**	**Price**	**Price**	**AggregateQuantity**	**PriceLevel**	**Tick**
1	1	250	9750	9760	500	1	1
2	2	50	9740	9770	200	2	2
3	3	700	9730	9780	100	3	3
4	4	350	9720	9790	150	4	4
5	5	150	9710				5
6	6	250	9700				6
7	7	100	9690				7
8	8	150	9680				8
9	9	50	9670				9
10	10	150	9660	9850	300	5	10

Price 9750 and quantity 250 is added according to the message.

Price 9650 and quantity 100 must be deleted by the client.

Price 9660 quantity must be reduced to 150 – PriceLevel 10 is used in the incoming message to reflect the new price level of the price 9660 after the addition of the price 9750.

Example 4 – Explicit Additions

If a match causes an order to be removed so that there are now less than 10 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 11th level which needs to be disseminated then it will cause the following message to be sent:

	Offset	Field Name	Value	
	0	MsgSize	60	
	2	MsgType	53	
	4	SecurityCode	1234	
	8	Filler	NULL	

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11	NoEntries	2	
12	AggregateQuantity	250	
20	Price	9750	
24	NumberOfOrders	1	
28	Side	0 (Bid)	
30	PriceLevel	1	
31	UpdateAction	2	
32	Filler	NULL	
36	AggregateQuantity	100	
44	Price	9650	
48	NumberOfOrders	1	
52	Side	0 (Bid)	
54	PriceLevel	10	
55	UpdateAction	0	
56	Filler	NULL	

The resulting order book should now be;

Bid Side				Ask Side			
Tick	PriceLevel	AggregateQuantity	Price	Price	AggregateQuantity	PriceLevel	Tick
1	1	50	9740	9760	500	1	1
2	2	700	9730	9770	200	2	2
3	3	350	9720	9780	100	3	3
4	4	150	9710	9790	150	4	4
5	5	250	9700				5
6	6	100	9690				6
7	7	150	9680				7
8	8	50	9670				8
9	9	200	9660				9
10	10	100	9650	9850	300	5	10

Example 5 – Explicit Deletions

Suppose a new book entry causes the last tick entry (Tick 10 in the previous order book in Example 4) to be shifted out of the book, if the shifted out entry is within 10 price level, OMD will send an explicit deletion for the entry. If the shifted out entry is outside the 10 price level, OMD will not send further updates on that price and the client must delete the excess entry (please refer to Example 3 above for details) to ensure their order book will not keep out-dated information.

For example, if an ask order with price 9750 and quantity 300 is added to the order book above, it will cause the following message to be sent:

Offset	Field Name	Value
0	MsgSize	60
2	MsgType	53
4	SecurityCode	1234
8	Filler	NULL
11	NoEntries	2
12	AggregateQuantity	300
20	Price	9750
24	NumberOfOrders	1
28	Side	1 (Offer)

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	30	PriceLevel	1	
	31	UpdateAction	0	
	32	Filler	NULL	
	36	AggregateQuantity	300	
	44	Price	9850	
	48	NumberOfOrders	1	
	52	Side	1 (Offer)	
	54	PriceLevel	6	
	55	UpdateAction	2	
	56	Filler	NULL	

The resulting order book should now be;

Bid Side				Ask Side			
Tick	PriceLevel	AggregateQuantity	Price	Price	AggregateQuantity	PriceLevel	Tick
1	1	50	9740	9750	300	1	1
2	2	700	9730	9760	500	2	2
3	3	350	9720	9770	200	3	3
4	4	150	9710	9780	100	4	4
5	5	250	9700	9790	150	5	5
6	6	100	9690				6
7	7	150	9680				7
8	8	50	9670				8
9	9	200	9660				9
10	10	100	9650				10

Explicit Deletions versus Implicit Deletions

Suppose initially bid orders are queued in 8 price levels in the aggregate order book and assume there is no order inputted at price 9770 & 9740. The aggregate order book will be as follows.

Bid Side			
Tick	PriceLevel	AggregateQuantity	Price
1	1	700	9800
2	2	350	9790
3	3	150	9780
4			
5	4	250	9760
6	5	100	9750
7			
8	6	400	9730
9	7	200	9720
10	8	300	9710

When new bid orders at 3 different prices (9860, 9850 & 9840) arrived, the resulting book will be changed as follows:

Bid Side				
Tick	PriceLevel	AggregateQuantity	Price	
1	1	450	9860	← new order, Explicit Addition
2	2	550	9850	← new order, Explicit Addition
3	3	650	9840	← new order, Explicit Addition

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4				
5				
6				
7	4	700	9800	← previous best bid, now at PriceLevel 4 (Tick 7), Implicit Level Adjustment
8	5	350	9790	← previous 2nd best bid, now at PriceLevel 5 (Tick 8), Implicit Level Adjustment
9	6	150	9780	← previous 3rd best bid, now at PriceLevel 6 (Tick 9), Implcit Level Adjustment
10				
11	7	250	9760	← orders exceed 10 Tick but within 10 PriceLevel, Explicit Deletion
12	8	100	9750	← orders exceed 10 Tick but within 10 PriceLevel, Explicit Deletion
13				
14	9	400	9730	← orders exceed 10 Tick but within 10 PriceLevel, Explicit Deletion
15	10	200	9720	← orders exceed 10 Tick but within 10 PriceLevel, Explicit Deletion
16	11	300	9710	← orders exceed 10 Tick & exceed 10 PriceLevel, Implicit Deletion

Orders in shaded area which were originally within the 10 tick levels offered in OMD now fall outside the 10 tick levels. OMD will send Explicit Delete for orders which fall outside 10 tick levels but are within 10 price levels (i.e. entries highlighted in blue). However OMD will not send Explicit Delete for orders which are outside 10 price levels (i.e. entries highlighted in pink) and the client must delete the excess entries (i.e. Implicit Delete by the client).

The following message will be sent:

Offset	Field Name	Value
0	MsgSize	180
2	MsgType	53
4	SecurityCode	1234
8	Filler	NULL
11	NoEntries	7
12	AggregateQuantity	450
20	Price	9860
24	NumberOfOrders	1
28	Side	0 (Bid)
30	PriceLevel	1
31	UpdateAction	0
32	Filler	NULL
36	AggregateQuantity	550
44	Price	9850
48	NumberOfOrders	1
52	Side	0 (Bid)
54	PriceLevel	2
55	UpdateAction	0
56	Filler	NULL
60	AggregateQuantity	650
68	Price	9840
72	NumberOfOrders	1
76	Side	0 (Bid)
78	PriceLevel	3
79	UpdateAction	0
80	Filler	NULL
84	AggregateQuantity	250
92	Price	9760
96	NumberOfOrders	1
100	Side	0 (Bid)

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102	PriceLevel	7	
103	UpdateAction	2	
104	Filler	NULL	
108	AggregateQuantity	100	
116	Price	9750	
120	NumberOfOrders	1	
124	Side	0 (Bid)	
126	PriceLevel	7	
127	UpdateAction	2	
128	Filler	NULL	
132	AggregateQuantity	400	
140	Price	9730	
144	NumberOfOrders	1	
148	Side	0 (Bid)	
150	PriceLevel	7	
151	UpdateAction	2	
152	Filler	NULL	
156	AggregateQuantity	200	
164	Price	9720	
168	NumberOfOrders	1	
172	Side	0 (Bid)	
174	PriceLevel	7	
175	UpdateAction	2	
176	Filler	NULL	

Example 6 – 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 security. An example message is shown below.

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

Offset	Field Name	Value
0	MsgSize	36
2	MsgType	53
4	SecurityCode	1234
8	Filler	NULL
11	NoEntries	1
12	AggregateQuantity	0
20	Price	0
24	NumberOfOrders	0
28	Side	0
30	PriceLevel	0
31	UpdateAction	74
32	Filler	NULL

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APPENDIX A - LIST OF INDICES AND MARKET INFORMATION UNDER OMD INDEX

The information supplied in this appendix applies to OMD Index only.

The indices supplied under the OMD Index are described in the table below, as it may be amended from time to time by HKEX-IS pursuant to clause 2.2 of the Licence Agreement. The mark [●] specifies if an index disseminated under the OMD Index is Third Party Content under the Licence Agreement. Licensee shall refer to clause 10.6 of the Market Data Vendor Licence Agreement and notices issued by HKEX-IS from time to time for redistribution of Third Party Content.

The Index Source and Index Code in the table below include the source and code for market information.

Index Source	Index Code	Name of the Index and market information disseminated under the OMD Index	Third Party Content under the Licence Agreement	Third Party Index Ownership
C	CES120	CES China 120 Index	●	CES
C	CESA80	CES China A80 Index	●	CES
C	CESHKM	CES China HK Mainland Index	●	CES
C	CES280	CES China 280 Index	●	CES
C	CESG10	CES Gaming Top 10 Index	●	CES
C	CES300	CES Stock Connect 300 Index	●	CES
C	CES100	CES Stock Connect Hong Kong Select 100 Index	●	CES
C	CESP50	CES Stock Connect Hong Kong Premier 50 Index	●	CES
C	CSI300	CSI 300 Index	●	CSI
C	000942	CSI China Mainland Consumer Index	●	CSI
C	H11108	CSI Cross-Straits 500 Index	●	CSI
C	H11123	CSI HK Mainland Enterprises 50 Index	●	CSI
C	H11100	CSI Hong Kong 100 Index	●	CSI
C	H11140	CSI Hong Kong Dividend Index	●	CSI
C	H11144	CSI Hong Kong Listed Tradable Mainland Consumption Index	●	CSI
C	H11143	CSI Hong Kong Listed Tradable Mainland Real Estate Index	●	CSI
C	H11120	CSI Hong Kong Middle Cap Select Index	●	CSI
C	H11152	CSI Hong Kong Private-owned Mainland Enterprises Index	●	CSI
C	H11153	CSI Hong Kong State-owned Mainland Enterprises Index	●	CSI
C	H11110	CSI RAFI Hong Kong 50 Index	●	CSI
C	000016	SSE 50 Index	●	SSE
C	000021	SSE 180 Governance Index	●	SSE
C	000010	SSE 180 Index	●	SSE
C	000009	SSE 380 Index	●	SSE
C	000066	SSE Commodity Equity Index	●	SSE
C	000001	SSE Composite Index	●	SSE
C	000015	SSE Dividend Index	●	SSE
C	000043	SSE Mega-cap Index	●	SSE
C	000044	SSE Mid Cap Index	●	SSE
C	000065	SSE Industry Top Index	●	SSE
H	0001500	Hang Seng China Affiliated Corporations Index	●	HSDS
H	0001400	Hang Seng China Enterprises Index	●	HSDS
H	0000100	Hang Seng Index	●	HSDS

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H	0000101	HSI Sub Indices – Finance	●	HSDS
H	0000102	HSI Sub Indices – Utilities	●	HSDS
H	0000103	HSI Sub Indices – Property	●	HSDS
H	0000104	HSI Sub Indices – Commerce & Industry	●	HSDS
H	0105000	HSI Volatility Index (VHSI)	●	HSDS
H	0200700	Hang Seng Mainland Banks Index	●	HSDS
H	0200800	Hang Seng Mainland Properties Index	●	HSDS
H	0200900	Hang Seng Mainland Healthcare Index	●	HSDS
H	0201000	Hang Seng Mainland Oil and Gas Index	●	HSDS
H	0201100	Hang Seng IT Hardware Index	●	HSDS
H	0201200	Hang Seng Software & Services Index	●	HSDS
H	1006800	Hang Seng Index (Gross Total Return Index)	●	HSDS
H	1006801	Hang Seng Finance Sub-Index (Gross Total Return Index)	●	HSDS
H	1006802	Hang Seng Utilities Sub-Index (Gross Total Return Index)	●	HSDS
H	1006803	Hang Seng Properties Sub-Index (Gross Total Return Index)	●	HSDS
H	1006804	Hang Seng Index Commerce & Industry Sub-Index (Gross Total Return Index)	●	HSDS
H	1007200	Hang Seng China Enterprises Index (Gross Total Return Index)	●	HSDS
H	2006800	Hang Seng Index (Net Total Return Index)	●	HSDS
H	2006801	Hang Seng Finance Sub-Index (Net Total Return Index)	●	HSDS
H	2006802	Hang Seng Utilities Sub-Index (Net Total Return Index)	●	HSDS
H	2006803	Hang Seng Properties Sub-Index (Net Total Return Index)	●	HSDS
H	2006804	Hang Seng Index Commerce & Industry Sub-Index (Net Total Return Index)	●	HSDS
H	2007200	Hang Seng China Enterprises Index (Net Total Return Index)	●	HSDS
S	SPHKG	S&P/HKEX GEM Index		N/A
S	SPHKL	S&P/HKEX LargeCap Index		N/A
T	RXYH	TR/HKEX RXY Global CNH	●	TR
T	RXYY	TR/HKEX RXY Global CNY	●	TR
T	RXYRH	TR/HKEX RXY Reference CNH	●	TR
T	RXYRY	TR/HKEX RXY Reference CNY	●	TR

Note 1: For indices with the index source = C, in the event there is service outage in the HKEX primary data center and restart of OMD-C at the secondary data center, real-time dissemination of CSI and CES index data will be suspended until service resumption of the HKEX primary data center

Abbreviation:

CES	=	China Exchanges Services Company Limited
CSI	=	China Securities Index Company Limited
HSDS	=	Hang Seng Data Services Limited
HSI	=	Hang Seng Indexes Company Limited
S&P	=	S&P Dow Jones Indices
TR	=	Thomson Reuters Hong Kong Limited

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