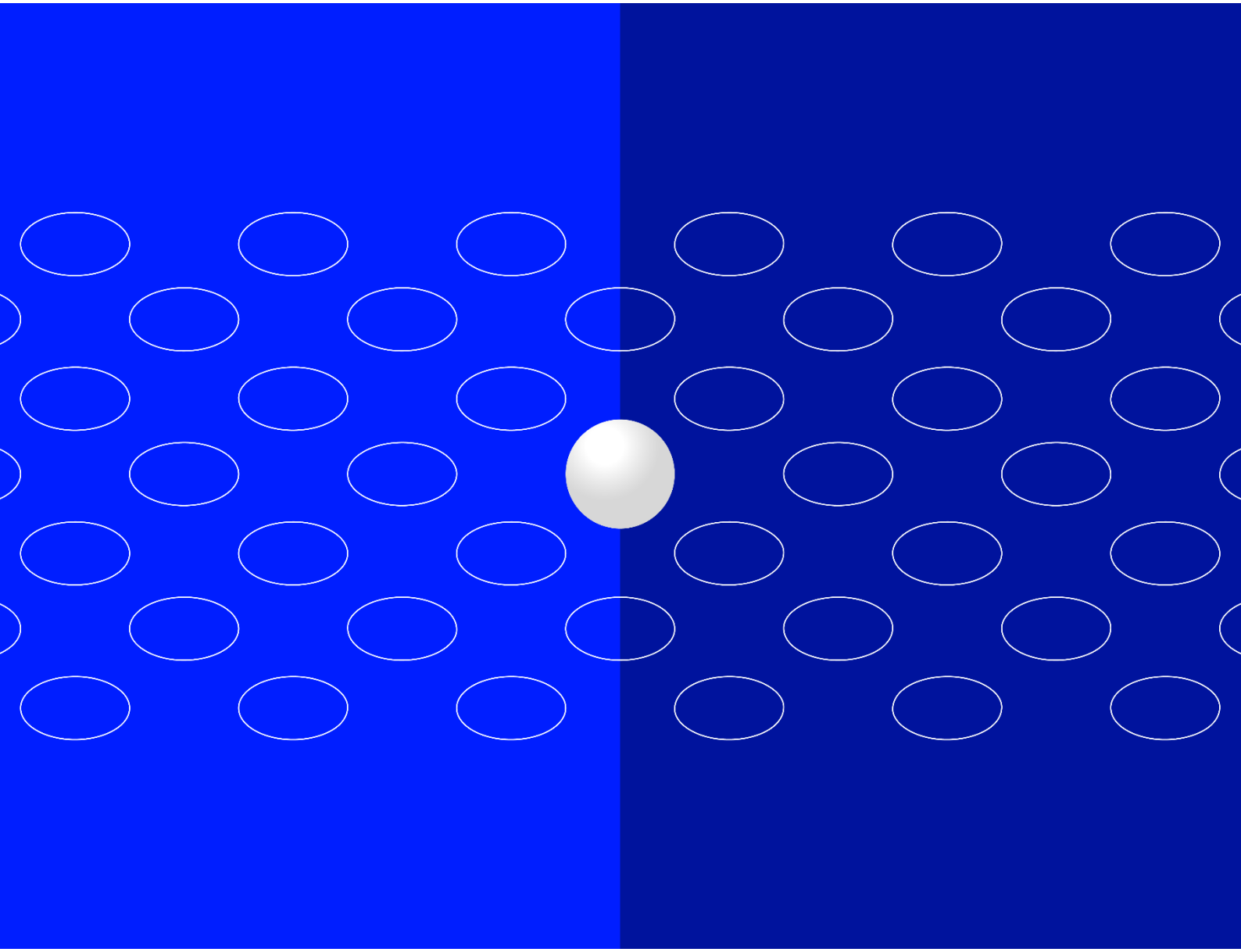
GROUP TICKER PLANT

GTP 002 – Technical Guide - TRADEcho

ISSUE 24.4

24 April 2024



LONDON STOCK EXCHANGE

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1 Documentation

1.1 This guide

The purpose of this document is to provide a detailed guide to the various message types and message formats as employed by the interface of the Group Ticker Plant. It also provides information on the behaviour and characteristics of our service lines, including Level 1, Level 2 snapshot, Level 2 incremental and FTSE Indices as supported by the Group Ticker Plant protocol.

This guide will be updated and reissued when appropriate to do so.

1.2 Readership

This document is particularly relevant to trading, market data and technical teams within member firms, information vendors and other market participants who currently receive or are interested in receiving London Stock Exchange Group market data.

When read in conjunction with other Group Ticker Plant documents, it is intended to provide all required information to develop to, and interact with, our real-time information systems.

1.3 Document series

This guide, 'GTP002 – Technical guide', forms part of the documentation library supporting those clients interacting with the Group Ticker Plant. For information, the full series of currently available documentation is outlined below:

- GTP001 – Product guide
- GTP002 – Technical guide (this document)
- GTP002 – Technical guide - Turquoise
- GTP002 – Technical guide – London Stock Exchange
- **GTP002 – Technical guide – TRADEcho (this document)**
- GTP003 – Statistics guide
- GTP004 – Parameters guide
- GTP005 – Testing guide
- GTP006 – External sources guide

Further documentation to support activities, such as testing and displaying our data, will be released in due course.

The full library of Group Ticker Plant documentation can be found at: https://www.lseg.com/areas-expertise/technology/group-technology/group-ticker-plant

1.4 Document history

This document has been subject to the following iterations:

Issue	Date	Description
19.9.3.1	17 January 2019	3.11.24 – Added Trade Summary to Turquoise services.
19.9.3.2	18 January 2019	Re-branding Turquoise Lit Auctions™ to Turquoise Plato Lit Auctions™. Turquoise Lit Auctions™ has recently become part of the Plato Co-operation agreement.
19.10	26 July 2019	3.11.13 – Added Hidden Execution Indicator attribute to Trade message.
19.10.2.5	20 January 2020	6.2, 6.3.5, 7.2, 3.10.7,3.11.1, 3.11.2, 3.11.13, 3.11.20 – Added the Turquoise NYLON™ Cash Order Book as a source venue for which Market Data will be published by GTP.

Issue	Date	Description
19.10.3	9 August 2019	3.11.23 – Updated service breakdown with inclusion of EuroTLX Admin channel. 6.5 – Added Security Type ML for Milan Bond Market. 5 – Updated section due to decommissioning of Tertiary Feed in GTP Milan.
19.10.4	23 December 2019	3.7 – Off Book Trade message removed. 3.11.3, 3.11.4, 3.11.5, 3.11.6 – Instrument. Directory Messages moved under Application messages. 3.11.3, 3.11.5 – Updated Data type of EMS.
19.11	28 February 2020	3.11.26 – Trade Summary: added Side of resting orders – message becomes applicable to Borsa and EuroTLX venues 4.2.2, 4.2.3– Updated Recovery Request of Order book. 6.2 – Combined Borsa and EuroTLX in a single Source Venue code.
19.11.1	16 March 2020	4.2.2, 4.2.3 – Minor update to Level 1 Order Book Recovery.
19.11.2	14 May 2020	3.11.14, 3.11.22 – Minor update to footnote and Trade Type definition. 3.7 – Updated Intelligent Throttling schema.
20.2	10 August 2020	**Changes for Release 1.4.5.0** 3.11.25, 3.11.26, 3.11.27 – Updated MiFID II Trade, MiFID II Trade Report and MiFID II Trade Cross messages positioning of ILQD, SIZE and LRGS flags. 3.11.2 – Updated the datatype of the ADT field from Price to Price4. 5, 5.1, 5.2, 5.3, 5.4, 5.5 – Sections rewritten to explain new behaviour and details relating to Failure of Primary Feed and Disaster Recovery using Secondary Data Centre. 6.9 – Added the tick sizes for the ATF Market. Removed entries on the revision history prior to 2019.
20.3	30 September 2020	6.2 – Rebranded Turquoise Global Holdings Limited (TGHL) source venues and added new Turquoise Global Holdings Europe (TGHE) source venues. 3.11.2, 3.11.3 – Under the Venue Instrument ID field on the Instrument Directory and Instrument Directory – Equities messages added new Instrument Identifiers that will be used by Instruments of the TGHE source venues. Note: This change will only go live into the production environment in a Hard Brexit Scenario. If and when this does move to production, there will be a specific notice issued to notify customers. 3.11.25, 3.11.26 – Added Venue of Publication to distinguish Trade Reports and SI quotes published on EU TRADEcho APA and UK TRADEcho APA. Note: This change will only go live into the production environment in a Hard Brexit Scenario. If and when this does move to production, there will be a specific notice issued to notify customers.
20.4	10 January 2021	**Changes for Release 1.4.6.0** All sections – Removed content related to Borsa Italiana and associated venues. 3.11.14, 3.11.22 Appended the Trade Qualifier field to the Trade message and the MiFID II Trade message. 3.11.22, 3.11.23, 3.11.24 Appended the MMT byte array to the MiFID II Trade, MiFID II Trade Cross and MiFID II Trade Report messages. 4.1.3, 4.2.9 Update to how Replay, Recovery and GTP Lite force terminate TCP sessions.
20.5	01 February 2021	L1 Incremental Service is now available for the Turquoise MTF.
20.6	26 March 2021	4.1.3, 4.2.9 Removed the update to how Replay, Recovery and GTP Lite force terminate TCP sessions with RST flags, instead FIN will be used.

Issue	Date	Description
20.7	01 August 2021	3.11.27 – Added the Analytics message. 3.11.1, 3.11.2, 3.11.4 – Updated the diagram to state that the system event message, instrument status message and the instrument directory messages will be published by the Analytics Gateway.
20.8	15 October 2021	3.11.15, 3.11.24 – Introduction of BTF trades for Turquoise. 6.3.2 – 't' will be used for stating the end of Regular Trading on Turquoise Lit™ and Turquoise Plato Lit Auctions™ Order Books.
20.9	25 May 2022	3.11.12 – the 2nd bit will be used to indicate Retail LP orders on Turquoise Plato Lit Auctions™ Order Books
20.10	15 September 2022	3.11.12 – the note 'Depth indication won't be provided for Retail LP orders' was deleted
20.11	9 November 2022	3.11.23 – Reserved field (Alpha) is converted into 'Total Number of Transactions' (Uint32) 4.2.4 – Reject code changed from 'e' to 'a' 3.11.17 – Footnote is added to 'Statistic Type' field 3.11.17 – 'Not Applicable' value is added to 'Auction Info' field 3.11.3 – 'Price Band Tolerances (%)' field converted into 'Reserved Field'
20.12	18 January 2023	Change made with 20.9 was reverted
20.13	15 February 2023	Description of rapid login protection is added to section 2.1.2
21.0	20 March 2023	3.11.12 – the 2nd bit will be used to indicate Retail LP orders on Turquoise Plato Lit Auctions™ Order Books
21.1	5 May 2023	3.11.17 – Removed 18,19 statistics types since they are not applicable to LSEG Trading Venues
22.0	5 May 2023	3.11.17 – Removed the note that Static and Dynamic Reference Prices are not applicable to LSEG Trading Venues. Description of the functionality is added to GTP 003 - Statistics Guide - Issue 11.0
23.0	7 September 2023	3.11.14 – Typo in 'Trade Qualifier' field is fixed 3.11.22 – Typo in 'Instrument Identification Code Type' field is fixed 3.11.23 - MIFID II Trade Report (0x54) is updated as follow: • New fields are added: Third-country trading venue of execution, Portfolio Transaction Flag, Contingent Transaction Flag, Missing Price • New values are added to the fields: Price Formation Indicator, Reference Price Indicator • Description of the following fields is updated: MIFID Price, Price Currency, Notional Currency, Notional Amount
23.1	20 October 2023	3.11.23 - MIFID II Trade Report (0x54) is updated as follow: • Description of field 'MIFID Quantity' is updated

<table>
<tr><th>Issue</th><th>Date</th><th>Description</th></tr>
<tr><td>24.0</td><td>21 December 2023</td><td>All sections – Removed content related to London Stock Exchange and Turquoise.

Section “5. Product failure” was removed from this document and merged with respective section in GTP001 – “4.0 System overview.”

The following messages are removed:
Instrument Directory – Equities
Add Order – MBO
Add Order Short – MBO
Add Order – MBP
Add Order Short – MBP
Add Order Incremental
Order Modify
Top of Book
Trade
Trade Cross
Statistics Update
FTSE Russell Indices Update
Announcements
Indicative Quote Information
MiFID II Trade
MiFID II Trade Cross
Trade Summary
Analytics
<table>
<tr><th>Message</th><th>Updated description of the fields</th></tr>
<tr><td>System Event</td><td>Event Code</td></tr>
<tr><td>Instrument Directory</td><td>Allowed Book Types, Venue Instrument ID, Tick ID, Price Band Tolerances (%), Dynamic Circuit Breaker Tolerances (%), Static Circuit Breaker Tolerances (%)</td></tr>
<tr><td>Instrument Status</td><td>Trading Status, Session Change Reason, New End Time, Order Book Type</td></tr>
<tr><td>Delete Order</td><td>Order Book Type</td></tr>
<tr><td>Order Book Clear</td><td>Order Book Type</td></tr>
<tr><td>Statistics</td><td>VWAP, VWAP (on-book only), Turnover, Turnover (on-book only)</td></tr>
<tr><td>Statistics Snapshot</td><td>VWAP, VWAP (on-book only), Turnover, Turnover (on-book only), Official Opening Price, Official Closing Price, Trade High (on-book only), Trade Low (on-book only), Trade High, Trade Low, 52-week Trade High, 52-week Trade Low, Opening Price Indicator, Closing Price Indicator, IAU Price, IAU Paired Size, Imbalance Quantity, Imbalance Direction, Best Closing Bid Price, Best Closing Ask Price, Best Closing Bid Size, Best Closing Ask Size, Trade High Off-Book, Trade Low Off-Book, Auction Type, Last Trade Price, Last Trade Quantity, Last Trade Time, Static Reference Price, Dynamic Reference Price</td></tr>
</table>
<table>
<tr><th>Message</th><th>Field is renamed</th></tr>
<tr><td>Instrument Directory</td><td>'Group ID' into 'Segment'
'Underlying ISIN Code' into 'Reserved Field'
'Underlying Instrument ID' into 'Reserved Field'
'Flags' into 'Reserved Field'</td></tr>
<tr><td>Statistics Snapshot</td><td>'Open Interest' into 'Reserved Field'
'Volatility' into 'Reserved Field'</td></tr>
</table></td></tr>
</table>

Issue	Date	Description	
		Order Delete	'Previous Yield' into 'Transaction Time' (N/A for TRADEcho)
		MiFID II Trade Report	'Volume Omission Flag' (offset 329) into 'Volume Omission For Sovereign Debt Flag'
24.1	10 January 2024	**Changes for Release - TRADEcho 3.17** 3.5 - Description of data type 'Alpha' is updated 3.5 - Description of data type 'UDT' is updated 3.11.8 - MIFID II Trade Report (0x54) is updated as follow: • New fields are added: 'Market Closing Price Flag', 'NT Large in Scale Flag' and 'NT Pre-Trade Transparency Flag' • New values are added to the fields: Negotiation Indicator, Reference Price Indicator • The following fields are renamed: ○ 'Price Currency' into 'Price Major Currency (FCA) / Price Currency (ESMA)' ○ 'Missing Price' into 'Missing Price (ESMA) / Price Conditions (FCA)' • Description of the following fields is updated: MIFID Price, Notional Currency, Negotiation Indicator, Reference Price Indicator, Missing Price (ESMA) / Price Conditions (FCA), Price Major Currency (FCA) / Price Currency (ESMA) • Added table 'Trade Flags Relevance Across Jurisdictions'	
24.2	22 January 2024	**Changes for Release - TRADEcho 3.17** 3.11.8 - MIFID II Trade Report (0x54) is updated as follow: • 'Duplicative Indicator' field is enriched with values related to Intra-Group Trade (IGRP) and Cross-Border Duplicative Trade Report (XBDT) • 'Transaction Category' field is enriched with values related to RFMD Give-Up Trade (GIVE)	
24.3	28 March 2024	**Changes for Release - TRADEcho 3.17** Firm Quote book is renamed to SI Quote book in the following messages: • 3.9.3 - Recovery Request • 3.11.2 – Instrument Directory • 3.11.3 - Instrument Status • 3.11.4 - Order Delete • 3.11.5 - Order Book Clear • 3.11.9 - SI Quotes 3.11.8 - MIFID II Trade Report (0x54) is updated as follow: • 'Price Notation' field added support of unset value • 'Secondary Publication' field is renamed to 'Reserved Field'	
24.4	24 April 2024	3.5 Data Type section – name of extended ASCII table is corrected 3.10.5 Replay and Recovery Complete – typo in field length is corrected	

In subsequent issues of this document, where amendments have been made, these changes will be indicated through the use of red text.

1.5 Enquiries

For further information on Group Ticker Plant, please contact either your Technical Account Manager or the Client Technology Group (UK):

- Telephone: +44 (20)7797 3939
- E-mail: londontam@lseg.com

Please contact the market data team of LSEG for further information regarding data licensing for this service by e-mailing: marketdata@lseg.com.

Further information can also be found on our project websites:

https://www.lseg.com/areas-expertise/technology/group-technology/group-ticker-plant

2 Connectivity

2.1 Transmission Standards

The Group Ticker Plant employs industry standard data delivery and recovery transmission techniques. Further details are provided below.

Clients should note that network addressing is included as part of GTP004 – Parameters guide.

2.1.1 Multicast Channels

The Group Ticker Plant delivers real-time market data over a number of load-balanced IP multicast channels. Details of the service line allocation across multicast channels can be found in GTP001 – Product guide.

The real-time channels transmit in UDP network packets over IP version 4 (IPv4) Ethernet standards. UDP header information is as defined in the IETF RFC 791 (IPv4) and RFC 768 (UDP) transmission standards. While each UDP network packet will contain a single Unit Header, multiple application messages may be packaged in a single network packet. This is done in an effort to manage client bandwidth requirements. Further details are contained in section 4.3.1 of GTP001 – Product guide.

Clients should subscribe to both primary and secondary market data feeds. While, during normal service, replay and recovery services are only available on the primary market data gateway, through subscription to both primary and secondary feeds clients are able to arbitrage messages – recovering any missed messages on the primary market data feed from the secondary market data feed.

2.1.2 Recovery and Replay Services

The Recovery and Replay unicast channels will guarantee data delivery though use of TCP over IP version 4 (IPv4) Ethernet standards. TCP Header information is defined in the IETF RFC 793 standard and IPv4 is defined in the RFC 791 standard.

A protection mechanism is in place to protect Recovery and Replay gateways from rapid logins/logouts/disconnects. A rapid login/logout/disconnect is one that occurs very quickly following a previous login/logout/disconnect. Once a user has triggered this mechanism, the gateway response to each successive login/logout attempt or disconnect will be subject to a delayed response that grows exponentially. It is recommended that all users maintain a 100mS interval between successive login or logout attempts and disconnects to each gateway (including where the gateway has initiated the disconnection) to keep a safe margin and avoid accidentally triggering this protection mechanism.

2.2 Client Identification

All clients are required to request enablement on Group Ticker Plant service lines ahead of access to either CDS or Production environments. Access is permissioned on both the Group Ticker Plant gateways and at our network firewalls.

Upon successful completion of access request, the Group will allocate clients their CompID(s). The CompID should be used by clients to log in to either the replay or recovery services. Each CompID will be permissioned to access all Group Ticker Plant multicast gateways for which a client has the correct commercial agreement(s) in place, each CompID can only be logged in to one replay or recovery service at any one time.

Unlike the existing Millennium Exchange market data solution, the Group Ticker Plant does not require a password to access the replay or recovery services. The removal of password validation was in direct response to client feedback on our existing product provision.

3 Message formats

Group Ticker Plant delivers all real-time multi-asset class information in a single, bespoke, binary protocol. In close collaboration with clients, the Group worked to build an improved library of messages which are intuitive and clear; we believe we have made significant improvements to our legacy market data protocols. Some of these improvements include:

- Removal of password validation on both replay and recovery services
- Removal of logout process from both replay and recovery services
- Decommission of the Level 2-MITCH Time message, replacing with nanosecond time-stamping on all application messages
- Introduction of the Statistics message to support the publication of derived information
- Introduction of asset-specific Instrument Directory messages available on the recovery solution to support the publication of instrument-specific reference data
- Inclusion of the 'Allowed Book Types' field in the Instrument Directory messages to facilitate the identification of applicable trading models for an instrument

The Group protocol has been developed to be as generic as possible, facilitating the introduction of additional services as we develop and enhance the Group Ticker Plant product.

3.1 Packet composition

The Unit Header is used to deliver all administrative and application messages to and from the server on all multicast and unicast channels. Whilst a Unit Header may contain multiple application messages, it will never contain more than one administrative message. A Unit Header will not contain a combination of both application and administrative messages.

3.2 Message types

The Group Ticker Plant broadcasts a library of messages. The messages are categorised as either administrative or application messages. The administrative messages are used on the TCP/IP replay and recovery and GTP Lite services to implement the interaction of a user with the system. The application messages are used to broadcast our real-time data service lines on the multicast channels, and to provide certain static reference data information via replay and recovery services.

Clients should treat each application message as a single standalone instruction, updating their order books and systems appropriately based on the content of the application message. Clients should not program to a multicast stream of messages in an attempt to identify patterns or system logics, as the stream of messages disseminated is subject to change as we optimise our trading and market data technologies. If a client processes each application message in real-time as a standalone instruction, order books will be a true state of the trading engines of the supported markets.

3.3 Sequence Numbers

All application messages transmitted by the server on the multicast channels and the replay services are sequenced. The Unit Header only contains the sequence number of the first message; the sequence numbers of any other messages included in the same packet are implied. The sequence number of the next packet can be determined by adding the value in the Message Count field of the Unit Header to the value in the Sequence Number field.

The application messages sent from the server by the recovery service and all administrative messages (including those sent by the client) are un-sequenced.

3.4 Timestamps

All Group Ticker Plant application messages contain a timestamp with nanosecond granularity and will be sent in UTC. Timestamps are derived from the supporting infrastructure timestamp, which is synched through various processes including industry standards such as NTP – guaranteeing accuracy to the millisecond – and PTP allowing accuracy to microsecond.

Transaction times included in both the Trade and Off-Book Trade messages will be disseminated as reported to the Group Ticker Plant by upstream systems. Where granularity to nanosecond does not exist, the timestamp will be rounded to the nearest microsecond and disseminated to clients. It is assumed that each upstream system, by adhering to the level of accuracy requested in MIFID II RTS25 Table 2, will ensure the appropriate timestamp granularity is transmitted to Group Ticker Plant.

3.5 Data types

The fields of the messages utilized by the server will support the data types outlined below:

Data type	Length	Description
Alpha	Variable	These fields use standard ASCII and Windows-1252 (CP-1252) based on Latin-1 (ISO8859-1) character bytes. They are left justified and padded on the right with spaces.
Bit Field	1	A single byte used to hold up to eight 1-bit flags. Each bit will represent a Boolean flag. The 0 bit is the lowest significant bit and the 7 bit is the highest significant bit.
Byte	1	A single byte used to hold one ASCII character.
Date	8	Date specified in the YYYYMMDD format using ASCII characters.
Time	6	Time specified in HHMMSS format using ASCII characters in a 24-hour clock format.
UDT (Unix Date Time)	8	Little-Endian encoded 64 bit unsigned integer where; time stamp (in UTC) = (date time per second resolution in unix time format) * 1,000,000,000 + (nanoseconds component).
Price	8	Signed Little-Endian encoded 64 bit integer field with eight implied decimal places.
Size	8	Little-Endian encoded 64 bit unsigned integer with eight implied decimal places.
Price4	8	Signed Little-Endian encoded 64 bit integer field with four implied decimal places.
Size4	8	Little-Endian encoded 64 bit unsigned integer with four implied decimal places.
UInt8	1	8 bit unsigned integer.
UInt16	2	Little-Endian encoded 16 bit unsigned integer.
UInt32	4	Little-Endian encoded 32 bit unsigned integer.
UInt64	8	Little-Endian encoded 64 bit unsigned integer.
Date and Time	27	ISO 8601 date and time in the following string format:YYYY-MM-DDThh:mm:ss.dddddddZ. – ‘YYYY’ is the year – ‘MM’ is the month – ‘DD’ is the day – ‘T’ – means that the letter ‘T’ shall be used – ‘hh’ is the hour – ‘mm’ is the minute – ‘ss.dddddd’ is the second and its fraction of a second – Z is UTC time Dates and times shall be reported in UTC.

Data type	Length	Description
MiFID Decimal	20	These fields use standard ASCII character bytes to represent numeric values. They are left justified and padded on the right with spaces. {DECIMAL-n/m} – Decimal number of up to 'n' digits in total of which up to 'm' digits can be fraction digits. Decimal separator is '.' (Full stop). Negative numbers are prefixed with '-' (minus). Where applicable, values shall be rounded and not truncated. The default value that is populated when there is no valid value can be '0' (zero) or 'spaces', dependent on the upstream system. For upstream system, TRADEcho it is always 'spaces'.

Please note that some field descriptions in this document include 'blank' as valid values. 'Blank' should be considered as 'space filled' for Alpha data types and '0' (zero) for data types Byte, Price, Size, UInt8, UInt16, UInt32 and UInt64.

3.6 Message overview – Administrative Messages

	Message type		
Name	ASCII	Hex	Usage
Heartbeat	-	-	Used by the server, on the real-time service, to exercise the communication line during periods of inactivity.
Login Request	(soh)	0x01	Used by the client to log in to the replay or recovery channel.
Login Response	(stx)	0x02	Used by the server to accept or reject a login request to the replay or recovery channel.
Replay Request	(etx)	0x03	Used by the client to request a retransmission of messages on the replay channel.
Replay Response	(eot)	0x04	Used by the server to respond to a retransmission request on the replay channel.
Recovery Request	•	0x81	Used by the client to request data on the recovery channel.
Recovery Response	,	0x82	Used by the server to respond to a snapshot request on the Snapshot channel.
Replay and Recovery Complete	*f*	0x83	Used by the server to indicate the successful completion of servicing a message replay or a recovery request.

3.7 Message overview – Application Messages

Each GTP Application Message is listed below with corresponding ASCII and Hex codes. Intelligent Throttling configuration is indicated for Level 2 Incremental (L2I) and Level 2 Snapshot (L2S) services. For additional information related to Intelligent Throttling, please refer to GTP Product Guide (GTP001).

	Message type			Intelligent Throttling applied?	
	ASCII	Hex		London	
Name			Usage	L2I	L2S
System Event	S	0x53	Session transition is advertised via one system event message for all instruments allocated to the same multicast channel. The system event message will also be broadcast at the end of day on TRADEcho. Customers should consider the SI quote order book to be empty following receipt of this message. No explicit order book clear or delete order messages will be sent.	N	N
Instrument Directory	p	0x70	Used to disseminate a common and limited set of data for all configured instrument types (except strategy instruments) on the real-time channels.	Y	Y
Instrument Status	H	0x48	Should a specific instrument be subject to individual status change – such as suspension or halt – this will be communicated by the instrument status message. Customers should note that instrument status messages may be disseminated prior to system event – start of day message	N	N
Delete Order	D	0x44	Sent to instruct recipients to delete an order from the retrospective order book.	N	
Order Book Clear	y	0x79	Sent to instruct recipients to remove all orders from the order book for the specified instrument.	N	N
Statistics	w	0x77	Contains a set of statistics that are updated frequently, usually as a result of executions.	N	N
Statistics Snapshot	k	0x6b	A snapshot of an instrument's statistics that is used for recovery.		
MiFID Trade Report	T	0x54	Sent to report the MiFID compliant details of a privately negotiated trade.	Y	Y
SI Quoting	G	0x47	Publishing Systematic Internaliser (SI) Quotes	N	N

3.8 Unit header

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of the message block including the header and all payload messages.
Message Count	2	1	UInt8	Number of payload messages that will follow the header.
Market Data Group	3	1	Byte	Identity of the market data group the payload messages relate to.
Sequence Number	4	4	UInt32	Sequence number of the first payload message.
Payload	8	Variable	-	One or more payload messages.

3.9 Administrative Messages (Client-Initiated)

3.9.1 Login Request

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		Y	Y
Channel 2/6	TRADEcho	Trades		N	Y	Y
Channel 3/7	TRADEcho	SI Quoting	N		Y	Y
Channel 4/8	TRADEcho	Trades		N	Y	Y

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x01	Login Request
Username	3	8	Alpha	CompID assigned to the client.	

3.9.2 Replay Request

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		Y	N
Channel 2/6	TRADEcho	Trades		N	Y	N
Channel 3/7	TRADEcho	SI Quoting	N		Y	N
Channel 4/8	TRADEcho	Trades		N	Y	N

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x03	Replay Request
First Message	0	2	UInt32	Sequence number of the first message in range to be retransmitted.	
Count	7	4	UInt32	Number of messages to be resent.	
Request ID	11	4	UInt32	The value set in this will be echoed back in the corresponding Replay Response. The system will not validate uniqueness of the set value.	

3.9.3 Recovery Request

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		N	Y
Channel 2/6	TRADEcho	Trades		N	N	Y
Channel 3/7	TRADEcho	SI Quoting	N		N	Y
Channel 4/8	TRADEcho	Trades		N	N	Y

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x81	Recovery Request
Request Level	3	1	UInt8	Defines the level of the request:	
				Hex	**Meaning**
				0	Instrument
				1	Group (Segment)
				2	Multicast Channel
Instrument	4	8	UInt64	GTP Instrument identifier if Request Level is 0. Blank if not.	
Group ID	12	6	Alpha	Group/Segment ID if Request Level is 1. Blank if not.	
Order Book Type	18	1	UInt8	Only considered if the Request Level is 0. If specified, only data related to the specified order book type is provided. If not specified, data for all available book types for the instrument are provided. For Recovery Type = 3 (Statistics) this has to be set to '0' = All.	
				Value	**Meaning**
				0	All Books
				1	SI Quote Book
				2	Off-book
Source Venue	19	2	UInt16	Venue from which market data is received for the instrument.	
				Value	**Meaning**
				11	TRADEcho

Field	Offset	Length	Type	Description
Recovery Type	21	1	UInt8	The type of messages to be replayed:
				Value / **Meaning**
				0 – Instrument Directory
				1 – Order book
				2 – All Trades
				3 – Statistics
				4 – Instrument Status
				5 – Reserved
				6 – System Event
Sequence Number	22	4	UInt32	Only valid if Recovery Type = 2 (Trades). If specified, the trades reported with an equal or higher sequence number will be sent.
Request ID	26	4	UInt32	The value set in this will be echoed back in the corresponding Recovery Response and Recovery Complete. The system will not validate uniqueness of the set value.

3.10 Administrative Messages (Server-Initiated)

3.10.1 Heartbeat

A Unit Header with a Message Count of zero (0) will be used by the server as the Heartbeat message. Such a message will never increment the sequence number of the real-time multicast channel. The next anticipated sequence number will be included in the Sequence Number to enable recipients to detect gaps on the real-time channel.

3.10.2 Login response

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		Y	Y
Channel 2/6	TRADEcho	Trades		N	Y	Y
Channel 3/7	TRADEcho	SI Quoting	N		Y	Y
Channel 4/8	TRADEcho	Trades		N	Y	Y

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message, including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x02	Login Response
Status	3	1	Byte	Status of the login request.	
				Value	**Meaning**
				A	Login Accepted
				a	CompID Inactive/Suspended
				b	Login Limit Reached
				c	Service Unavailable
				d	Maximum Connections Limit Reached
				e	Failed (other)
				f	Invalid CompID or IP Address

3.10.3 Replay Response

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		Y	N
Channel 2/6	TRADEcho	Trades		N	Y	N
Channel 3/7	TRADEcho	SI Quoting	N		Y	N
Channel 4/8	TRADEcho	Trades		N	Y	N

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x04	Replay Response
First Message	3	4	UInt32	Sequence number of the first message in range to be retransmitted. This will be zero if Status is not “A”.	
Count	7	4	UInt32	Number of messages to be resent, not including any Replay and Recovery Complete messages. This will be zero if Status is not “A”.	
Status	11	1	Byte	**Value**	**Meaning**
				A	Request Accepted
				D	Request Limit Reached
				O	Out of Range
				U	Replay Unavailable
				c	Concurrent Limit Reached
				e	Failed (Other)
Request ID	12	4	UInt32	Will include the value set as Request ID in the Replay Request message.	

3.10.4 Recovery Response

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		N	Y
Channel 2/6	TRADEcho	Trades		N	N	Y
Channel 3/7	TRADEcho	SI Quoting	N		N	Y
Channel 4/8	TRADEcho	Trades		N	N	Y

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x82	Replay Response
Sequence Number	3	4	UInt32	Sequence number on the real-time channel with which the snapshot is synchronised when Recovery Type = 1, 2, 3, 4. This will be zero for other Recovery Types or if Status is not “A”.	
Count	7	4	UInt32	Number of messages to follow, not including any Replay and Recovery Complete messages. This will be zero if Status is not “A”.	
Status	11	1	Byte	**Value**	**Meaning**
				A	Request Accepted
				O	Out of Range
				a	Invalid Group or Instrument
				b	Request Limit Reached
				c	Concurrent Limit Reached
				d	Invalid Recovery Type or Request Level
				e	Failed (Other)
Request ID	12	4	UInt32	Will include the value set as Request ID in the Recovery Request message.	

3.10.5 Replay and Recovery Complete

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		Y	Y
Channel 2/6	TRADEcho	Trades		N	Y	Y
Channel 3/7	TRADEcho	SI Quoting	N		Y	Y
Channel 4/8	TRADEcho	Trades		N	Y	Y

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x83	Replay and Recovery Complete
Request ID	3	4	UInt32	Will include the value set as Request ID in the Recovery Request message.	
Trading Status	7	1	Byte	Current Trading status of the Instrument. Populated only when the message is sent at the end of individual order book snapshots during a trading session.	

3.11 Application Messages

3.11.1 System Event

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	Y		Y	Y
Channel 2/6	TRADEcho	Trades		Y	Y	Y
Channel 3/7	TRADEcho	SI Quoting	Y		Y	Y
Channel 4/8	TRADEcho	Trades		Y	Y	Y

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x53	System Event
Timestamp	3	8	UDT	Time the message was generated.	
Event Code	11	1	Byte	**Value**	**Meaning**
				T	Start of Open
				P	Start of Pre Close
Source Venue	12	2	UInt16	Venue from which market data is received for the instrument.	
				Value	Meaning
				11	TRADEcho

3.11.2 Instrument directory

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	Y		Y	Y
Channel 2/6	TRADEcho	Trades		Y	Y	Y
Channel 3/7	TRADEcho	SI Quoting	Y		Y	Y
Channel 4/8	TRADEcho	Trades		Y	Y	Y

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x70	Instrument Directory
Timestamp	3	8	UDT	Time the message was generated.	
Instrument	11	8	UInt64	GTP Instrument identifier.	
ISIN	19	12	Alpha	ISIN Code of an instrument.	
Allowed Book Types	31	1	Bit Field	Defines the order-book types that are allowed for the instrument. Each designated bit represents a book type. '0' means not allowed and '1' means allowed:	
				Bit	**Name**
				1	SI Quote Book
				2	Off-book
Source Venue	32	2	UInt16	Venue from which market data is received for the instrument.	
				Value	Meaning
				11	TRADEcho
Venue Instrument ID	34	11	Alpha	Instrument identifier used by the source venue.	
Tick ID	45	2	Alpha	Not Applicable to TRADEcho	
Price Band Tolerances (%)	47	8	Price	Not Applicable to TRADEcho	
Dynamic Circuit Breaker Tolerances (%)	55	8	Price	Not Applicable to TRADEcho	
Static Circuit Breaker Tolerances (%)	63	8	Price	Not Applicable to TRADEcho	
Segment	71	6	Alpha	Segment the instrument is assigned to.	

Field	Offset	Length	Type	Description
Reserved Field	77	12	Alpha	Reserved for future use.
Reserved Field	89	11	Alpha	Reserved for future use.
Currency	100	3	Alpha	Currency Code as per ISO 4217. For additional currencies supported refer to the Additional Field Values section of this document
Reserved Field	103	1	Byte	Reserved for future use.
Reserved Field	104	4	Alpha	Reserved for future use.
Average Daily Turnover (ADT)	108	8	Price4	Average Daily Turnover as reported by the Source Venue.
Reserved Field	116	8	Alpha	Reserved for future use.
Reserved Field	124	1	Bit Field	Reserved for future use.
Reserved Field	125	8	Price	Reserved for future use.
Reserved Field	133	8	Price	Reserved for future use.

3.11.3 Instrument Status

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	Y		Y	Y
Channel 2/6	TRADEcho	Trades		Y	Y	Y
Channel 3/7	TRADEcho	SI Quoting	Y		Y	Y
Channel 4/8	TRADEcho	Trades		Y	Y	Y

Instrument status management

TRADEcho instrument status	SI quoting		GTPSI Quote book status	Accept on Exchange trade report	Accept OTC trade report	Accept SI trade report	GTP off book status
	Cancel	Accept					
Active	No	Yes	Active	Yes	Yes	Yes	Active
Inactive	Yes	No	Inactive	No	No	No	Inactive
Halt	No	Yes	Reg. halt	Yes	Yes	Yes	Reg. halt
SI quote prohibited	Yes	No	Suspended	Yes	Yes	Yes	Active
Instrument suspended	No	Yes	Suspended	No	Yes	Yes	Suspended

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x48	Instrument Status
Timestamp	3	8	UDT	Time the message was generated.	
Instrument	11	8	UInt64	GTP Instrument identifier.	
Source venue	19	2	UInt16	Venue from which market data is received for the instrument.	
				Value	**Meaning**
				11	TRADEcho
Trading Status	21	1	Byte	**Value**	**Meaning**
				1	Inactive/Underlying Suspended
				2	Suspended
				3	Active
				P	Halt – Regulatory Halt

Field	Offset	Length	Type	Description	
Session Change Reason	22	1	UInt8	**Value**	**Meaning**
				0	Scheduled Transition
New End Time	23	6	Time	Not Applicable to TRADEcho	
Order Book Type	29	1	UInt8	**Value**	**Meaning**
				1	SI Quote Book
				2	Off-book

3.11.4 Order Delete

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	Y		Y	N
Channel 2/6	TRADEcho	Trades		N	N	N
Channel 3/7	TRADEcho	SI Quoting	Y		Y	N
Channel 4/8	TRADEcho	Trades		N	N	N

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x44	Delete Order
Timestamp	3	8	UDT	Time the message was generated	
Order ID	11	8	UInt64	Unique identifier of the order.	
Instrument	19	8	UInt64	GTP Instrument identifier.	
Side	27	1	Byte	**Value**	**Meaning**
				B	Buy Order
				S	Sell Order
Order Book Type	28	1	UInt8	**Value**	**Meaning**
				1	SI Quote Book
Source venue	29	2	UInt16	Venue from which market data is received for the instrument.	
				Value	**Meaning**
				11	TRADEcho
Previous Price	31	8	Price	Price of the order that was deleted from the book.	
Previous Quantity	39	8	Size	Quantity of the order that was deleted from the book.	
Transaction Time	47	8	Price	Not Applicable to TRADEcho	

3.11.5 Order Book Clear

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	Y		Y	Y
Channel 2/6	TRADEcho	Trades		N	N	N
Channel 3/7	TRADEcho	SI Quoting	Y		Y	Y
Channel 4/8	TRADEcho	Trades		N	N	N

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x79	Order Book Clear
Timestamp	3	8	UDT	Time the message was generated.	
Source venue	11	2	UInt16	Venue from which market data is received for the instrument.	
				Value	**Meaning**
				11	TRADEcho
Instrument	13	8	UInt64	GTP Instrument identifier.	
Order Book Type	21	1	UInt8	**Value**	**Meaning**
				1	SI Quote Book

3.11.6 Statistics

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		N	N
Channel 2/6	TRADEcho	Trades		Y	Y	N
Channel 3/7	TRADEcho	SI Quoting	N		N	N
Channel 4/8	TRADEcho	Trades		Y	Y	N

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x77	Statistics
Timestamp	3	8	UDT	Time the message was generated.	
Instrument	11	8	UInt64	GTP Instrument identifier.	
Source venue	19	2	UInt16	Venue from which market data is received for the instrument.	
				Value	**Meaning**
				11	TRADEcho
Volume	21	8	Size4	Cumulative volume of all trades for the trading day.	
Volume (on-book only)	29	8	Size4	Cumulative volume for the trading day excluding off-book trades.	
VWAP	37	8	Price4	Not Applicable to TRADEcho	
VWAP (on-book only)	45	8	Price4	Not Applicable to TRADEcho	
Number of trades	53	4	UInt32	Count of all trades for the day.	
Number of trades (on-book only)	57	4	UInt32	Count of trades for the day excluding off-book trades.	
Turnover	61	8	Price4	Not Applicable to TRADEcho	
Turnover (on-book only)	69	8	Price4	Not Applicable to TRADEcho	

3.11.7 Statistics Snapshot

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		N	N
Channel 2/6	TRADEcho	Trades		N	N	Y
Channel 3/7	TRADEcho	SI Quoting	N		N	N
Channel 4/8	TRADEcho	Trades		N	N	Y

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x6b	Statistics Snapshot
Timestamp	3	8	UDT	Time the message was generated.	
Instrument	11	8	UInt64	GTP Instrument identifier.	
Source venue	19	2	UInt16	Venue from which market data is received for the instrument.	
				Value	**Meaning**
				11	TRADEcho
Volume	21	8	Size4	Cumulative volume of all trades for the trading day.	
Volume (on-book only)	29	8	Size4	Cumulative volume for the trading day excluding off-book trades.	
VWAP	37	8	Price4	Not Applicable to TRADEcho	
VWAP (on-book only)	45	8	Price4	Not Applicable to TRADEcho	
Number of trades	53	4	UInt32	Count of all trades for the day.	
Number of trades (on-book only)	57	4	UInt32	Count of trades for the day excluding off-book trades.	
Turnover	61	8	Price4	Not Applicable to TRADEcho	
Turnover (on-book only)	69	8	Price4	Not Applicable to TRADEcho	
Official Opening Price	77	8	Price	Not Applicable to TRADEcho	
Official Closing Price	85	8	Price	Not Applicable to TRADEcho	
Trade High (on-book only)	93	8	Price	Not Applicable to TRADEcho	

Field	Offset	Length	Type	Description
Trade Low (on-book only)	101	8	Price	Not Applicable to TRADEcho
Trade High	109	8	Price	Not Applicable to TRADEcho
Trade Low	117	8	Price	Not Applicable to TRADEcho
52-week Trade High	125	8	Price	Not Applicable to TRADEcho
52-week Trade Low	133	8	Price	Not Applicable to TRADEcho
Opening Price Indicator	141	1	Byte	Not Applicable to TRADEcho
Closing Price Indicator	142	1	Byte	Not Applicable to TRADEcho
IAU Price	143	8	Price	Not Applicable to TRADEcho
IAU Paired Size	151	8	Size	Not Applicable to TRADEcho
Imbalance Quantity	159	8	Size	Not Applicable to TRADEcho
Imbalance Direction	167	1	Byte	Not Applicable to TRADEcho
Best Closing Bid Price	168	8	Price	Not Applicable to TRADEcho
Best Closing Ask Price	176	8	Price	Not Applicable to TRADEcho
Best Closing Bid Size	184	8	Size	Not Applicable to TRADEcho
Best Closing Ask Size	192	8	Size	Not Applicable to TRADEcho
Trade High Off-Book	200	8	Price	Not Applicable to TRADEcho
Trade Low Off-Book	208	8	Price	Not Applicable to TRADEcho
Reserved Field	216	8	Size	Reserved for future use.
Reserved Field	224	8	Price	Reserved for future use.
Auction Type	232	1	Byte	Not Applicable to TRADEcho
Last Trade Price	233	8	Price	Not Applicable to TRADEcho
Last Trade Quantity	241	8	Size	Not Applicable to TRADEcho
Last Trade Time	249	8	UDT	Not Applicable to TRADEcho
Static Reference Price	257	8	Price	Not Applicable to TRADEcho
Dynamic Reference Price	265	8	Price	Not Applicable to TRADEcho

3.11.8 MiFID II Trade Report

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	N		N	N
Channel 2/6	TRADEcho	Trades		Y	Y	Y
Channel 3/7	TRADEcho	SI Quoting	N		N	N
Channel 4/8	TRADEcho	Trades		Y	Y	Y

Field	Offset	Length	Type	Description
Length	0	2	UInt16	Length of message including this field.
Message Type	2	1	Byte	**Hex** **Meaning** 0x54 MiFID Trade Report
Timestamp	3	8	UDT	Time the message was generated.
Instrument	11	8	UInt64	GTP Instrument Identifier. This field will be populated with 0 for Non-Exchange listed instruments
Transaction identification code	19	52	Alpha	A unique trade identifier. The value will be right aligned.
Total Number of Transactions	71	4	Uint32	Total Number of Transactions of aggregated trade
Reserved Field	75	8	Price	Reserved for future use.
Source venue	83	2	UInt16	Venue from which market data is received for the instrument. **Value** **Meaning** 11 TRADEcho
MiFID Price	85	20	MiFID Decimal	MiFID compliant Price field populated using either Price or Yield. Will be set to default value (20 spaces) if there is a pending price (PNDG) {DECIMAL-18/13} in case the price is expressed as monetary value. {DECIMAL-11/10} in case the price is expressed as percentage or yield. In case of transactions under ESMA jurisdiction: • Will be set to default value (20 spaces) if price is not available (NOAP)

Field	Offset	Length	Type	Description
MiFID Quantity	105	20	MiFID Decimal	Number of units of the financial instrument. {DECIMAL-18/17} In case of transactions under ESMA jurisdiction: • Will be set to default value (20 spaces) if quantity is not available
MiFID Trading Date and Time	125	27	Date and Time	Date and time when the transaction was executed/ agreed upon. If a trade is cancelled or amended, this field will contain the MiFID Trading Date and Time of the original trade. If the Trade is Aggregated this field will be populated with a Default of 27 spaces. Applicable to Daily Aggregated Transaction Flag (DATF), FWAF (Four Week Aggregation Flag), IDAF (Indefinite Aggregation Flag), COAF (Consecutive Aggregation Flag).
Instrument Identification Code Type	152	4	Alpha	**Value** / **Meaning** ISIN / International Securities Identification Number
Instrument Identification Code	156	12	Alpha	Instrument identification number (ISIN code).
Price Notation	168	4	Alpha	Indicates if the price is expressed in monetary value, in percentage or yield. Will be set to default value (4 spaces) if not available Possible values: **Value** / **Meaning** MONE / Monetary value PERC / Percentage YIEL / Yield BAPO / Basis Point
Price Major Currency (FCA) / Price Currency (ESMA)	172	3	Alpha	Major currency in which the price is expressed (applicable if the price is expressed as monetary value). Currency Code as per ISO 4217. For additional currencies supported, refer to the Additional Field Values section of this document.
Notional Amount	175	20	MiFID Decimal	Notional value relevant to the security {DECIMAL-18/5}
Notional Currency	195	3	Alpha	Major currency in which the notional amount is denominated.
Venue of Execution	198	4	Alpha	Identification of the venue where the transaction was executed. Possible Values: **Value** / **Meaning** XOFF / OTC SINT / Systematic Internaliser {MIC} / Reported by RM/MTF/OTF (the MIC corresponding to the relevant venue)

Field	Offset	Length	Type	Description
Publication Date and Time	202	27	Date and Time	Date and time when the transaction was published.
Benchmark Transaction Flag	229	4	Alpha	Possible values:
				Value
				BENC
Agency CrossTrade Flag	233	4	Alpha	Possible values:
				Value
				ACTX
Non Price Forming Transactions Flag	237	4	Alpha	Possible values:
				Value
				NPFT
Non Price Contribution to Discovery	241	4	Alpha	Possible values:
				Value
				TNCP
Special Dividend Flag	245	4	Alpha	Possible values:
				Value
				SDIV
PTDeferralReason Flag	249	4	Alpha	Possible values:
				Value
				SIZE
				LRGS
Reference Price Transaction Flag	253	4	Alpha	Possible values:
				Value
				RFPT
NT Liquidity Flag	257	4	Alpha	Possible values:
				Value
				NLIQ
				OILQ
NT Price Conditions Flag	261	4	Alpha	Possible values:
				Value
				PRIC
Algo Transaction Flag	265	4	Alpha	Possible values:
				Value
				ALGO

Field	Offset	Length	Type	Description
PTIliquidFlag	269	4	Alpha	Possible values:
				Value
				ILQD
Price Improvement Flag	273	4	Alpha	Possible values:
				Value
				RPRI
CancellationFlag	277	4	Alpha	Possible values:
				Value
				CANC
AmendmentFlag	281	4	Alpha	Possible values:
				Value
				AMND
DuplicateFlag	285	4	Alpha	Possible values:
				Value
				DUPL
				ORGN
Exchange For Physicals Flag	289	4	Alpha	Possible values:
				Value
				TPAC
				XFPH
Limited Details Flag	293	4	Alpha	Possible values:
				Value
				LMTF
LDFull Details Flag	297	4	Alpha	Possible values:
				Value
				FULF
Daily Aggregated Transaction Flag	301	4	Alpha	Possible values:
				Value
				DATF
DAFull Details Flag	305	4	Alpha	Possible values:
				Value
				FULA

Field	Offset	Length	Type	Description
Volume Omission Flag	309	4	Alpha	Possible values: **Value** VOLO
VOFull Details Flag	313	4	Alpha	Possible values: **Value** FULV
Four Weeks Aggregation Flag	317	4	Alpha	Possible values: **Value** FWAF
FAFull Details Flag	321	4	Alpha	Possible values: **Value** FULJ
Indefinite Aggregation Flag	325	4	Alpha	Possible values: **Value** IDAF
Volume Omission For Sovereign Debt Flag	329	4	Alpha	Possible values: **Value** VOLW
Consecutive Aggregation Flag	333	4	Alpha	Possible values: **Value** COAF
Reserved Field	337	1	UInt8	Reserved for future use
Venue Type	338	1	UInt8	Type sent by the venue. Possible values: **Value** **Meaning** 0 Unspecified 1 MTF 2 OTF 3 Regulated Market

Field	Offset	Length	Type	Description
Venue Book Definition ID	339	1	UInt8	Book Definition ID sent by the venue.
				Value **Meaning**
				0 On Book
				1 Off Book
Venue Measurement Unit Notation	340	25	Alpha	Notation of the Quantity in Measurement Unit.
Quantity in Measurement Unit	365	20	MiFID Decimal	The Quantity in Measurement Unit.
Transaction to be Cleared	385	1	Byte	Identifies if the firm intends to clear the transaction. ESMA field for derivatives.
				Value **Meaning**
				0 No
				1 Yes
Type	386	4	Alpha	Emission Allowance Type.
				Possible values :
				Value **Meaning**
				EUAE European Union Allowance
				CERE Certified Emission Reductions
				ERUE Emission Reduction Units
				EUAA European Union Aviation Allowances
				OTHR Other
				Blank if not applicable
Venue of Publication	390	4	Alpha	Identification of the regulatory regime under which the transaction was published. The value sent by the source venue is passed on.
				Value **Meaning**
				ECHO Published under UK APA Regulation
				ECEU Published under EU APA Regulation
				{MIC} Reported by RM/MTF/OTF (the MIC corresponding to the relevant venue)”
				Note: This field will be present on the message, only in case of a hard Brexit scenario.

Field	Offset	Length	Type	Description	
Market Mechanism	394	1	Byte	**Value**	**Meaning**
				4	Off Book
Trading Mode	395	1	Byte	**Value**	**Meaning**
				5	Trade Reporting (On Exchange)
				6	Trade Reporting (Off Exchange)
				7	Trade Reporting (Systemic Internaliser)
Transaction Category	396	1	Byte	**Value**	**Meaning**
				R	Trade that has Received Price Improvement (RPRI)
				Z	Package Trade, excluding Exchange for Physicals (TPAC)
				Y	Exchange for Physicals Trade (XFPH)
				G	RFMD Give-Up Trade (GIVE)
				H	RFMD Give-Up Trade (GIVE) and Exchange for Physicals Trade (XFPH)
				-	None apply
Negotiation Indicator	397	1	Byte	**Value**	**Meaning**
				1	Negotiated Trade in Liquid Financial Instruments (NLIQ)
				2	Negotiated Trade in Illiquid Financial Instruments (OILQ)
				3	Negotiated Trade Subject to Conditions Other than the Current Market Price (PRIC)
				7	Negotiated Trade Larger than LIS brought onto a venue (NTLS)
				8	Negotiated Trade with pre-trade transparency waiver (NETW)
				-	Not a Negotiated Trade
Agency Cross Indicator	398	1	Byte	**Value**	**Meaning**
				X	Agency Cross Trade (ACTX)
				-	No Agency Cross Trade
Modification Indicator	399	1	Byte	**Value**	**Meaning**
				C	Trade Cancellation (CANC)
				A	Trade Amendment (AMND)
				-	New Trade

Field	Offset	Length	Type	Description	
Reference Price Indicator	400	1	Byte	**Value**	**Meaning**
				B	Benchmark Trade (BENC)
				S	Reference Price Trade (RFPT)
				O	Benchmark Trade (BENC) & Portfolio Transaction (PORT) & Contingent Transaction (CONT)
				N	Portfolio Transaction (PORT) & Contingent Transaction (CONT)
				M	Benchmark Trade (BENC) & Contingent Transaction (CONT)
				Y	Benchmark Trade (BENC) & Portfolio Transaction (PORT)
				C	Contingent Transaction (CONT)
				P	Portfolio Transaction (PORT)
				1	Market Closing Price (CLSE)
				2	Market Closing Price (CLSE) & Portfolio Transaction (PORT)
				-	Not a Reference Price Trade
Special Dividend Indicator	401	1	Byte	**Value**	**Meaning**
				E	Special Dividend Trade (SDIV)
				-	No Special Dividend Trade
Off Book Automated Indicator	402	1	Byte	**Value**	**Meaning**
				M	Off Book Non-Automated
				Q	Off Book Automated
				-	Unspecified or does not apply
Price Formation Indicator	403	1	Byte	**Value**	**Meaning**
				P	Plain-Vanilla Trade
				T	Non-Price Forming Trade (NPFT)
				J	Trade not Contributing to Price Discovery (TNCP)
				N	Pending Price (PNDG)
				Z	Price is not Applicable (NOAP) (ESMA only)
Algorithmic Indicator	404	1	Byte	**Value**	**Meaning**
				H	Algorithmic Trade (ALGO)
				-	Not an Algorithmic Trade

Field	Offset	Length	Type	Description	
Post-Trade Deferral Reason	405	1	Byte	**Value**	**Meaning**
				2	Non-Immediate Publication: Deferral for “Large in Scale” (LRGS)
				3	Non-Immediate Publication: Deferral for “Illiquid Instrument” (ILQD)
				4	Non-Immediate Publication: Deferral for “Size Specific” (SIZE)
				5	Non-Immediate Publication: Deferrals of “ILQD” and “SIZE”
				6	Non-Immediate Publication: Deferrals of “ILQD” and “LRGS”
				-	Immediate Publication
Deferral/ Enrichment Type	406	1	Byte	**Value**	**Meaning**
				1	LMTF
				2	DATF
				3	VOLO
				4	FWAF
				5	IDAF
				6	VOLW
				7	FULF
				8	FULA
				9	FULV
				V	FULJ
				W	COAF
				-	Not Applicable/No Relevant Enrichment Type
Duplicative Indicator	407	1	Byte	**Value**	**Meaning**
				1	Duplicative Trade Report (DUPL)
				2	Intra-Group Trade (IGRP)
				3	Duplicative Trade Report (DUPL) and Intra-Group Trade (IGRP)
				4	Cross-Border Duplicative Trade Report (XBDT)
				5	Duplicative Trade Report (DUPL) and Cross-Border Duplicative Trade Report (XBDT)
				6	Duplicative Trade Report (DUPL) and Intra-Group Trade (IGRP) and Cross-Border Duplicative Trade Report (XBDT)
				7	Intra-Group Trade (IGRP) and Cross-Border Duplicative Trade Report (XBDT)
				-	Unique Trade Report

Field	Offset	Length	Type	Description
Third-country trading venue of execution	408	4	Alpha	Identification of the third-country trading venue where the transaction was executed.
Portfolio Transaction Flag	412	4	Alpha	Possible values:
				Value
				PORT
Contingent Transaction Flag	416	4	Alpha	Possible values:
				Value
				CONT
Missing Price (ESMA) / Price Conditions (FCA)	420	4	Alpha	Possible values:
				Value
				PNDG
				NOAP
Market Closing Price Flag	424	4	Alpha	Possible values:
				Value
				CLSE
NT Large in Scale Flag	428	4	Alpha	Possible values:
				Value
				NTLS
NT Pre-Trade Transparency Flag	432	4	Alpha	Possible values:
				Value
				NETW

Trade Flags Relevance Across Jurisdictions

Flag Description	Flag	FCA	ESMA	MiFID Trade Report related fields	
Trade that has Received Price Improvement	RPRI	N/A	Y	Price Improvement Flag	Transaction Category
Package Trade (excluding Exchange for Physicals)	TPAC	N/A	Y	Exchange For Physicals Flag	
Exchange for Physicals Trade	XFPH	N/A	Y	Exchange For Physicals Flag	
RFMD Give-Up Trade	GIVE	N/A	N/A	N/A	N/A
Pre-Trade Transparency Waiver for Illiquid Instrument on an SI	ILQD	N/A	Y	N/A	N/A
Pre-Trade Transparency Waiver for Above Standard Market Size on an SI	SIZE	N/A	Y	N/A	
Negotiated Trade With Pre-Trade Transparency Waiver	NETW	Y	N/A	NT Pre-Trade Transparency Flag	Negotiation Indicator
Negotiated Trade in Liquid Financial Instruments	NLIQ	N/A	Y	NT Liquidity Flag	
Negotiated Trade Larger Than LIS Brought Onto a Venue	NTLS	Y	N/A	NT Large in Scale Flag	

Flag Description	Flag	FCA	ESMA	MiFID Trade Report related fields	
Negotiated Trade in Illiquid Financial Instruments	OILQ	N/A	Y	NT Liquidity Flag	
Negotiated Trade Subject to Conditions Other Than The Current Market Price	PRIC	N/A	Y	NT Price Conditions Flag	
Agency Cross Trade	ACTX	N/A	Y	Agency CrossTrade Flag	Agency Cross Indicator
Trade Amendment	AMND	Y	Y	Amendment Flag	Modification Indicator
Trade Cancellation	CANC	Y	Y	Cancellation Flag	
Benchmark Trade	BENC	Y	Y	Benchmark Transaction Flag	Reference Price Indicator
Benchmark Transactions Executed at the Market Closing Price	CLSE	Y	N/A	Market Closing Price Flag	
Contingent Trade	CONT	N/A	Y	Contingent Transaction Flag	
Portfolio Trade	PORT	Y	Y	Portfolio Transaction Flag	
Reference Price Trade	RFPT	Y	Y	Reference Price Transaction Flag	
Special Dividend Trade	SDIV	Y	Y	Special Dividend Flag	Special Dividend Indicator
Price is Not Applicable	NOAP	N/A	Y	Missing Price (ESMA) / Price Conditions (FCA)	Price Formation Indicator
Non-Price Forming Trade (formerly defined as a Technical Trade)	NPFT	Y	Y	Non Price Forming Transactions Flag	
Price is Currently Not Available but Pending	PNDG	Y	Y	Missing Price (ESMA) / Price Conditions (FCA)	
Trade not Contributing to the Price Discovery Process (formerly defined as a Technical Trade)	TNCP	Y	N/A	Non Price Contribution to Discovery	
Algorithmic Trade	ALGO	Y	Y	Algo Transaction Flag	Algorithmic Indicator
Non-Immediate Publication: Deferral for Illiquid Instrument	ILQD	N/A	Y	PTIliquid Flag	Post Trade Deferral Reason
Non-Immediate Publication: Deferral for Large in Scale	LRGS	Y	Y	PTDeferralReason Flag	
Non-Immediate Publication: Deferral for Size Specific	SIZE	N/A	Y	PTDeferralReason Flag	
Full Details in Aggregated Form of Earlier Volume Omission Trade, Eligible for Subsequent Enrichment in Aggregated Form (VOLW)	COAF	N/A	Y	Consecutive Aggregation Flag	Deferral/ Enrichment Type
Daily Aggregated Trade	DATF	N/A	Y	Daily Aggregated Transaction Flag	
Full Details of Earlier Daily Aggregated Trade (DATF)	FULA	N/A	Y	DAFull Details Flag	
Full Details of Earlier Limited Details Trade (LMTF)	FULF	N/A	Y	LDFull Details Flag	
Full Details of Earlier Four Weeks Aggregation Trade (FWAF)	FULJ	N/A	Y	FAFull Details Flag	
Full Details of Earlier Volume Omission Trade (VOLO)	FULV	N/A	Y	VOFull Details Flag	
Four Weeks Aggregation Trade	FWAF	N/A	Y	Four Weeks Aggregation Flag	
Indefinite Aggregation Trade	IDAF	N/A	Y	Indefinite Aggregation Flag	
Limited Details Trade	LMTF	N/A	Y	Limited Details Flag	
Volume Omission Trade	VOLO	N/A	Y	Volume Omission Flag	

Flag Description	Flag	FCA	ESMA	MiFID Trade Report related fields	
Volume Omission Trade, Eligible for Subsequent Enrichment in Aggregated Form	VOLW	N/A	Y	Volume Omission Flag	
Original Trade Report	ORGN	N/A	Y[6]	Duplicate Flag	Duplicative Indicator
Duplicative Trade Report (reported to more than one APA)	DUPL	N/A	Y	Duplicate Flag	
Intra-Group Trade	IGRP	N/A	N/A	N/A	N/A
Cross-Border Duplicative Trade Report	XBDT	N/A	N/A	N/A	

[6] ESMA – Manual on post-trade transparency under MiFID II/ MiFIR (ESMA74-2134169708-6870)

3.11.9 Systematic Internaliser (SI) Quotes

Market Data Group	Source Venue	Channel Content	Level 2 Incremental	MIFID II Post Trade	Replay	Recovery
Channel 1/5	TRADEcho	SI Quoting	Y		Y	Y
Channel 2/6	TRADEcho	Trades		N	N	N
Channel 3/7	TRADEcho	SI Quoting	Y		Y	Y
Channel 4/8	TRADEcho	Trades		N	N	N

Field	Offset	Length	Type	Description	
Length	0	2	UInt16	Length of message including this field.	
Message Type	2	1	Byte	**Hex**	**Meaning**
				0x47	SI Quote
Timestamp	3	8	UDT	Time the message was generated.	
Order ID	11	8	UInt64	Unique identifier of the order.	
Side	19	1	Byte	**Value**	**Meaning**
				B	Buy Order
				S	Sell Order
Size	20	8	Size	Displayed Size of the order.	
Instrument	28	8	UInt64	GTP Instrument identifier.	
Price	36	8	Price	Limit price of the order. Implied price if instrument trades in yield.	
Yield	44	8	Price	Yield, if the instrument trades in yield.	
Source venue	52	2	UInt16	Venue from which market data is received for the instrument.	
				Value	Meaning
				11	TRADEcho
Order Book Type	54	1	UInt8	**Value**	**Meaning**
				1	SI Quote Book
Participant	55	11	Alpha	Identity of trading participant that submitted the order.	
Order Type	66	1	66	**Value**	**Meaning**
				0	SI Quote (default)
Reserved	67	10	Alpha	Reserved field.	

Field	Offset	Length	Type	Description
Currency[7]	77	3	Alpha	Currency of the SI Quote price.
Venue of Publication	80	4	Alpha	Identification of the regulatory regime under which the transaction was published. The value sent by the source venue is passed on.
				Value / **Meaning**
				ECHO — Published under UK Regulation
				ECEU — Published under EU Regulation
				Note: This field will be present on the message, only in case of a hard Brexit scenario.

[7] For an order on the given currency on the order book, no order priority or price prioritization is done for SI Quotes

4 Client Data Recovery

The Group Ticker Plant operates with similar data recovery solutions as the existing Millennium Exchange market data product: replay and recovery service.

Should a gap in sequence numbers be noticed on both the primary and secondary feed, or following a failure at client site, clients should assume that instrument order books are stale and should initiate one of the below data recovery processes to refresh systems.

4.1 Replay Channel

The replay service provides clients the ability to request a finite number of application messages as disseminated on the real-time multicast channel. Provisioned to facilitate client recovery following a small scale data loss, the replay service caches the last 65,000 application messages published for each multicast channel.

Clients are permitted to log on to the replay service a finite number of times each day and, following successful login, subsequently submit a finite number of requests each day. Whilst these counters can be reset intraday by the Group, this will be done only in an emergency situation and should not be relied upon as normal practice.

Each client CompID is permitted to log on to the Production replay service 3,000 times per day, submitting a maximum of 3,000 requests per day. Clients are permitted to queue a maximum of 10 requests at any one time. Should any of these parameters be reached, the replay server will respond with an explanatory reason code.

4.1.1 Establishing a connection

Clients should send a Login Request message to the appropriate target replay service IP gateway address and port. Validation of appropriate credentials as configured on the Group Ticker Plant will be done against both the CompID, as supplied in the message sent by the client, and the incoming source IP address. Upon successful validation, the replay service responds with a Login Response message of Status ‘A’ – the session should now be considered active. Clients should wait for the server’s response prior to submitting replay requests. Any requests submitted prior to authentication will be ignored.

Should the attempted connection fail for any reason, the server will respond with a Login Response message which will contain a reason code. This reason code will facilitate the diagnosis of the failed login request.

4.1.2 Sending a request

Once successful connection is established, clients can queue requests for retransmission of missed messages. The Replay Request message should include the first sequence number of the range of messages to be retransmitted and the total number of messages subsequent to the first missed message required. A Request ID can also be included if required – this is not validated by the replay service.

Should the server accept the request for message retransmission, clients will receive a Replay Response message of Status ‘A.’ If a Request ID was specified, this will be included in the Replay Response message. This will be immediately followed by the requested message stream. The completion of the request will be marked by the sending of a Replay and Recovery Complete message. This will include the original Request ID if specified but will not include the current Trading Status of the instrument.

Should the replay request fail, the server will respond with a Replay Response message which will contain a reason code. This reason code will facilitate the diagnosis of the failed replay request.

Submitted requests will be processed serially, but the capability of the replay service will be split across any logged in CompID. This may mean that the performance of the replay solution may differ, dependent upon the number of CompIDs logged in to the service at any given time.

4.1.3 Terminating a connection

Clients will not be required to log out from the replay service. Instead, immediately after the completion of the request, the replay server will terminate the connection with the client.

Clients should note that, upon successful login to the replay service, a request should be submitted within five seconds or the server will force-logout the client.

Replay, Recovery and GTP Lite services will close connection to user via message with FIN flag in case termination of connection is initiated by the service itself.

4.2 Recovery Channel

The recovery service facilitates a client's resynchronisation with the order book following a large scale data loss for the which the replay service is insufficient. Following successful login, clients are able to request the following:

- A snapshot of the order book for any active instrument in the Market Data Group
- All trades reported for the trading day (both on and off book)
- A snapshot of an instrument's current statistics
- The current trading status of an instrument
- The full set of reference data for an instrument

In a similar approach to that of the replay service, clients are permitted to log in to the recovery service a finite number of times each day and, following successful login, subsequently submit a finite number of requests each day. While these counters can be reset intraday by the Group, this will be done only in an emergency and should not be relied upon as normal practice. Each client CompID is permitted to log on to the Production recovery service 3,000 times per day, submitting a maximum of 3,000 requests per day. Clients are permitted to queue a maximum of 10 requests at any one time. Should any of these parameters be reached, the recovery server will respond with an explanatory reason code.

4.2.1 Establishing a connection

Clients should send a Login Request message to the appropriate target recovery service IP gateway address and port. Validation of appropriate credentials as configured on the Group Ticker Plant will be done against both the CompID as supplied in the message by the client and the incoming source IP address. Upon successful validation, the recovery service will respond with a Login Response message of Status 'A' – the session should now be considered active. Clients should wait for the server's response prior to submitting recovery requests. Any requests submitted prior to authentication will be ignored.

Should the attempted connection fail for any reason, the server will respond with a Login Response message which will contain a reason code. This reason code will facilitate the diagnosis of the failed login request.

4.2.2 Sending a request for an Instrument Level Order Book snapshot

Following receipt of a Login Response message of Status 'A,' used to confirm successful login to the recovery service, clients may submit a request for a snapshot of the current order book using the Recovery Request message. The Recovery Request message should indicate that the client requires an instrument order book snapshot – the Recovery Type field should be '1,' and the Request Level field should be '0.' Clients are also permitted to request a specific order book, either Electronic or SI Quote, in the Order Book Type field. Clients may also include a Request ID in the Recovery Request message – this is not validated by the server.

The server will transmit a Recovery Response message which should indicate the successful acceptance of the request. The Recovery Response message will also include the Request ID if specified by the client. The Recovery Response message will also include the real-time channel sequence number with which the snapshot is synchronised. Clients should buffer all messages as received on the real-time channel with a sequence number greater than that received in the Recovery Response message.

If active and displayable orders are present on the order book, the server will transmit an Order Book Clear message followed by a message stream to allow the rebuild of the order book. The MBO and MBP snapshot service line order book recovery will be disseminated through a number of Add Order messages. The order book should be built in the same way as on the real-time channel – further details are contained within section 3.1.2 of GTP001 – Product Guide. The level 2 incremental services should be rebuilt by processing all Add Order Incremental messages as disseminated following the Recovery Response message. The buy side will always be transmitted first. The level 1 order book recovery will publish an Order Book Clear message followed by the current best Bid and Ask aggregated levels in a single TOB message, similar to that of the real-time service.

If the snapshot request was for more than one order book as specified in the Order Book Type field of the Recovery Request message, the Electronic Order Book will always be provided first. Following transmission of each requested order book, the server will disseminate a Replay and Recovery Complete message. If no active displayable orders are present on any applicable order book type, the server will disseminate only an Order Book Clear message followed by the Replay and Recovery Complete message. This message includes the real-time trading status of the instrument if the instrument is currently in a trading session. To complete the request, following transmission of all requested order books for an instrument, the server will disseminate a final Replay and Recovery Complete message. If a Request ID was specified by the client, this will be included.

4.2.3 Sending a request for a Group or Channel Level Order Book snapshot

Following receipt of a Login Response message of Status 'A,' used to confirm successful login to the recovery service, clients may submit a request for a snapshot of the current order book using the Recovery Request message. The Recovery Request message should indicate that the client requires Group or Channel level order book snapshots – the Recovery Type field should be '1,' and the Request Level field should be either '1' or '2'. If a Group or Channel level recovery is requested by the client, all order books will be disseminated – the Order Book Type field is not processed by the server. Clients may also include a Request ID in the Recovery Request message. This is not validated by the server.

The server will transmit a Recovery Response message which should indicate the successful acceptance of the request. The Recovery Response message will also include the Request ID, if specified by the client, and the real-time channel sequence number with which the snapshot is synchronised. Clients should buffer all messages as received on the real-time channel with a sequence number greater than that received in the Recovery Response message.

If active and displayable orders are present on the order book, the server will transmit an Order Book Clear message, followed by a message stream to allow the rebuild of the order book. The MBO and MBP snapshot service line order book recovery will be disseminated through a number of Add Order and Add Order Short messages. The order book should be built in the same way as on the real-time channel – further details are contained within section 3.1.2 of GTP001 – Product Guide.

The level 2 incremental services should be rebuilt by processing all Add Order Incremental messages as disseminated following the Recovery Response message. The buy side will always be transmitted first. Order books will be transmitted to clients serially, with the Electronic Order Book always transmitted prior to the SI Quote book if applicable. If private RFQ book is applicable, a series of Add Order Incremental messages will be transmitted pertaining to private RFQ book depending on the RFQ Transparency regime. All applicable order books will be transmitted prior to dissemination of the next instrument's snapshot. The level 1 order book recovery will publish an Order Book Clear message followed by the current best Bid and Ask aggregated levels in a single TOB message – similar to that of the real-time service.

For instruments with no active displayable orders present on any applicable order book type, the server will disseminate only an Order Book Clear message followed by the Replay and Recovery Complete message. This message includes the real-time trading status of the instrument if the instrument is currently in a trading session. For the private RFQ book, the Trading Status will always be set to No Active Session (w). To complete the full request, following transmission of all requested order books, the server will disseminate a final Replay and Recovery Complete message. If a Request ID was specified by the client, this will be included. The final Replay and Recovery Complete message will not contain a value in the Trading Status field.

4.2.4 Sending a request for the Instrument Directory (reference data)

Following receipt of a Login Response message of Status 'A,' used to confirm successful login to the recovery service, clients may submit a request for Instrument Directory messages using the Recovery Request message. The Recovery Request message should indicate that the client requires Instrument Directory messages. The Recovery Type field should be '0.' Clients should also indicate the level of the request – an individual instrument, a segment or for all instruments on the multicast channel. Clients may also include a Request ID in the Recovery Request message. This is not validated by the server.

The server will transmit a Recovery Response message which should indicate the successful acceptance of the request. The Recovery Response message will also include the Request ID, if specified by the client. The Recovery Response message will also include the real-time channel sequence number of the last Instrument Directory message sent. This will be followed by the Instrument Directory message(s) as requested by the client. Successful 'Group' or 'Multicast Channel' requests will result in the dissemination of all configured instruments on the Group Ticker Plant at that request level, irrespective of their trading status. Instrument Directory messages are available via Recovery once they have been published by multicast.

Customers should note that, should a request be made for an instrument not supported by the targeted multicast group, the server will respond with the rejection Status of 'a.'

The completion of the recovery request will be indicated through the dissemination of a Replay and Recovery Complete message. The Trading Status field of the Replay and Recovery Complete message will only be populated if the original request level was 'Instrument.' The Replay and Recovery Complete message will also include the Request ID, if specified by the client.

4.2.5 Sending a request for trades

Following receipt of a Login Response message of Status 'A,' used to confirm successful login to the recovery service, clients may submit a request for trades as reported by supported markets using the Recovery Request message. The Recovery Request message should indicate that the client requires trade recovery. The Recovery Type field should be '2.' Clients should also indicate the level of the request – an individual instrument, a segment or for all instruments on the multicast channel. Clients may also include a Request ID in the Recovery Request message. This is not validated by the server.

The server will transmit a Recovery Response message, which should indicate the successful acceptance of the request. The Recovery Response message will include the Request ID, as specified by the client. This message will also include the real-time multicast channel sequence number of the last trade to be disseminated as part of the request, with the total number of trade messages to be disseminated indicated in the Count field.

The Recovery Response message will be immediately followed by a stream of execution messages as disseminated on the multicast channel. All trade types will be disseminated, including Trade, Off-book Trade, and Trade Cross messages, in their original sequence. It is not possible to request a subset of trade types on the trade recovery service. Trade cancellations as originally disseminated will be included in the recovery service message stream. While clients cannot specify a subset of trade types on the recovery service, clients may include a real-time channel sequence number on the Recovery Request message. When a sequence number is included, the recovery service will transmit only trade messages with an equal or greater sequence number to that specified.

The completion of the recovery request will be indicated through the dissemination of a Replay and Recovery Complete message. The Trading Status field of the Replay and Recovery Complete message will only be populated if the original request level was 'Instrument.' The Replay and Recovery Complete message will also include the Request ID, if specified by the client.

If no trade messages exist which satisfy the original request, the server will transmit a Recovery Response message followed immediately by a Replay and Recovery Complete message.

4.2.6 Sending a request for a statistics snapshot

Following receipt of a Login Response message of Status 'A,' used to confirm successful login to the recovery service, clients may submit a request for an instrument's statistics as calculated by the Group Ticker Plant by using the Recovery Request message. The Recovery Request message should indicate that the client requires statistics. The Recovery Type field should be '3.' Clients should also indicate the level of the request – an individual instrument, a segment or for all instruments on the multicast channel. Clients may also include a Request ID in the Recovery Request message. This is not validated by the server.

The server will transmit a Recovery Response message which should indicate the successful acceptance of the request. The Recovery Response message will include the Request ID, as specified by the client. This message will also include the real-time multicast channel sequence number of the last message sent on the multicast channel. Clients should buffer all messages as received on the real-time channel with a sequence number greater than specified. The total number of Statistic Snapshot messages to be disseminated will be indicated in the Count field.

Following dissemination of the Recovery Response message, the server will disseminate one or more Statistic Snapshot messages, the number dependent upon the level of the original request. The Statistic Snapshot message will provide clients all current statistics as calculated by the Group Ticker Plant.

The server will disseminate a Replay and Recovery Complete message to indicate the successful completion of the request. The Trading Status field will only be populated if the request level was 'Instrument'. The Replay and Recovery Complete message will also include the Request ID if specified by the client.

If no statistics exist to satisfy the original request, the server will transmit a Recovery Response message followed immediately by a Replay and Recovery Complete message.

4.2.7 Sending a request for an Instrument Status

Following receipt of a Login Response message of Status 'A,' used to confirm successful login to the recovery service, clients may submit a request for the current Trading Status of an instrument on any supported market by using the Recovery Request message. The Recovery Request message should indicate that the client requires Instrument Status messages. The Recovery Type field should be '4.' Clients should also indicate the level of the request – an individual instrument, a segment or for all instruments on the multicast channel. Clients may also include a Request ID in the Recovery Request message. This is not validated by the server.

The server will transmit a Recovery Response message which should indicate the successful acceptance of the request. The Recovery Response message will include the Request ID, as specified by the client. This message will also include the real-time multicast channel sequence number of the last real-time message disseminated.

Clients should buffer all messages as received on the real-time channel with a sequence number greater than specified. The total number of Instrument Status messages to be disseminated will be indicated in the Count field.

Following dissemination of the Recovery Response message, the server will transmit one or more Instrument Status messages, the number dependent upon the level of the original request. The current Trading Status of an instrument is indicated in the Instrument Status message.

The server will disseminate a Replay and Recovery Complete message to indicate the successful completion of the request. The Trading Status field will only be populated if the request level was ‘Instrument’. The Replay and Recovery Complete message will also include the Request ID if specified by the client.

If no Instrument Status messages exist to satisfy the original request, the server will transmit a Recovery Response message followed immediately by a Replay and Recovery Complete message.

4.2.8 Terminating a connection

Clients will not be required to log out from the recovery service. Instead, immediately after the completion of the request, the recovery server will terminate the connection with the client.

Clients should note that, upon successful login to the recovery service, a request should be submitted within five seconds or the server will force-logout the client.

Replay, Recovery and GTP Lite services will close connection to user via message with FIN flag in case termination of connection is initiated by the service itself.

5 Additional field values

5.1 Supported currencies

Code	Description
EUX	Euro – cents
USX	Cent
GBX	GB pennies
ZAC	100th of RAND
ITL	Italian LIRA

6 Data Mapping

6.1 Conversion of Order ID

Venue	Representation
TRADEcho	Base 64 (URL Safe) decoded value from source venue ASCII format, but will be prefixed with B or A to indicate Bid or Ask order type

6.2 Conversion of Trade ID

Venue	Representation
TRADEcho	Base 64 (URL Safe) decoded value from source venue ASCII format

6.3 Base 64 decoding alphabets

6.3.1 Base 64 (URL Safe)

HEX	ASCII	HEX	ASCII	HEX	ASCII	HEX	ASCII
0	A	18	S	36	k	54	2
1	B	19	T	37	l	55	3
2	C	20	U	38	m	56	4
3	D	21	V	39	n	57	5
4	E	22	W	40	o	58	6
5	F	23	X	41	p	59	7
6	G	24	Y	42	q	60	8
7	H	25	Z	43	r	61	9
8	I	26	a	44	s	62	-
9	J	27	b	45	t	63	_
10	K	28	c	46	u		
11	L	29	d	47	v		
12	M	30	e	48	w		
13	N	31	f	49	x		
14	O	32	g	50	y		
15	P	33	h	51	z		
16	Q	34	i	52	0		
17	R	35	j	53	1		

6.4 Conversion of negative values in price fields

Signed data types, such as Price and Price4, might indicate negative values where applicable. Negative numbers are represented using the “Sign and magnitude” method. Encoding and decoding examples are provided in the following sections.

6.5 Encoding negative values in price fields

Decimal value = -1
Decimal value with eight implied decimal places = -100000000
Remove sign bit = 100000000
Convert to binary = 00000000 00000000 00000000 00000000 00000101 11110101 11100001 00000000
Add sign bit = 10000000 00000000 00000000 00000000 00000101 11110101 11100001 00000000
Hex value = 80 00 00 00 05 f5 e1 00
Hex value converted to Little endian = 00 e1 f5 05 00 00 00 80

6.6 Decoding negative values in price fields

Received bytes in hex = 00 e1 f5 05 00 00 00 80
Change the byte order to big endian = 80 00 00 00 05 f5 e1 00
Convert to binary = 10000000 00000000 00000000 00000000 00000101 11110101 11100001 00000000
Most significant bit is set. Therefore this is a negative value.
Remove the sign bit = 00000000 00000000 00000000 00000000 00000101 11110101 11100001 00000000
Convert to decimal = 100000000
Add sign to decimal = -100000000
Mark eight implied decimal places -1.00000000