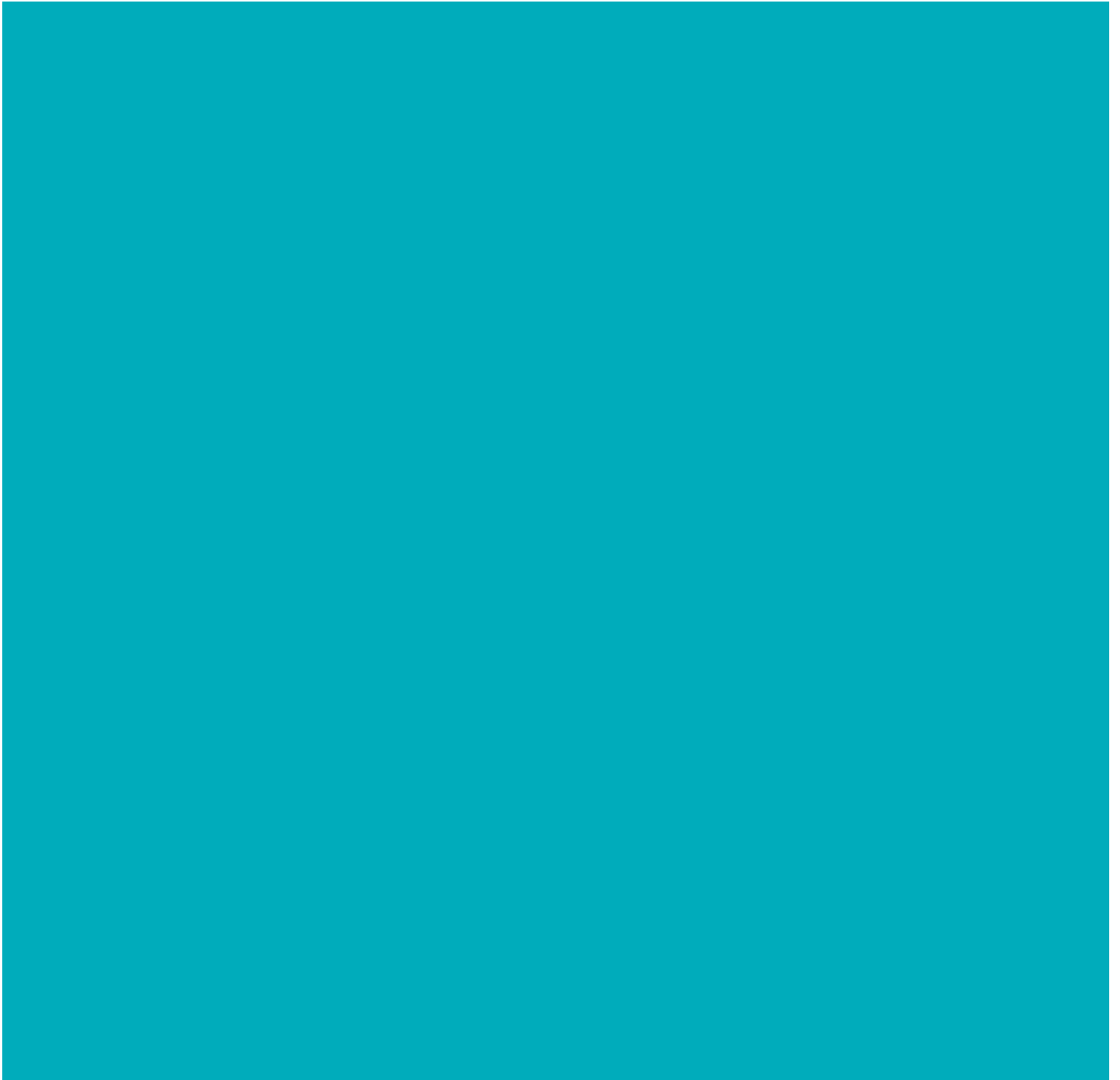


EquityClear

Trade Source Interface – FIX44 Messages

LCH The Markets'
Partner



CONTENTS

1	Introduction	4
2	EquityClear Service Overview	5
2.1	Trade Management	5
2.2	Risk & Financial Management.....	5
2.3	Settlement Management.....	5
3	Business Interface	6
3.1	Trade Submission	6
3.2	Trade Cancellation.....	8
3.3	Trade Acknowledgements	8
3.4	Trade Feed Reconciliation	9
3.5	Session, Message and Operational Information Flow	10
4	FIX 4.4 Message Specification	11
4.1	Trade Capture Report (AE).....	11
4.1.1	Component and Tag Notes.....	14
4.2	Trade Capture Report Acknowledgement (AR)	16
4.2.1	Component and Tag Notes.....	17
5	FIX Session Protocol	18
5.1	Connectivity	18
5.2	Sequence Numbers	18
5.3	Logon	18
5.4	Heartbeat.....	19
5.5	Test Request.....	19
5.6	Resend Request.....	19
5.7	Reject	19
5.8	Sequence Reset	19
5.9	Logout.....	20
5.10	Error Handling	20
6	Network and FIX Servers Design.....	21
7	Document History.....	22

Abbreviations

Abbreviation	Explanation
BIC	Bank Identification Code
CCP	Central Counterparty
CFD	Contract for Difference
CSD	Central Securities Depository
ECL	EquityClear
ERA	Equity Risk Analysis
FIX	Financial Information Exchange
ICSD	International Central Securities Depository
ISD	Intended Settlement Date
ISIN	International Securities Identification Number
ISO	International Standardisation Organisation
LCH	LCH Ltd
MIC	ISO 10383 Market Identifier Code
MTF	Multilateral Trading Facility
UTC	Coordinated Universal Time

1 Introduction

The LCH EquityClear service has cleared cash equity and equivalent products since February 2001 and CFDs since 2010.

The EquityClear service continues to expand, clearing trades from additional trade sources (exchanges, MTFs and other platforms) and offering settlement in a wider choice of “Settlement Services” (CSDs and ICSDs - henceforth all termed CSDs).

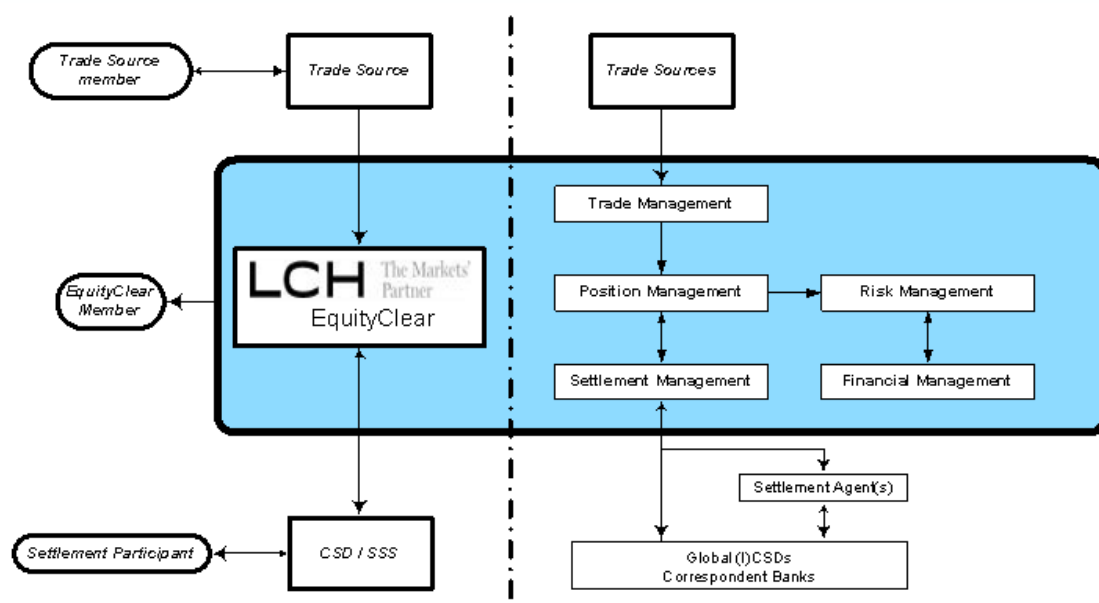
This document is provided exclusively to Trade Sources wishing to appoint LCH Ltd to clear or offer clearing of its matched trades. The purpose of the document is to:

01. Describe the current EquityClear service as it supports Trade Sources.
02. Describe the business interface between the Trade Source and LCH.
03. Describe the technical interface between the Trade Source and LCH.

2 EquityClear Service Overview

The clearing and settlement model of the EquityClear service is the standard hourglass model. That is, trades are sent by the trade source to LCH for clearing, with subsequent settlement in the appropriate Settlement Service.

The left hand side of the diagram below shows the high-level hourglass model. The right side shows a first level of detail.



2.1 Trade Management

All trades must be for standard conditions (no specials).

Both order book and off order book trades can be accepted.

2.2 Risk & Financial Management

LCH Risk Management approve eligible instruments for clearing.

Trades are risk managed using the LCH ERA algorithm.

LCH Ltd standard practices and procedures for collateral management and default management are used.

2.3 Settlement Management

Equity settlement is in CSDs with the associated cash movements either in the CSD or via separate correspondent banking arrangements.

3 Business Interface

3.1 Trade Submission

The trade source must submit matched trades, that is, a single message with both sides of the match.

All order book trades (under open offer) must be submitted to LCH such that they will be received within ten minutes. Any disruption of the normal operation of the feed over ten minutes must be notified to LCH Risk Management and Business Operations. If the feed is lost for over an hour, LCH Risk Management will be looking for alternate methods of sourcing the trade positions from the trade source. In extremis, LCH will no longer accept order book trades on an open offer basis.

There is more flexibility for clearing off order book [OTC] trades as contract formation is by novation.

The following table shows the business data content to be sent in the trade feed for new trades, including contras.

Data Item	Description	Required ¹	Note (see below)	Business Data Item ID ²
Trade Source ID	Unique reference for the “trade source”	Y	1	A
Trade ID	Trade source generated trade reference	Y	2	B
Trade Date/Time	Date and time on which the trade was executed	Y	3	C
ISD	Intended Settlement Date	N	4	D
Instrument	Identifier of the traded instrument	Y	5	E
Reference Market	Identifier of the reference market	N	6	F
Quantity	Quantity of instrument traded	Y	7	G
Trade Price	Price and currency at which the trade was executed	Y	8	H
Trade Type	Trade type - used for trade processing	Y	9	I
Contra Reference	For a contra trade the Trade ID of the original trade	N	10	J
Dealing Firm ID (Buy)	Dealing Firm identifier in “trade source”	Y	11	K
Dealing Capacity (Buy)	Legal capacity in which the dealing firm has executed the trade. (Agency, Matched Principal or Principal)	Y	12	L

¹ Required: Yes, No

² This is used to cross-reference these business items to the fields in the message specification tables in the subsequent sections.

Data Item	Description	Required ¹	Note (see below)	Business Data Item ID ²
Dealing Firm Order Reference (Buy)	Reference attached to the order on input	N	13	M
House/Client Indicator (Buy)	LCH sub-account denomination through which to clear the trade	N	14	N
Account Information (Buy)	Account information attached to the order on input	N	15	S
Dealing Firm ID (Sell)	Dealing Firm identifier in “trade source”	Y	11	O
Dealing Capacity (Sell)	Legal capacity in which the dealing firm has executed the trade. (Agency, Matched Principal or Principal)	Y	12	P
Dealing Firm Order Reference (Sell)	Reference attached to the order on input	N	13	Q
House/Client Indicator (Sell)	LCH sub-account denomination through which to clear the trade	N	14	R
Account Information (Sell)	Account information attached to the order on input	N	15	S

Notes

01. Usually the ISO Market Identification Code of the trade source. It may be beneficial or necessary to have more than one code per trade source to segment the business appropriately and such details can be agreed.
02. The minimum requirement is for the trade reference to be unique per trade date per Trade Source ID. A trade source must fully describe its trade reference policy, including the format.
03. Two values are accepted and processed.
 - a. The ‘trade date’ being the reference date for corporate action processing. Trades should not be sent later than the day after trade date (T+1). Trades received later than this (i.e. > T+1) will be rejected.
 - b. The ‘transaction date/time’ used solely for reporting purposes.
04. LCH calculates an ISD from the trade date and the standard settlement lag for the equity.
 - c. If no ISD is provided the calculated date is used.
 - d. If an ISD is provided on an OTC trade where standard ISD lags are not mandated then the provided ISD will be used. This ISD must be later than the day the trade is received by LCH.
 - e. If an ISD is provided where standard ISD lags are mandated the value is validated against the LCH calculated value. Any mismatch will cause the trade to go pending for further investigation. The probable cause is a mistake by one party in setting up bank holidays.

05. The ISIN of the equity instrument.
06. Some equity instruments are traded on more than one reference market and settled in a different CSD in each case. These are sometimes referred to as 'dual listed ISINs'. Where an alternate market, such as an MTF, offers trading to match both reference markets a method is required to differentiate the instruments as they will have the same ISIN and often the same currency. This is the MIC (market identification code) of the reference market.
07. The quantity of the instrument traded as defined by the contract.
08. The trade price in the currency units specified, the later being an ISO currency code or an agreed minor unit currency code. Therefore for sterling, GBP (pounds) and GBp (pence) are accepted and similarly for US dollars, USD (dollars) and USc (cents) are accepted.
09. An LCH defined trade type used by EquityClear to appropriately process the trade. Trade types include:
 - f. A standard 'on book' equity trade
 - g. An off order book or post recorded equity trade
10. A contra trade is submitted as a new trade. For information purposes, the original Trade ID may be submitted on a contra trade.
11. A unique identifier of the trading party. This is generally a SWIFT BIC but can be other values. This can also represent a CCP in the case of interoperability, where one of the trading parties does not clear through LCH.
12. The legal capacity in which the dealing firm has executed the trade, either as agent, matched principal or principal. **Where the dealing firm represents a CCP this field must be set to principal.**
13. This is intended to be a reference entered by the dealing party on their order or trade side to be used by them or their clearer for post trade processing.
14. A clearing member can segregate their business between House and Client clearing accounts. The account can be specified directly on the trade. If not supplied the value will be derived by LCH from pre-defined static data.
15. This is intended to be account information entered by the dealing party on their order or trade side, to be used by them or their clear for post trade processing.

3.2 Trade Cancellation

Where a trade source sends a trade with details which do not reflect the true contractual nature of the trade the trade source must send LCH either a cancellation of the errant trade or a contra.

Where a trade is made between two parties and sent through for clearing and one party subsequently requests a trade cancellation via the trade source, say for a 'fat-finger' problem, and their counterparty agrees, then the trade source must send through a contra trade for clearing and not a cancellation.

3.3 Trade Acknowledgements

A trade source can request to be set up in EquityClear to receive an acknowledgement message for each trade accepted for clearing.

A trade source can request to be set up in EquityClear to receive a message for each trade which has gone pending and has not yet been accepted or rejected for clearing.

A rejection message will always be sent when a trade is not accepted for clearing.

A reason will be provided on pending and rejection messages as a comprehensible description and not a code. Reasons for a trade failing validation include, but are not limited to, the following:

01. Incorrect trading capacity;
02. No clearing relationship for the trading participant;
03. ISIN not an Eligible CCP security for the trade source;
04. Invalid trade type;
05. The currency on the trade is not a currency cleared.

The basis of operation at LCH is that formally rejecting a trade is only done when the trade cannot be accepted for clearing and hence should be extremely rare. Trades are put to pending where they fail validation and Business Operations monitor for these and work to resolve the issue both internally and in conjunction with interested parties with the objective of accepting the trade where possible. The issues must be resolved on trade date for the trade to be accepted.

Where a trade message is received for a trade that has already been processed the new message is discarded and no acknowledgements will be sent.

The above describes the process for the business processing of valid FIX messages. Where technical problems prevent the proper business processing of a trade message an alternative exception process will be implemented and followed.

3.4 Trade Feed Reconciliation

To allow LCH to reconcile its outstanding trading obligations, the trade source must notify³ LCH of the number of trades submitted for clearing, broken down by:

01. New trades (including contras).
02. Cancellations (trade source errors).
03. LCH rejections (as returned by LCH).

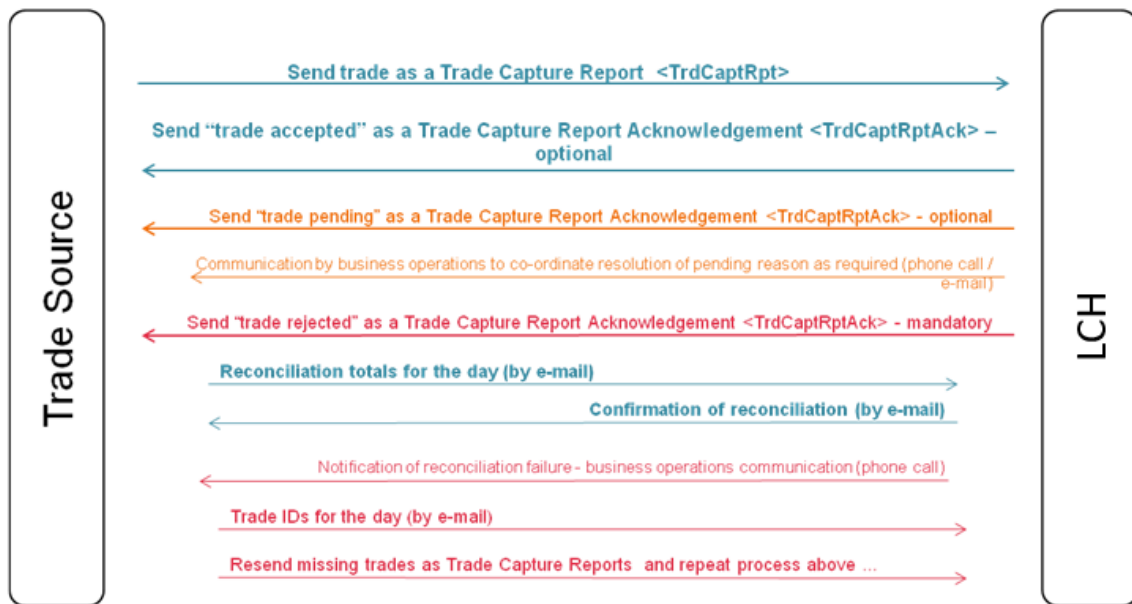
If the figures reconcile, as will normally be the case, a quick confirmation⁴ will be sent back to the trade source.

If there is a mismatch, LCH Business Operations will contact the trade source operations team to coordinate the investigation and resolution of the problem. The objective is to complete this on trade day. Details will be agreed in bilateral operational procedures.

³ Via an agreed interface.

⁴ Using the same interface method as for the incoming information.

3.5 Session, Message and Operational Information Flow



4 FIX 4.4 Message Specification

FIX 4.4 messages are supported for the interface between the trade source system and EquityClear. The specification of these messages is detailed in this section. The data items in these messages correspond to the business data previously specified in this document.

No start-of-day or end-of-day messages are required

4.1 Trade Capture Report (AE)

This message type is used by the trade source to send trade details to LCH for clearing.

Tag or Component	Field Name	Required	Data Type	Content	Business Data Item
StandardHeader		M			
8	BeginString	M	String	'FIX.4.4'	
9	BodyLength	M	Length (int)		
35	MsgType	M	String	'AE'	
49	SenderCompID	M	String	'XXXX_LCH'	
56	TargetCompID	M	String	'LCH_ECL_XXXX'	
34	MsgSeqNum	M	SeqNum (int)		
50	SenderSubID	M	String	'CERT' or 'PROD'	
57	TargetSubID	M	String	'ECL_XXXX'	
52	SendingTime	M	UTCTimestamp (String - YYYYMMDD- HH:MM:SS)		
End StandardHeader		M			
571	TradeReportID	M	String	Maximum 16 characters	
487	TradeReportTransType	M	int	0, 1 or 4	I
828	TrdType	M	int	0 or 1	I
17	ExecID	M	String	Maximum 16 characters	B
527	SecondaryExecID	C	String	Maximum 16 characters	J

Tag or Component	Field Name	Required	Data Type	Content	Business Data Item
570	PreviouslyReported	M	Boolean	'N'	
Instrument		M			
55	Symbol	M	String	ISIN. Maximum 20 characters	E
207	SecurityExchange	O	String	MIC. Maximum 4 characters	F
End Instrument		M			
32	LastQty	M	Qty (float)		G
31	LastPX	M	Price (float)		H
30	LastMkt	M	String	Maximum 30 characters	A
75	TradeDate	M	LocalMktDate		C
60	TransactTime	M	UTCTimestamp (String - YYYYMMDD- HH:MM:SS)		C
64	SettlDate	O	LocalMktDate	Intended settlement date of the cash equity delivery.	D
TrdCapRptSideGrp		M			
552	NoSides	M	Int	2	
Buy Side					
54	Side	M	Char	1	
37	OrderId	M	String		
11	ClOrdId	O	String	Maximum 35 characters	M
Parties		M			
453	NoPartyIDs	M	Int	1	
448	PartyID	M	String	Maximum 34 characters	K

Tag or Component	Field Name	Required	Data Type	Content	Business Data Item
447	PartyIDSource	M	Char	'B' or 'D'	
452	PartyRole	M	Int	1	
End Parties		M			
1	Account	O	Sting	Maximum 35 characters	S
581	AccountType	O	Int	1 or 3	N
15	Currency	M	Currency		G
528	OrderCapacity	M	Char	'A', 'R' or 'P'	L
End Buy Side					
Sell Side					
54	Side	M	Int	2	
37	OrderId	M	String		
11	ClOrdId	O	String	Maximum 35 characters	Q
Parties		M			
453	NoPartyIDs	M	Int	1	
448	PartyID	M	String	Maximum 34 characters	O
447	PartyIDSource	M	Char	'B' or 'D'	
452	PartyRole	M	Int	1	
End Parties		M			
1	Account	O	String	Maximum 35 characters	S
581	AccountType	O	Int	1 or 3	R
15	Currency	M	Currency		G
528	OrderCapacity	M	Char	'A', 'R' or 'P'	P

Tag or Component	Field Name	Required	Data Type	Content	Business Data Item
End Sell Side					
	End TrdCapRptSideGrp	M			
	StandardTrailer	M			
10	Checksum	M	String		
End StandardTrailer		M			

4.1.1 Component and Tag Notes

The 'Required' codes used in the table above are as follows:

M (bold)	FIX mandatory
M	LCH mandatory
C	conditional (see additional notes)
O	optional

Tag	Field Name	Required	Notes
49	SenderCompID	M	'XXXX' is the trade source identifier in Tag 30 LastMkt. This is usually the four character MIC (market identification code) of the trade source but may be longer. The SenderCompID value of XXXX_LCH is a suggested value and a change may be agreed with the trade source.
56	TargetCompID	M	
57	TargetSubID	M	
50	SenderSubID	O	CERT – test system/data PROD – production system/data
571	TradeReportID	M	Unique message reference. As a minimum this must be unique for the trade date.
487	TradeReportTransType	M	0 – New trade 1 – Trade cancellation 4 – Contra trade (reversal)
828	TrdType	M	0 – Regular trade 1 – Limit checking required – generally used for OTC trades. Please check with LCH if this value needs to be used. (Not FIX standard).

Tag	Field Name	Required	Notes
17	ExecID	M	Unique trade reference for the matched trade. Except for cancellations this must be unique for the trade date.
527	SecondaryExecID	C	Where this trade message is a contra or a cancellation, this is the Trade ID (Tag 17 ExecID) of the original trade.
570	PreviouslyReported	M	Not used by EquityClear.
207	SecurityExchange	O	Reference market MIC
31	LastPx	M	Value in the currency units specified in Tag 15 Currency.
15	Currency	M	The FIX standard is for ISO currency only. However, specified codes for minor currency units are accepted.
75	TradeDate	M	The reference date used for corporate action processing.
60	TransactTime	M	Using UTC/GMT as per FIX standard.
37	OrderID	M	Not used by EquityClear but mandatory in FIX standard. Any value can be supplied, e.g. 'N' or Trade ID (Tag 17 ExecID).
11	ClOrdID	O	Maximum 35 characters
447	PartyIDSource	M	B – BIC code D – Proprietary code
452	PartyRole	M	1 – Executing Firm
1	Account	O	Account information
581	AccountType	O	1 – Client 3 – House
528	OrderCapacity	M	The dealing capacity of the party identified by the PartyID. Therefore where this is a CCP the value must be 'P' even if the PartyID on the original execution which is being cleared by the identified CCP is acting as agent. A – Agent R – Matched Principal P – Principal

4.2 Trade Capture Report Acknowledgement (AR)

This message type is used by LCH to report back to the trade source trade acknowledgements, rejections and pending notifications.

Tag or Component	Field Name	Required	Data Type	Content	Business Data Item
StandardHeader		M			
8	BeginString	M	String	'FIX.4.4'	
9	BodyLength	M	Length (int)		
35	MsgType	M	String	'AR'	
49	SenderCompID	M	String	'LCH_ECL_XXXX'	
56	TargetCompID	M	String	'XXXX_LCH'	
34	MsgSeqNum	M	SeqNum (int)		
50	SenderSubID	M	String	'ECL_XXXX'	
57	TargetSubID	M	String	'CERT' or 'PROD'	
52	SendingTime	M	UTCTimestamp (String - YYYYMMDD- HH:MM:SS)		
End StandardHeader		M			
571	TradeReportID	M	String		
150	ExecType	M	Char	'F' or 'H'	
939	TrdRptStatus	M	int	0 or 1	
17	ExecID	M	String		
Instrument		M			
460	Product	M	Int	5	
End Instrument		M			
58	Text	M	String		

Tag or Component	Field Name	Required	Data Type	Content	Business Data Item
StandardTrailer		M			
10	Checksum	M	String		
End StandardTrailer		M			

4.2.1 Component and Tag Notes

The 'Required' codes used in the table above are as follows:

M (bold)	FIX mandatory
M	LCH mandatory

Tag	Field Name	Required	Notes
49	SenderCompID	M	'XXXX' is the trade source identifier in Tag 30 LastMkt. This is usually the four character MIC (market identification code) of the trade source but may be longer.
56	TargetCompID	M	
50	SenderSubID	M	
			The TargetCompID value of XXXX_LCH is a suggested value and a change may be agreed with the trade source.
57	TargetSubID	M	CERT – test system/data PROD – production system/data
571	TradeReportID	M	Trade source inbound message reference.
150	ExecType	M	'F' – Trade 'H' – TradeCancel
939	TrdRptStatus	M	0 – Accepted or Pending 1 – Rejected
17	ExecID	M	Trade source trade reference.
460	Product	M	5 – Equity
58	Text	M	Set to 'ACK' if a trade has been accepted. Set to 'OK' if a trade cancellation has been accepted. Set to a meaningful description of the reason for the trade going pending or being rejected, or a trade cancellation being rejected.

5 FIX Session Protocol

An adapted subset of the FIX 4.4 protocol is used for sending and receiving messages. It is assumed that the reader is familiar with the FIX 4.2 protocol as described at <https://www.fixtrading.org/standards/>.

All FIX timestamps are UTC as per the FIX standard. The Trade Source is expected to synchronise their clocks with an external time source.

The Trade Source and LCH will agree upon the following FIX credentials: *SenderCompID*, *TargetCompID*, *SenderSubID* and *TargetSubID*. These must be sent on every message. All messages LCH sends will have the Sender and Target fields swapped, as per the FIX specification.

The FIX Session Initiator is typically the Trade Source and the Session Acceptor is typically LCH.

The following session messages are supported in both directions.

Message	Type	Comment
Logon	A	Begin session (or resume a broken session)
Heartbeat	0	
Test Request	1	
Resend Request	2	
Reject	3	Malformed message or improper session level handling
Sequence Reset	4	Both Gap Fill (<i>GapFillFlag=Y</i>) and Reset
Logout	5	Used to gracefully close session

5.1 Connectivity

IP connectivity will be arranged with the extranet provider (e.g. BT Radianz).

IP Address	Address to connect to	Supplied by LCH
TCP Port	Port to connect to	Supplied by LCH

5.2 Sequence Numbers

Sequence numbers, both inbound and outbound, will be reset to 1 each night during the down time.

Messages are processed in sequence order. Behind sequence messages (other than Sequence Reset – Reset) cause immediate logout. Ahead of sequence messages (other than a Resend Request) trigger a message recovery via a Resend Request.

5.3 Logon

The Logon will be the exchange of the first messages initiated by the Session Initiator after the TCP connection is established. The *EncryptMethod* should be ignored (FIX level encryption is not supported). *HeartBtInt* must be specified by the Session Initiator in the logon message. This value will be 30 seconds and returned in the logon reply message.

If connection is unexpectedly broken, upon reconnection LCH may receive a logon request with a sequence number lower than expected. This means that one side has reset their sequence numbers without notifying the other party. In this case both sides should restart application with sequence number set to 1. If one side of the session receives a sequence number higher than expected, the other party will issue a Resend Request to retrieve the missed messages. The Resend Request is preferred to using *ResetSeqNumFlag* attribute of the Logon message.

Also, if the connection is broken any messages (like trade status/confirmation) generated by LCH will be persistently queued, waiting for the Session Initiator to reconnect.

5.4 Heartbeat

A Heartbeat message should be sent if the agreed upon *HeartBtInt* has elapsed since the last message sent. If any message has been sent during the preceding *HeartBtInt* a Heartbeat message need not be sent.

5.5 Test Request

If a *HeartBtInt* + 1 second have elapsed since the last message received, a Test Request should be issued. If another *HeartBtInt* + 1 second go by without receiving a message the TCP connection should be dropped. This ensures that a broken TCP connection will be detected even if the TCP stack doesn't notice (this has been observed to happen in WAN environments, particularly when a VPN is involved).

5.6 Resend Request

The Resend Request is sent by the receiving application to initiate the retransmission of messages. This function is utilized if a sequence number gap is detected, if the receiving application lost a message, or as a function of the initialization process.

The Resend Request can be used to request a single message, a range of messages or all messages subsequent to a particular message.

- To request a single message: *BeginSeqNo* = *EndSeqNo*
- To request a range of messages: *BeginSeqNo* = first message of range, *EndSeqNo* = last message of range
- To request all messages subsequent to a particular message: *BeginSeqNo* = first message of range, *EndSeqNo* = 0 (represents infinity)

5.7 Reject

Session level rejects are used to indicate violations of the session protocol, or missing (or bogus) fields. These are to be expected during development and certification, but should be extremely rare in production. Application layer rejects (like Order Reject and Cancel Reject) are normal.

5.8 Sequence Reset

Sequence Reset is typically performed at the end of the business day at a mutually agreed time.

Sequence Reset – Gap Fill messages (*GapFillFlag* = "Y") must be received in sequence. Any messages (including any Gap Fills) sent in response to a Resend Request should have *PossDup* = "Y".

Sequence Reset – Reset (*GapFillFlag* not "Y") is used only as a last resort, and always by human intervention, to allow an otherwise confused session to be resumed. In these cases all chance of automatic message recovery is lost.

5.9 Logout

Either side may issue a logout to gracefully close the session. The side that issues the logout should process messages normally until it sees the logout reply, and then break the TCP connection. The logout Initiator will typically only request logout after the scheduled end of the FIX session.

5.10 Error Handling

Messages which fail within the LCH FIX gateway will be rejected and a reject message sent back to the client. If a message passes beyond the FIX Gateway but it cannot be processed due to technical rather than business reasons the message will be placed in our internal error queue which will be monitored by LCH application support. The application support team will act and notify the client accordingly.

6 Network and FIX Servers Design

This will be managed specifically with each trade source. LCH technical staff will cover the following topics:

01. Network configuration

- Primary flows
- Alternate flows
- IP Address Scheme
 - FIX and FTP servers (Flow)
 - Firewall Flow Rules
 - Interconnectivity

02. Middleware

- Environments
- High Level view of the FIXEdge Cluster
- Session Connectivity
- Message Sequence numbering

03. Non Functional Tests (Disaster Recovery)

04. Security

- Data Network security

7 Document History

19 Dec 2017	First issue of new document format
29 Jul 2019	Document review. No changes required.
16 Mar 2020	Document review. No changes required.