



BATS Europe

Market On Close & Trading At Last Specification

Version 1.5

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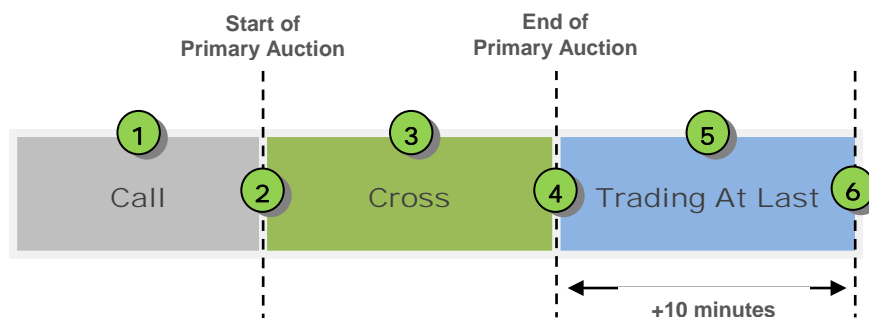
Overview

BATS Market On Close (MOC) allows participants to enter orders throughout the trading day that are not executed until the official closing price of the primary exchange is published. Following the publication of the primary exchange's closing price, participants can continue entering orders that are immediately executed at the official closing price where liquidity is available.

This document describes the BATS implementation of Market On Close and Trading At Last functionality. It is assumed that the reader is familiar with the FIX 4.2 protocol as described at <http://www.fixprotocol.org>.

In addition please see the [BATS Europe FIX Specification](#) for details on the subset of the FIX 4.2 protocol used by BATS for order entry. Further extensions to the FIX 4.2 specification for Market On Close and Trading At Last will be noted in this document.

Timeline



NOTE: The actual end time of the Market On Close period is determined by the publication of the official uncrossing price from the primary exchange. As such it will vary on a per market and per symbol basis.

Functionality

1. During Call Phase (Continuous Trading)

- Market On Close (MOC) orders only, therefore orders are un-priced.
- No restrictions on cancellation or modification
- Orders are not locked

2. Start of Primary Auction

- Orders are matched in time priority. Any quantity which matches is “locked” for actual execution once the official closing price from the primary is published. A locked quantity cannot be cancelled. Any quantity remaining on the order is called the “residual”
- After the start of the primary auction there are three possibilities for the BATS closing book:
 - residual on one side of the book (the “imbalance”)
 - a fully matched book
 - an empty book

3. During Cross Phase

- MOC orders can continue to be entered
- Residuals can be “returned” (to allow access to the primary auction or avoid entering the *Trading At Last* phase). This return can be implemented in a number of ways:
 - Initiated by the participant with an Order Cancel Request
 - Scheduled using an *ExpireTime (126)* on the original order
 - Specified using a *TimeInForce (59)* of 8 (Good Through Crossing)¹ on the original order
- New orders on the imbalance side of the book add to the imbalance

¹ A TimeInForce (59) value of 8 (Good Through Crossing) is not part of the original FIX 4.2 specification, it was introduced in FIX 5.0SP1

- New orders on the opposite side of the imbalance offset the imbalance and are immediately locked
- An order on the opposite side of the imbalance which is larger than the imbalance will flip the imbalance to the other side of the book and lock the previous imbalance

4. End of Primary Auction

- When the primary publishes the official closing price fills are sent for the locked quantity at the official closing price.
- Residuals on the imbalance side of the book will be moved automatically into the *Trading At Last* phase unless cancelled by the participant via an explicit Order Cancel Request or *ExpireTime* (126), or the *TimeInForce* (59) is 8 (Good Through Crossing)¹.

5. Trading At Last

- Market, Limit, MOC and Limit On Close (LOC) orders accepted
- The book, if any, is one-sided and consists entirely of imbalance
- Residuals can be cancelled
- New orders on the imbalance side add to the imbalance
- New orders on the opposite side of the imbalance offset the imbalance and are immediately executed at the official closing price
- An order on the opposite side of the imbalance which is larger than the imbalance will flip the imbalance to the other side of the book and execute the previous imbalance

6. End of Primary Auction + 10 Minutes

- All residual is cancelled

BATS Specific Fields

The following FIX fields are specific to BATS:

Tag		Values
7770	<i>LockedQty</i>	Quantity of locked (matched) shares on the order. The difference between the <i>OrderQty</i> and the <i>LockedQty</i> represents the residual size still eligible for matching.
9479	<i>DisplayIndicator</i>	Optional tag that can be used during the TAL phase to hide orders. MOC orders are always implicitly hidden. X = Displayed Order (default for TAL) I = Invisible (default for MOC)

Order Protocol for Market On Close

Order Entry

Market On Close orders are entered as standard New Order – Single messages with the following restrictions:

- **must** set *OrdType* (40) to 5 (market on close) **or** *OrdType* (40) to 1 (market) and *ExecInst* (18) to c
- **must** set *TimeInForce* (59) to either 0 (Day) or 1 (Good Till Cancel) or 3 (Immediate Or Cancel) or 6 (Good Till Date) or 8 (Good Through Crossing)
- *Price* (44) must **not** be set
- *may optionally* set *ExpireTime* (126) to force publication of an Order Restatement at the specified time. Valid when *TimeInForce* (59) is 6 (Good Till Date)

Orders are implicitly hidden but do not need to be Large In Scale (LIS). MOC orders only interact with other MOC orders. Quotes are not represented on any BATS market data feed. Matches are represented as trades on the BATS' market data feeds.

Orders may be submitted until the official closing price is published by the primary exchange however orders with a *TimeInForce* (59) of 3 (Immediate Or Cancel) can only be submitted during the *Cross* period.

Orders are matched in time priority at the **official closing price only**.

A single order may receive multiple fills dependant on the number of orders matched against it.

Due to the random end of the *Cross* period it is strongly suggested that those participants not wishing to take part in the *Trading At Last* phase should set the *TimeInForce* (59) on their order to 8 (Good Through Crossing).

Order Cancellation (Returning Residuals)

An Order Cancel Request can be sent at any time during the *Call* phase. The standard FIX protocol applies.

During the *Cross* phase an Order Cancel Request can be used to return the unmatched residual back to the client allowing access to the primary auction.

In FIX, an Order Cancel Request sent during the *Cross* phase has two possible outcomes:

1. A locked order will receive an Order Restatement specifying the locked quantity followed by an Order Cancel Reject with a *CxlRejectReason* (102) = 0 (Too late to cancel)
2. An unmatched order will be cancelled

An alternative, which automates the above process, is to explicitly set the *ExpireTime* (126) on the New Order Single message.

Order Cancel / Replace (a.k.a. Order Modification)

Only the *OrderQty* (38) field can be changed in an order cancel/replace request.

An Order Cancel / Replace can be sent at any time during the *Call* phase. The standard FIX protocol applies.

During the *Cross* phase an Order Cancel / Replace to modify the order quantity has three possible outcomes:

1. An increase is allowed. Any locked quantity will be transferred to the new order but the residual will lose time priority
2. A decrease above or equal to the locked quantity is allowed and the order will be modified in place, any residual will lose time priority
3. A decrease below the locked quantity will force an Order Restatement specifying the locked quantity followed by an Order Cancel Reject with a *CxlRejectReason* (102) = 0 (Too late to cancel)

Order Restatement

An Order Restatement is a standard Execution Report (*MsgType=8*) with the following fields set:

- *ExecType* (150) is D (Restated)
- *OrderQty* (38) is the number of shares for the order. May be less than the original order quantity if this restatement has been sent in response to an order expiry or cancellation/modification request.
- *LockedQty* (7770) is the orders locked (matched) quantity. The difference between the *OrderQty* and the *LockedQty* represents the residual size still eligible for matching.
- *ExecRestatementReason* (378) is 5 (Partial decline of OrderQty)
- *Text* (58) is "A: locked N shares", where N is the locked quantity

It is used by BATS to communicate the matched quantity on a Market On Close order in response to a lock adjustment, cancellation/modification request or order expiry. It is a guarantee of a fill in the future at the given size but at an as yet unknown price.

Uncrossing

Once the primary's uncrossing price is known fills are sent as standard Execution Report's for the locked quantity at the official closing price.

Order Protocol for Trading At Last

Order Entry

Trading At Last (TAL) orders are entered as standard New Order – Single messages with the following restrictions:

- **must** set *OrdType* (40) to 1 (market) or 2 (limit) or 5 (market on close) or B (limit on close)
- **must** set *TimeInForce* (59) to either 0 (Day) or 1 (Good Till Cancel) or 3 (Immediate Or Cancel) or 6 (Good Till Date) or 8 (Good Through Crossing)
- *may optionally* set *Price* (44). Valid when *OrdType* (40) is B (limit on close) or 2 (limit)
- *may optionally* set *ExpireTime* (126). Valid when *TimeInForce* (59) is 6 (Good Till Date)
- *may optionally* set *DisplayIndicator* (9479) = I (Invisible) to hide the order

By default TAL orders **will** be represented on the BATS market data feed unless the order has been explicitly hidden using *DisplayIndicator* (9479) = I (Invisible). Hidden orders do not need to be Large In Scale (LIS). The book, if any, is one-sided and consists entirely of imbalance.

Orders are matched in time priority at the **official closing price only**. The *Price* (44) field can be used to provide price protection however limit buys below and sells above the official close will be rejected immediately without resting on the book.

A single order may receive multiple fills dependant on the number of orders matched against it.

After the *Cross* phase residuals on the imbalance side of the book will be moved automatically into the *Trading At Last* phase (as hidden orders) unless cancelled by the participant via an explicit Order Cancel Request or *ExpireTime* (126), or the *TimeInForce* (59) is 8 (Good Through Crossing).

Order Cancellation

An order cancellation can be sent at any time during the *Trading At Last* period. The standard FIX protocol applies.

Order Cancel / Replace

An order cancel / replace can be sent at any time during the *Trading At Last* period. The restrictions on Order Entry still apply (see above).

Order Restatements

Order Restatements are not used during *Trading At Last*, orders can be cancelled at any time.

Order Fills

Fills are sent as standard Execution Report's as soon as they are matched. The *LastPx* will always be the official closing price.

Order Expiry

At the end of the *Trading At Last* period all unmatched residuals will be returned to the participants with an unsolicited cancel.

Support

Please e-mail questions or comments regarding this specification to tradedeskeurope@batstrading.com.

Revision History

12 June 2009:

- Initial version

17 July 2009:

- Added *ExecInst* (18) = c alternative for specifying MOC orders.
- Restatements are now also sent when cancelling or modifying a fully locked order.
- Added Immediate Or Cancel *TimeInForce* (59).

4 August 2009:

- Added custom FIX tag *LockedQty* (7770) and lock notification restatements.

18 September 2009:

- A decrease in order quantity now causes any residual to lose time priority.

16 March 2010:

- Added TAL *OrdType* (40) values of 1 (Market) and 2 (Limit). By default TAL orders are now visible unless explicitly hidden using *DisplayIndicator* (9479) = I (Invisible).

Appendix A – Order State Change Matrices

The following matrices are included to clarify the sequence of messages and the status of orders involved in Market On Close and Trading At Last:

- A1 – Fully filled Market On Close order
- A2 – Part-filled Market On Close order with early expiry
- A3a – Cancel request for a fully locked Market On Close order – order restated and cancel rejected
- A3b – Cancel request for a partially locked Market On Close order – order restated and cancel rejected
- A3c – Cancel request for an unmatched Market On Close order – order cancelled
- A4 – Cancel request for a partially locked order – order is restated and cancel rejected. Followed by a cancel / replace request to increase the quantity
- A5 – Part filled Market On Close only order
- A6 – Part filled Market On Close order, fully filled in trading at last
- A7 – Part filled trading at last order
- A8 – Non marketable trading at last LOC order

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A1 – Fully filled Market On Close order

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	LockedQty	Comment
1	New Order(X)				10000					OrdType=5 (MOC), TimeInForce=1 (Good Till Cancel)
2		Execution(X)	New	New	10000	0	10000	0		
3		Execution(X)	Restated	New	10000	0	10000	0	2000	Lock notification of 2000. Sent at the start of the <i>Cross</i> period. Guarantees a fill of 2000 shares at an as yet unknown price. The residual of 8000 is still eligible for further matching.
4		Execution(X)	Restated	New	10000	0	10000	0	3000	Lock notification update, increase of 1000. The residual of 7000 is still eligible for further matching.
5		Execution(X)	Restated	New	10000	0	10000	0	10000	Order for 7000 entered on the other side. Lock update notification, increase of 7000. Sent after the start of the <i>Cross</i> period. Order is now fully locked with no residual.
6		Execution(X)	Partial Fill	Partially Filled	10000	2000	8000	2000		Execution of 2000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary.
7		Execution(X)	Partial Fill	Partially Filled	10000	3000	7000	1000		Execution of 1000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary.
8		Execution(X)	Fill	Filled	10000	10000	0	7000		Execution of 7000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary.

A2 – Part-filled Market On Close order with early expiry time

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	LockedQty	Comment
1	New Order(X)				10000					OrdType=5 (MOC), TimeInForce=6 (GTD) , ExpireTime=16:33
2		Execution(X)	New	New	10000	0	10000	0		
3		Execution(X)	Restated	New	10000	0	10000	0	9000	Lock notification of 9000. Sent at the start of the <i>Cross</i> period. Guarantees a fill of 9000 shares at an as yet unknown price. The residual of 1000 is still eligible for further matching.
4		Execution(X)	Restated	New	9000	0	9000	0	9000	Sent at 16:33, ExecRestatementReason="Partial Decline of OrderQty", Text="A: locked 9000 shares". Order is now fully locked with no residual.
5		Execution(X)	Fill	Filled	9000	9000	0	9000		Execution of 9000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary.

A3a – Cancel request for a fully locked Market On Close order – order restated and cancel rejected

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	LockedQty	Comment
1	New Order(X)				10000					OrdType=5 (MOC), TimeInForce=0 (Day)
2		Execution(X)	New	New	10000	0	10000	0		
3		Execution(X)	Restated	New	10000	0	10000	0	10000	Lock notification of 10000. Sent at the start of the <i>Cross</i> period. Guarantees a fill of 10000 shares at an as yet unknown price. Order is now fully locked with no residual.
4	Cancel Request (Y,X)				10000					Sent during <i>Cross</i> period
5		Execution(X)	Restated	Pending Cancel	10000	0	10000	0	10000	Text="A: locked 10000 shares".
6		Cancel Reject(Y,X)		Replaced						Order is fully locked, cancellation is not allowed. CxlRejectReason=0 (too late to cancel). Text="J: locked in cross".
7		Execution(X)	Fill	Filled	10000	10000	0	10000		Execution of 10000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary.

A3b – Cancel request for a partially locked Market On Close order – order restated and cancel rejected

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	LockedQty	Comment
1	New Order(X)				10000					OrdType=5 (MOC), TimeInForce=0 (Day)
2		Execution(X)	New	New	10000	0	10000	0		
3		Execution(X)	Restated	New	10000	0	10000	0	8000	Lock notification of 8000. Sent at the start of the <i>Cross</i> period. Guarantees a fill of 8000 shares at an as yet unknown price. The residual of 2000 is still eligible for further matching.
4	Cancel Request (Y,X)				10000					Sent during <i>Cross</i> period
5		Execution(X)	Restated	Pending Cancel	8000	0	8000	0	8000	ExecRestatementReason="Partial Decline of OrderQty", Text="A: locked 8000 shares". Order is now fully locked with no residual.
6		Cancel Reject(Y,X)		Replaced						Order is locked, cancellation is not allowed. CxlRejectReason=0 (too late to cancel). Text="J: locked in cross".
7		Execution(X)	Fill	Filled	8000	8000	0	8000		Execution of 8000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary.

A3c – Cancel request for an unmatched Market On Close order – order cancelled

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	LockedQty	Comment
1	New Order(X)				10000					OrdType=5 (MOC), TimeInForce=0 (Day)
2		Execution(X)	New	New	10000	0	10000	0		
3	Cancel Request (Y,X)				10000					Sent during Cross period
4		Execution(X)	Cancelled	Cancelled	10000	0	0	0		Order is unmatched and not locked, cancellation is allowed

A4 – Cancel request for a partially locked order – order is restated and cancel rejected. Followed by a cancel / replace request to increase the quantity

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	LockedQty	Comment
1	New Order(X)				10000					OrdType=5 (MOC), TimeInForce=0 (Day)
2		Execution(X)	New	New	10000	0	10000	0		
3		Execution(X)	Restated	New	10000	0	10000	0	6000	Lock notification of 6000. Sent at the start of the Cross period. Guarantees a fill of 6000 shares at an as yet unknown price. The residual of 4000 is still eligible for further matching.
4	Cancel Request (Y,X)				10000					Sent during Cross period
5		Execution(X)	Restated	Pending Cancel	6000	0	6000	0	6000	ExecRestatementReason="Partial Decline of OrderQty", Text="A: locked 6000 shares". Order is now fully locked with no residual.
6		Cancel Reject(Y,X)		Replaced						Order is locked, cancellation is not allowed. CxlRejectReason=0 (too late to cancel). Text="J: locked in cross".
7	Replace Request (Z,X)				8000					Sent during Cross period. Request to increase quantity to 8000 is allowed.
8		Execution(Z)	Replace	Replaced	8000	0	8000	0	6000	Guaranteed locked quantity of 6000 is transferred to this order. Residual of 2000 now available for further crossing but time priority is lost.
9		Execution(Z)	Restated	Replaced	8000	0	8000	0	7000	Order for 1000 entered on the other side. Lock update notification, increase of 1000. Residual is now 1000.
10		Execution(Z)	Partial Fill	Partially Filled	8000	6000	2000	6000		Execution of 6000. Sent at the end of the Cross period, LastPx is the official closing price of the primary.
11		Execution(Z)	Partial Fill	Partially Filled	8000	7000	1000	1000		Execution of 1000. Sent at the end of the Cross period, LastPx is the official closing price of the primary. Residual of 1000 moves into Trading At Last period.

A5 – Part filled Market On Close only order

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	LockedQty	Comment
1	New Order(X)				10000					OrdType=5 (MOC), TimeInForce=8 (Good Through Crossing)
2		Execution(X)	New	New	10000	0	10000	0		
3		Execution(X)	Restated	New	10000	0	10000	0	2000	Lock notification of 2000. Sent at the start of the <i>Cross</i> period. Guarantees a fill of 2000 shares at an as yet unknown price. The residual of 8000 is still eligible for further matching.
4		Execution(X)	Restated	New	10000	0	10000	0	3000	Lock notification update, increase of 1000. The residual of 7000 is still eligible for further matching.
5		Execution(X)	Partial Fill	Partially Filled	10000	2000	8000	2000		Execution of 2000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary.
6		Execution(X)	Partial Fill	Partially Filled	10000	3000	7000	1000		Execution of 1000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary.
7		Execution(X)	Cancelled	Cancelled	10000	3000	0	0		Unsolicited cancellation sent at the end of the <i>Cross</i> period. Text="X: Expired".

A6 – Part filled Market On Close order, fully filled in trading at last

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	LockedQty	Comment
1	New Order(X)				10000					OrdType=5 (MOC), TimeInForce=1 (Good Till Cancel)
2		Execution(X)	New	New	10000	0	10000	0		
3		Execution(X)	Restated	New	10000	0	10000	0	3000	Lock notification of 3000. Sent at the start of the <i>Cross</i> period. Guarantees a fill of 3000 shares at an as yet unknown price. The residual of 7000 is still eligible for further matching.
4		Execution(X)	Partial Fill	Partially Filled	10000	3000	7000	3000		Execution of 3000. Sent at the end of the <i>Cross</i> period, LastPx is the official closing price of the primary. The residual of 7000 is automatically rolled into <i>Trading At Last</i> .
5		Execution(X)	Partial Fill	Partially Filled	10000	6000	4000	3000		Execution of 3000 in trading at last. LastPx is the official closing price of the primary.
6		Execution(X)	Fill	Filled	10000	10000	0	4000		Execution of 4000 in trading at last. LastPx is the official closing price of the primary.

A7 – Part filled trading at last order

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	Comment
1	New Order(X)				10000				OrdType=5 (MOC), TimeInForce=1 (Good Till Cancel) , sent during <i>Trading At Last</i>
2		Execution(X)	New	New	10000	0	10000	0	
3		Execution(X)	Partial Fill	Partially Filled	10000	2000	8000	2000	Execution of 2000 in trading at last. LastPx is the official closing price of the primary.
4		Execution(X)	Cancelled	Cancelled	10000	2000	0	0	Unsolicited cancellation sent at the end of the <i>Trading At Last</i> period. Text="X: Expired".

A8 – Non marketable trading at last LOC order

Time	Message Recv	Message Sent	ExecType	OrdStatus	OrderQty	CumQty	LeavesQty	LastShares	Comment
1	New Order(X)				10000				OrdType=B (LOC), TimeInForce=1 (Good Till Cancel), Price outside the official closing price of the primary, sent during <i>Trading At Last</i>
2		Execution(X)	New	New	10000	0	10000	0	
3		Execution(X)	Rejected	Rejected	10000	0	0	0	Rejection, price is outside the official closing price. Text="A: Price is greater than official close"