



TQD200 · TECHNICAL SPECIFICATION

# Turquoise Derivatives FIX 4.2 Business Design Guide

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# Introduction

## 1.1 Purpose

The purpose of this publication is to provide participants with the knowledge and technical details necessary for accessing and using the Turquoise derivatives trading system.

This FIX Business Design Guide provides essential information for participants and independent software vendors in the functional design of their application in order to interface with the Turquoise derivatives platform using the Financial Information eXchange (FIX) Protocol. This document is designed to supplement the FIX protocol documentation that can be found at [www.fixprotocol.org](http://www.fixprotocol.org) rather than be a complete and self-sufficient reference.

The Turquoise derivatives platform utilises FIX 4.2 with a few exceptions as noted in the FIX technical specification.

The FIX interface to Turquoise derivatives does not provide functions related to Market Making. Participants who intend to be Market Makers must use the native SOLA Access Information Language (SAIL) protocol.

## 1.2 Readership

The target audience for this publication is the business or Information Technology level of an organisation interested in the functional design of the Turquoise derivatives platform.

## 1.3 Revision History

This document has been through the following iterations:

Issue	Date	Description
1.0	21 December 2010	Publication of initial version

## 2 Service Description

### 2.1 Description of trading phases

The trading phases are described in the following sections.

#### 2.1.1 Consultation Start

This phase is reserved for Turquoise to perform actions on instruments for the forthcoming trading day (e.g., reserve instruments). No order entries coming from participants or Turquoise can be accepted during this phase. However, Turquoise can perform order deletions for a specific instrument or global deletions of a specific participant's orders.

#### 2.1.2 Order Cancellation

This phase allows Participants to cancel orders.

#### 2.1.3 Pre-opening

This phase allows participants to enter, modify, and cancel orders. Orders introduced during this period contribute to the calculation of the Calculated Theoretical Opening (“CTO”) but are not traded.

#### 2.1.4 Opening

At the scheduled Opening time, the random opening period begins and the instrument opening process can occur at any time between the beginning and the end of the random period. The random period duration is configured by Turquoise. During the opening process orders are matched and trades are generated at the last calculated CTO. An optimization algorithm maximizes the number of trades and reduces the remaining imbalance. FIFO (time priority at each price) is used to allocate the trades at the CTO.

#### 2.1.5 Trading Session (Continuous Trading)

This is the main trading period, whereby orders and quotes may be entered, deleted and modified with execution enabled. The switch to the Trading Session phase marks the end of the opening processes and is triggered as soon as the Order Cancellation phase ends.

#### 2.1.6 Closing

At the scheduled Closing time, the random closing period begins and the instrument closing process can occur at any time between the beginning and the end of the random period. The random period duration is configured by Turquoise. During the closing process orders are matched and trades are generated at the last CTO. An optimization algorithm maximizes the number of trades and reduces the remaining imbalance. FIFO (time priority at each price) is used to allocate the trades at the CTO.

#### 2.1.7 Exchange Intervention

This is a period during which Turquoise can perform all the modifications necessary to regulate the market and correct errors (deletion of orders for a specific instrument, cancellation of trades, etc.). During this period, neither participants nor Turquoise can place orders. Participants may receive messages during this phase, e.g., Group or Instrument State change notices.

### **2.1.8 Consultation End**

This phase is reserved for Turquoise for the purposes of consulting with the market. During this period, neither participants nor Turquoise can place orders. Participants will not receive any messages during this phase.

### **2.1.9 Mini Batch**

This is a phase during which a group switches to next trading day. Orders whose validity date has expired are deleted and statistics for the instruments are reset (high, low, volume). Participants cannot enter orders on any instrument during this phase. Notifications of expired orders are sent to participants, though participants are not typically connected during this phase. Such messages would be available upon next connection.

### **2.1.10 Post-session**

This is a weekly session during which various off-line processing takes place - including all maintenance processing. Participants cannot enter any orders on any instrument during this phase. As in the maintenance phase, messages to participants may be created during this phase. However, they would typically be available upon next connection.

## **2.2 Instrument Groups**

An instrument group is a set of investment instruments or financial instruments governed by the same trading rules.

An instrument is identified by its Group ID plus its Instrument ID. An Instrument ID is unique within its instrument group.

## **2.3 Behaviour of an Instrument Independently of its Group**

The normal behaviour of an instrument is to follow the rules of its group according to the group status. This section describes certain cases where the instrument behaves independently of its group.

### **2.3.1 Reservation, Opening of an Instrument**

An instrument may be reserved by Turquoise if deemed necessary. Reservation, triggered manually or automatically at the opening, is aimed at controlling the market by limiting the gap between prices.

The impact which the reservation has on the processing of orders related to that instrument varies according to the phase in which the group is situated.

#### **2.3.1.1 Order Cancellation**

If necessary, Turquoise can prevent an instrument from trading when the market opens. Turquoise can then reauthorize the instrument and the rules governing the instrument's group are reapplied.

#### **2.3.1.2 Trading Session**

If necessary, Turquoise can reserve an instrument. The instrument is then set apart from the group and its trading rules. Orders entered are processed as during Order Cancellation Phase.

Turquoise can lift the reservation on an instrument by opening the instrument which will

then follow the trading rules governing its group.

## **2.4 Behaviour of a Strategy Instrument Dependent on its Legs**

A strategy instrument always follows its leg trading state. If any of its legs is placed in a reserved mode, the trading engine automatically places the strategy instrument in a non-trading mode. All orders entered for this strategy instrument will be processed in the same way as during the Order Cancellation phase.

The strategy instrument can only trade if all its leg components are in the Trading Session. The strategy instrument will then follow the different phases as described in section 2.1 above.

## 3 Connection Management

### 3.1 Establishing a FIX Session

In order to establish a FIX session, clients need to pay special attention to the following items:

- Clients are allowed to establish FIX sessions on each trading day
- The Turquoise CompID is 'LSE1'
- No encryption technique is supported
- For a Resend Request, Turquoise will always request all messages subsequent to the last received ([BeginSeqNo 7=first message of range], [EndSeqNo 16=0]). Any new messages received before the reception of the last requested message will be discarded
- Turquoise does not support 24-hour connectivity and a new session must be re-established each morning
- Turquoise allows only one participant per FIX session (or per CompID). ISVs offering a service bureau are required to have a separate CompID, and therefore a separate FIX session, for each of their clients
- For message traffic efficiency, Turquoise does not allow clients to send a Heartbeat message at intervals of less than 30 seconds. Consequently, Logon messages with a value of less than 30 seconds, and not equal to 0 (meaning no Heartbeat will be sent) in the [HeartBtInt 108] field are rejected. If a participant does not send a message within 2 Heartbeat periods, Turquoise will send a Test Request message and wait for a response from the participant. If the participant does not respond to the Test Request within the Heartbeat period, the session will be disconnected. To summarize, if a participant does not send any messages within 3 Heartbeat periods, the connection is dropped and the participant will need to reconnect.

Figure 1: Initializing a FIX Connection



Figure 2: Terminating a FIX Connection

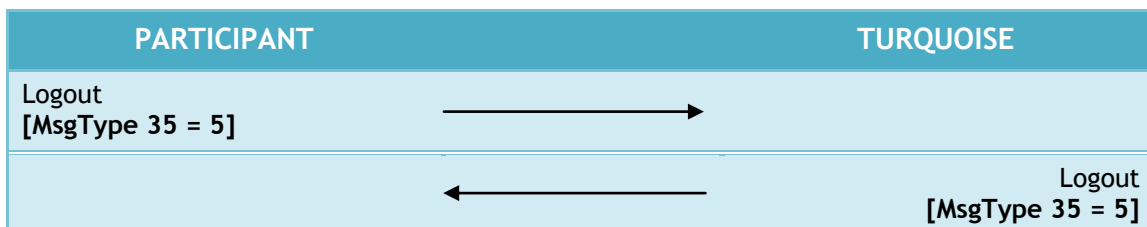


Figure 3: Sending a Heartbeat



Figure 4: Heartbeat Management

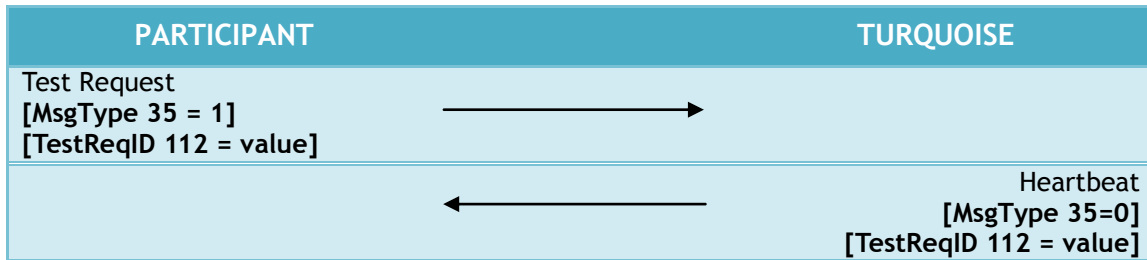


Figure 5: Sending a Resend Request

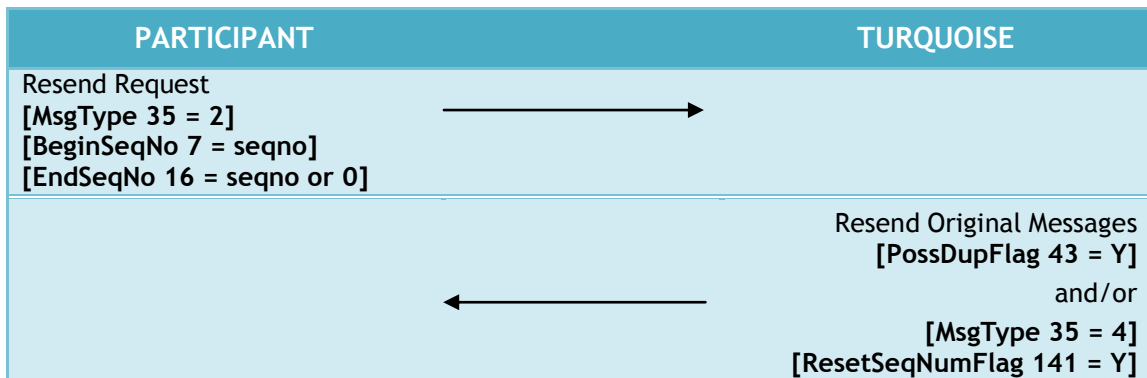


Figure 6: Sending a Sequence Reset

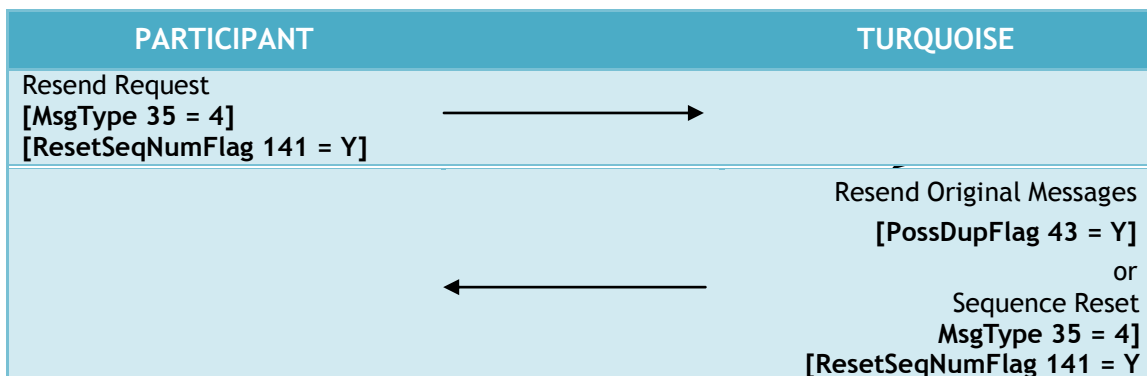
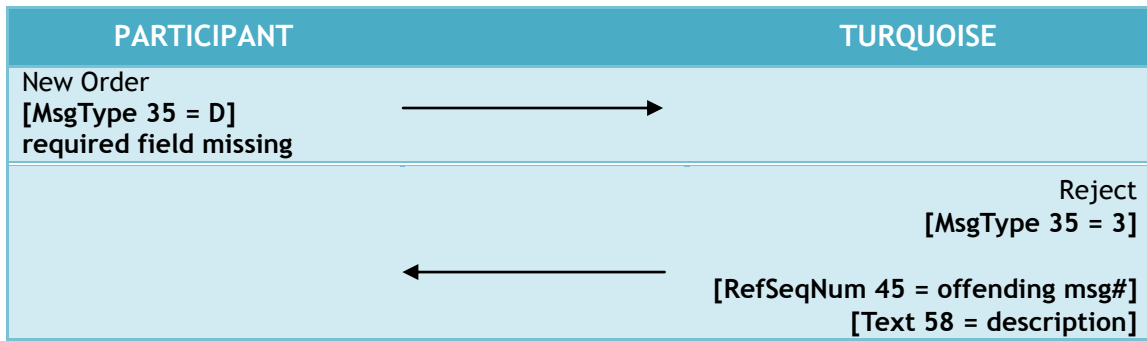


Figure 7: Receiving a Session Level Reject



### 3.2 Using a Single FIX Session to Send Orders for Multiple Traders/Users

Participants may use a single FIX session to send orders for different Traders/Users. In order to utilise this functionality the following optional tags are available on the FIX interface:

- Tag 50: SenderSubID, alphanumeric, maximum 11 characters
- Tag 57: TargetSubID, alphanumeric, maximum 11 characters

Tags 50 and 57 are commonly used as a unique value to identify a specific message originator, for example a specific trading desk or trader. For all FIX message types, Turquoise will support tag 50 SenderSubID and return back the same value in tag 57 TargetSubID. These tags will be part of the Standard Message Header.

As with the CompIDs, Turquoise will map SubIDs to TraderIDs. Values used by participants in tag 50 will need to be configured in the Turquoise participant database. All messages received with a value not configured will still be accepted but will be associated to the default TraderID configured for the CompID. Messages received without tag 50 will use the default TraderID as well (see following table). Consequently, this change is transparent for Participants who do not wish to implement and support this change.

**Note:** Participants who choose to support these new tags will need to contact Turquoise to have their new SubIDs configured.

Scenarios	Client CompID	Default TraderID linked with CompID	Client SubID	TraderID linked with SubID (new configuration)	TraderID used on Turquoise
Client SubID not provided	ABCDE	999S0F1	None	None	999S0F1
Client SubID provided but not configured on Turquoise	ABCDE	999S0F1	2-ABC	999S0Q1	999S0F1
Client SubID provided and configured on Turquoise	ABCDE	999S0F1	3-ABC	999S0Q1	999S0Q1

## 4 Order Management

### 4.1 General Processing (Buy or Sell Order)

To enter an order, a participant sends a NEW ORDER SINGLE message.

Turquoise carries out validation on the parameters of the message received. If one of these parameters is invalid, Turquoise sends back an EXECUTION REPORT - REJECT rejecting the message received and specifying the first error detected.

If validation is successful, Turquoise accepts the message received and attributes an [OrderId 37] to the order entered.

An EXECUTION REPORT message received immediately after an order entry can indicate that it has been:

- Entered on the order book (a part of the order having possibly been executed)
- Eliminated
- Executed partially or in full

If an order is either partially or fully executed, the client receives, immediately after the EXECUTION REPORT ([OrdStatus 39=0]) message, one or more EXECUTION REPORT ([OrdStatus 39=1 or 2]) messages providing more information about the trade that took place.

If the order was on a strategy instrument, the client receives an EXECUTION REPORT for the strategy instrument ([OrderStatus 39=1 or 2, MultiLegReportingType = 3]) and additional EXECUTION REPORT messages for each leg ([OrderStatus 39=1 or 2, MultiLegReportingType = 2]) providing additional information related to the price and quantity at which each of the individual legs of the strategy instrument traded.

If the order has been booked (an EXECUTION REPORT message is sent with [OrdStatus 39=0]) the participant will automatically receive at a later time one of the following messages:

- One or more EXECUTION REPORT ([OrdStatus 39=1 or 2]) messages
- In the case of a Strategy Order, several EXECUTION REPORT messages ([OrdStatus 39=1 or 2, MultiLegReportingType 442=2]) in addition to the EXECUTION REPORT on the strategy instrument ([OrdStatus 39=1 or 2, MultiLegReportingType 442=3]) are sent. Each of the leg EXECUTION REPORT can be linked to its parent strategy trade (EXECUTION REPORT on the strategy instrument) message by the Strategy Instrument Id ([SecurityAltId 10455]) and Strategy Execution Id ([SecondaryExecId 527]).
- An EXECUTION REPORT ([OrdStatus 39=4]) message if the order is eliminated

If the order entered is a STOP or IF TOUCHED order, the participant will later receive another EXECUTION REPORT message with [OrdStatus 39=0] and [OrdType 40=2] when the order is triggered and becomes a regular limit order (trigger price reached).

Figure 8: Order is rejected

PARTICIPANT	TURQUOISE
New Order [MsgType 35 = D]	
	Execution Report [MsgType 35 = 8] [ExecType 150 = 8] [OrdStatus 39 = 8] [ExecTransType 20 = 0]

Figure 9: Order is accepted and fully executed

PARTICIPANT	TURQUOISE
New Order [MsgType 35 = D]	
	Execution Report [MsgType 35 = 8] [ExecType 150 = 0] [OrdStatus 39 = 0] [ExecTransType 20 = 0]
	Execution Report [MsgType 35 = 8] [ExecType 150 = 1] [OrdStatus 39 = 1] [ExecTransType 20 = 0]
	Execution Report [MsgType 35 = 8] [ExecType 150 = 2] [OrdStatus 39 = 2] [ExecTransType 20 = 0]

Figure 10: Minimum Quantity Order is not executed when entered

PARTICIPANT	TURQUOISE
New Order [MsgType 35 = D] [MinQty 110 = 20]	
	Execution Report [MsgType 35 = 8] [ExecType 150 = 4] [OrdStatus 39 = 4] [ExecTransType 20 = 0]

Figure 11: Stop Order is triggered

PARTICIPANT	TURQUOISE
New Order [MsgType 35 = D] [StopPx 99 = 1.00]	
	Execution Report [MsgType 35 = 8] [ExecType 150 = 0] [OrdStatus 39 = 0] [ExecTransType 20 = 0] [OrdType 40 = 4]
	Execution Report <sup>1</sup> [MsgType 35 = 8] [ExecType 150 = 0] [OrdStatus 39 = 0] [ExecTransType 20 = 0] [OrdType 40 = 2]

1. When the Stop order is triggered and becomes a regular limit order.

Figure 12: New Order is sent with Possible Resend

PARTICIPANT	TURQUOISE
New Order [MsgType 35 = D] [PossResend 97 = Y]	
	Execution Report [MsgType 35 = 8] [ExecType 150 = 4] [OrdStatus 39 = 4] [ExecTransType 20 = 0]

Figure 13: Order is resent with Possible Resend

PARTICIPANT	TURQUOISE
New Order [MsgType 35 = D] [PossResend 97 = Y]	
	Execution Report [MsgType 35 = 8] [ExecType 150 = 0] [ExecTransType 20 = 0]

#### 4.1.1 Fill and Kill Order Completely Filled upon entry

A Fill and Kill order is also referred to as an Immediate or Cancel order (IOC). The participant will receive an EXECUTION REPORT ([OrdStatus 39=0]) message indicating that the order has been accepted. Then one or more EXECUTION REPORT ([OrdStatus 39=1 or 2]) messages will be sent. In each of the reports, the [LeavesQty 151] field specifies whether a part of the order remains to be traded. In the last EXECUTION REPORT, the [LeavesQty 151] is set to 0.

In the case of a strategy order fill, several EXECUTION REPORT messages ([OrdStatus 39=1 or 2, MultiLegReportingType 442=2]) in addition to the EXECUTION REPORT on the strategy instrument are sent.

Figure 14: A Fill and Kill Order is partially Executed in Continuous Trading

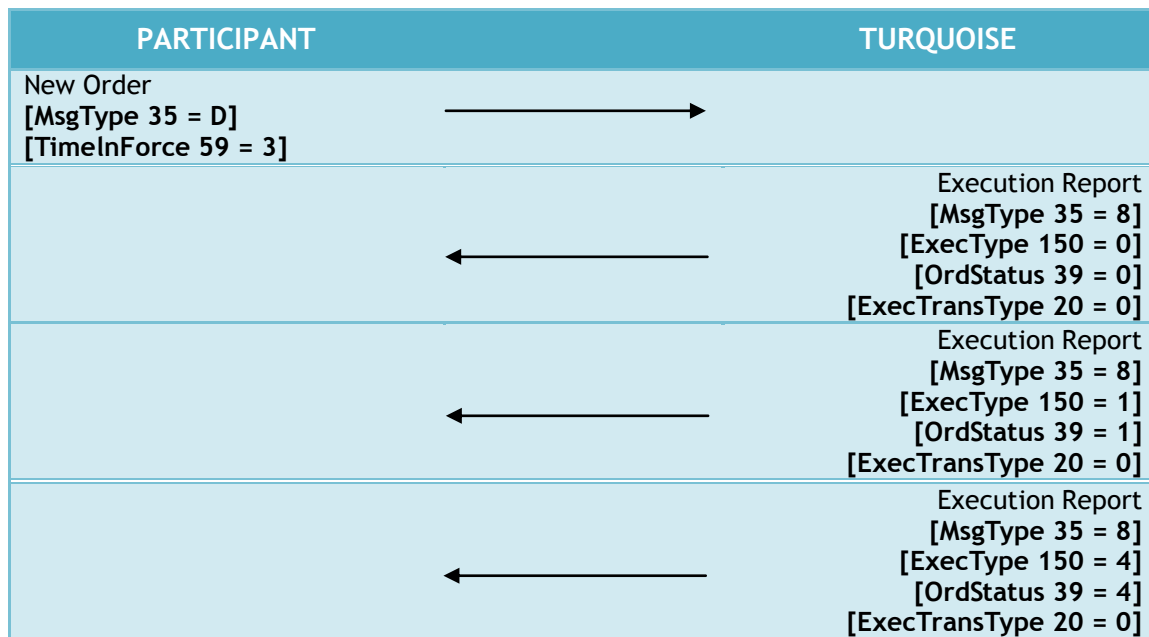
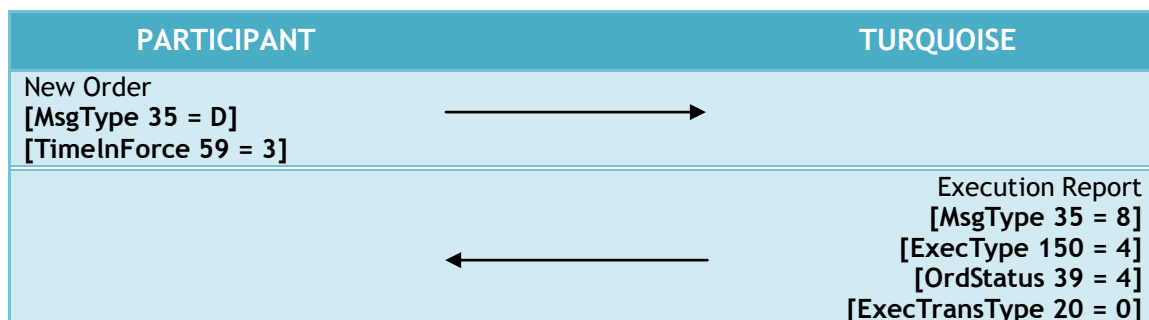


Figure 15: A Fill and Kill Order is not Executed in Continuous Trading



### 4.1.2 Stop and If Touched Order

If the order entered is a STOP or IF TOUCHED order, the participant will later receive another EXECUTION REPORT message with [OrdStatus 39=0] and [OrdType 40=2] when the order is triggered and becomes a regular limit order (trigger price reached).

The following table illustrates all possible triggering surfaces:

Triggering Surface	Verb	StopPxCondition
Trigger Price ≥ LAST	Buy	5255 = T: If Touched
	Sell	5255 = S: Stop
Trigger Price ≤ LAST	Buy	5255 = S: Stop
	Sell	5255 = T: If Touched
Trigger Price ≥ BID	Buy	5255 = F: If BID Touched
	Sell	5255 = E: Stop on BID
Trigger Price ≤ BID	Buy	5255 = E: Stop on BID
	Sell	5255 = F: If BID Touched
Trigger Price ≥ ASK	Buy	5255 = H: If ASK Touched
	Sell	5255 = I: Stop on ASK
Trigger Price ≤ ASK	Buy	5255 = I: Stop on ASK
	Sell	5255 = H: If ASK Touched

### 4.1.3 While Connected Orders

Order with designated as “While Connected” [TimelnForce 59 = W] is automatically cancelled following a participant disconnection.

Figure 16: While Connected orders cancelled on disconnection of a participant

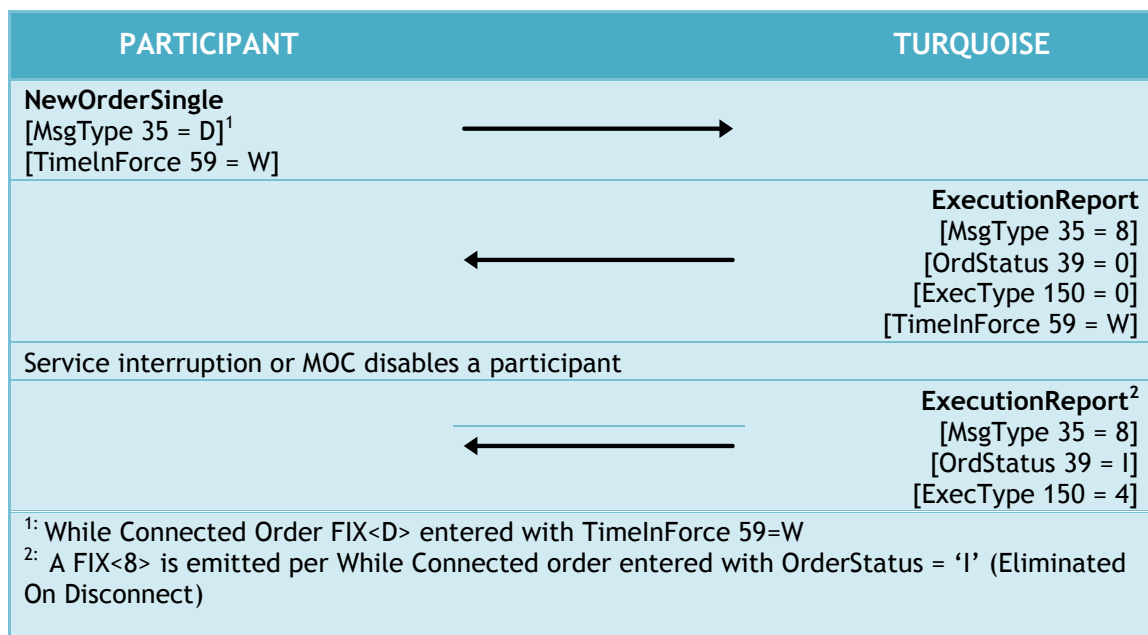
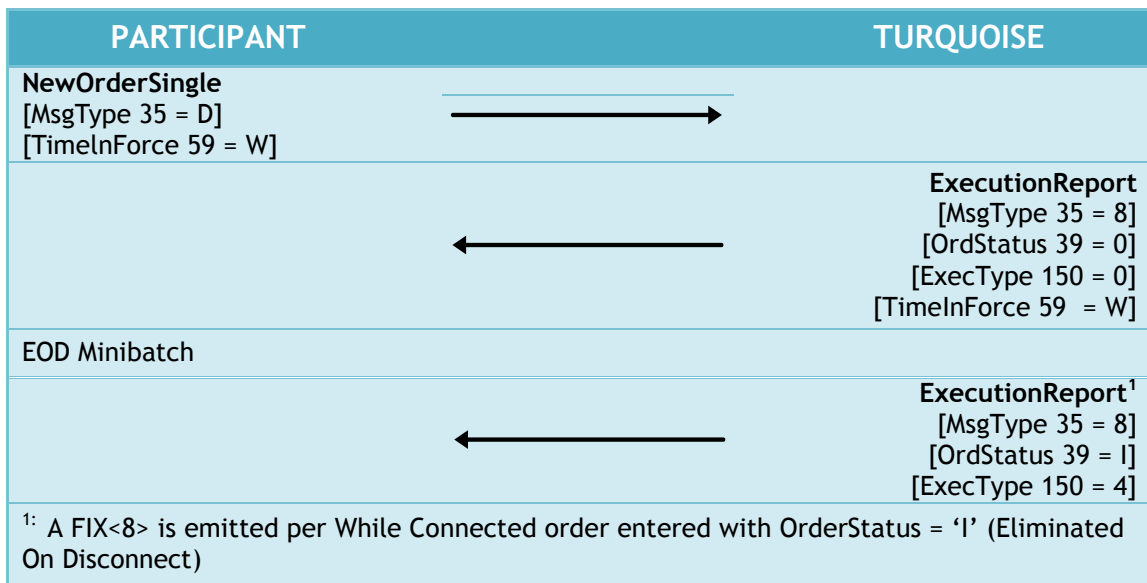


Figure 17: While Connected orders cancelled on EOD Mini batch



#### 4.1.4 Committed Order

Committed Order does not interact with the instrument order book. A Committed Order is submitted using NEW ORDER SINGLE and OrdType 40 = C. Committed order must include the opposite firm [Contra Trader 337].

Figure 18: Committed orders traded

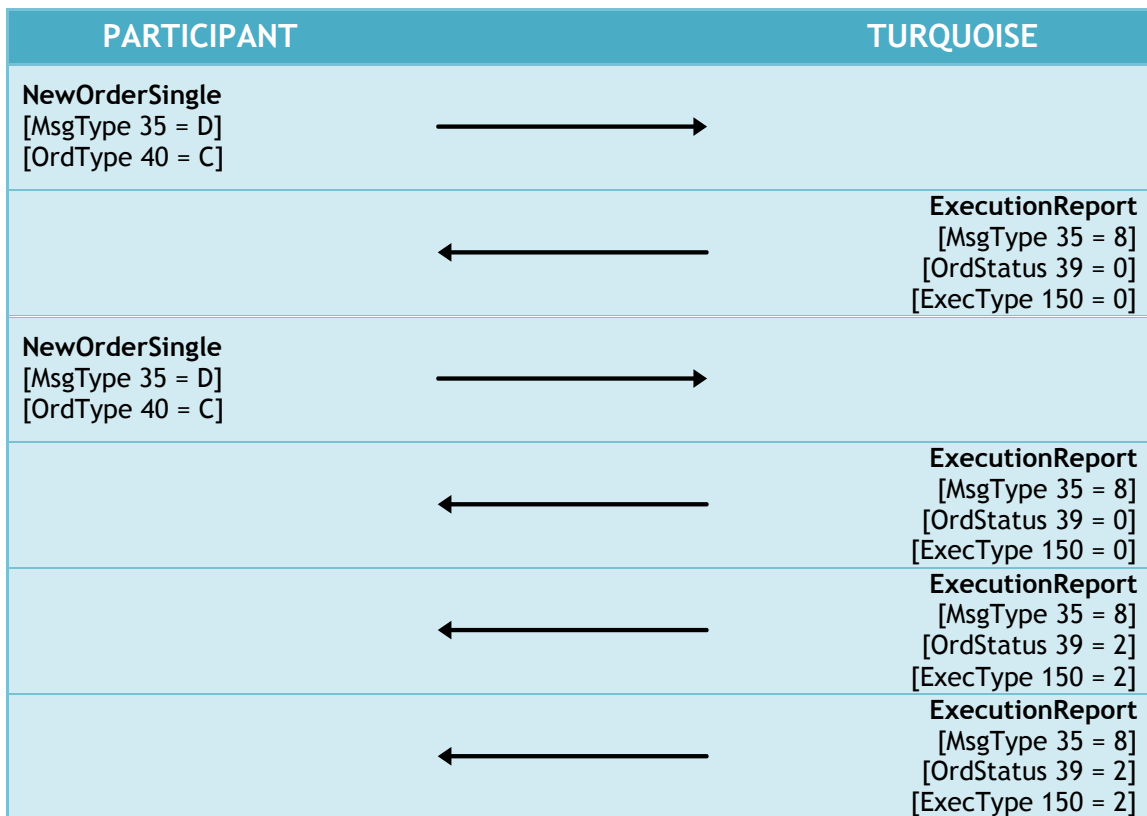


Figure 19: Committed order cancelled by participant before it trades

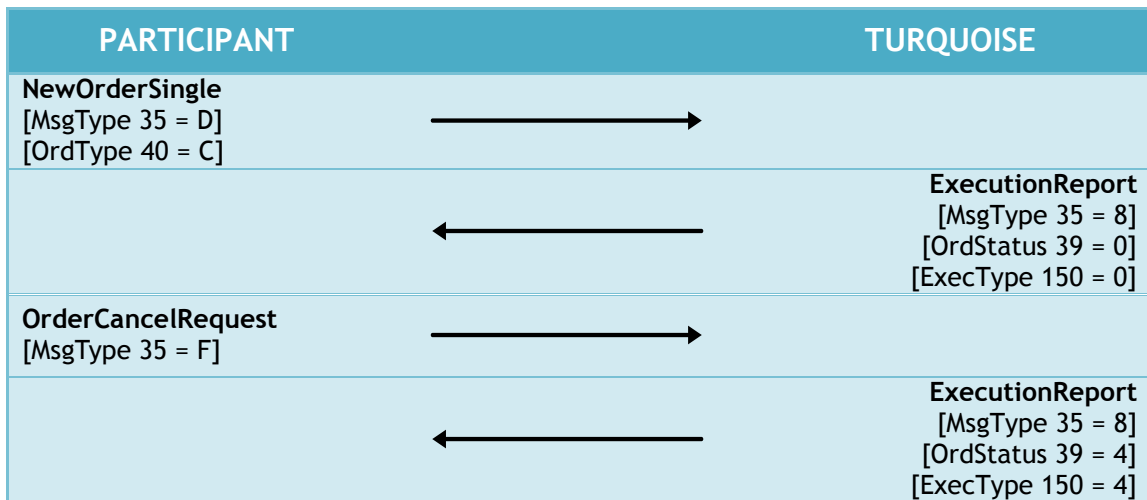


Figure 20: Pending Committed order cancelled on Mini batch event

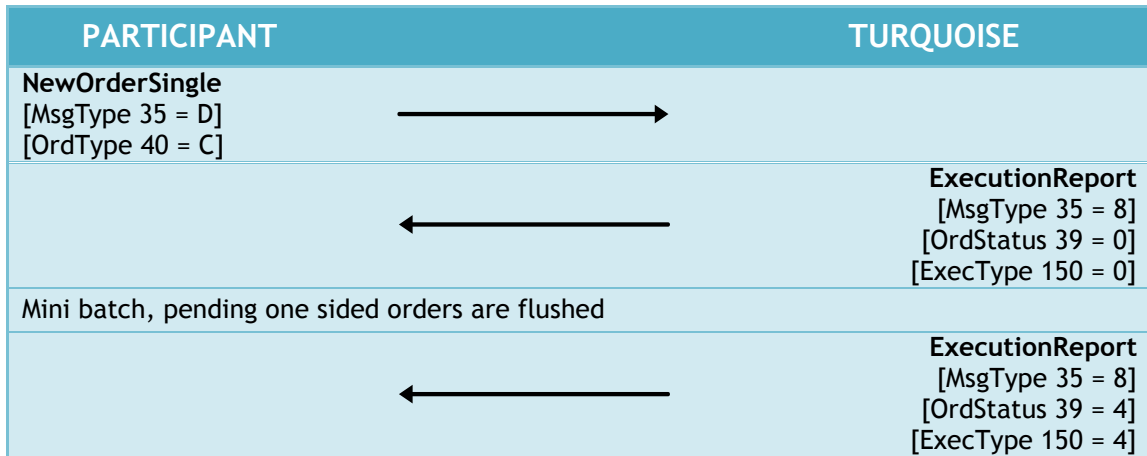


Figure 21: Committed order not accepted by the trading engine



### 4.1.5 New Order Cross

A NEW ORDER CROSS does not interact with the instrument order book. The same member must be on both sides of the order. A NEW ORDER CROSS can be rejected or traded at reception.

Figure 22: Entering an Accepted Cross Order

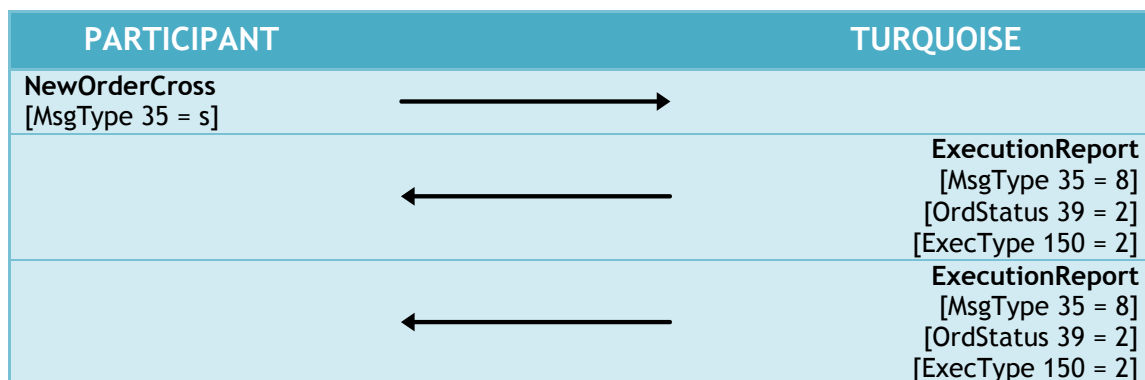


Figure 23: Cross Order Rejected



## 4.2 Order Modification

A participant may amend any open orders. Orders that have been fully executed, deleted or cancelled cannot be modified.

A participant cannot modify the instrument ID or the side (buy or sell) of the order. If the quantity is reduced the order retains price/time priority. Any other attributes that are modified will result in the order being eliminated and replaced by a new one.

To modify an order, the participant sends an ORDER CANCEL/REPLACE REQUEST message. In this message, the participant specifies the following elements enabling Turquoise to locate the order:

- The instrument affected by the modification [Symbol 55], [SecurityType 167], [PutOrCall 201], [StrikePrice 202], [MaturityMonthYear 200], [MaturityDay 205] and [OptAttribute 206]
- The [OrigClOrdID 41]
- The side of the order [Side 54]

Turquoise performs validation on the message received. When an error is detected in the incoming message, Turquoise sends a CANCEL REJECT message specifying the error code for the first error detected. If no parameters have been modified, Turquoise sends a CANCEL REJECT specifying 'No modification of the order'.

If the message is valid, Turquoise eliminates the old order from the order book and replaces it with a new one, to which it attributes a new [OrderId 37]. It sends the acknowledgement of the modification in the form of an EXECUTION REPORT message. This message contains the new [OrderId 37] attributed to the modified order by Turquoise and the revised characteristics of the modified order.

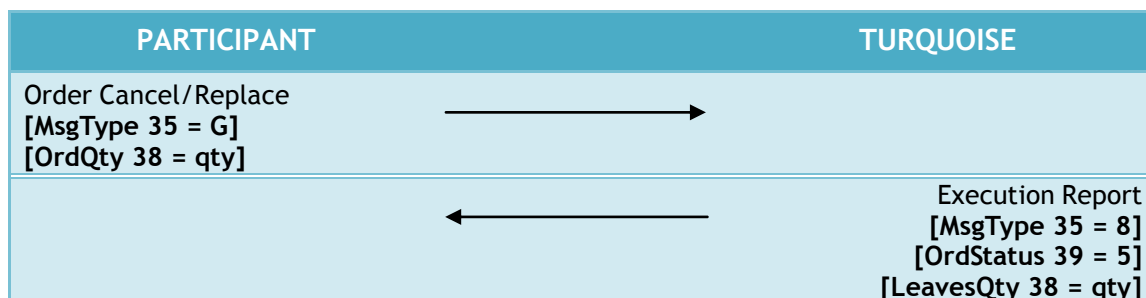
The modified order can be:

- Entered in the book (the order has been modified and at least a part of the order has been entered in the Order Book)
- Eliminated (the order has been modified and immediately eliminated)
- Executed partially or in full (the order has been modified and immediately executed in full or partially)

Figure 24: Modification is rejected



Figure 25: Modification is accepted



### 4.3 Order Cancellation

Clients may cancel all orders entered by themselves. Cancellations will only be valid for orders, or part of an order, which are currently booked.

To cancel an order, the client sends a CANCEL REQUEST message. This message specifies all the parameters allowing Turquoise to locate the order:

- The instrument affected by the modification [Symbol 55], [SecurityType 167], [PutOrCall 201], [StrikePrice 202], [MaturityMonthYear 200], [MaturityDay 205] and [OptAttribute 206]
- The [OrigClOrdID 41]
- The side of the order [Side 54]

Turquoise performs validation on the message received. If the CANCEL REQUEST is not valid, Turquoise sends a CANCEL REJECT message indicating the error code for the first error detected.

If the CANCEL REQUEST is valid, Turquoise will send the acknowledgement of the cancellation in the form of an EXECUTION REPORT ([OrdStatus 39=4]) message specifying the outcome reserved for the order.

Figure 26: Cancellation is accepted



Figure 27: Cancellation is rejected



#### 4.4 Entry of a Request for Quote

Request for Quote entry allows participants to broadcast a REQUEST FOR QUOTE to other participants.

The client enters a QUOTE REQUEST message with the symbol and an optional quantity. If the message is valid, the participant receives a QUOTE ACKNOWLEDGEMENT message with [QuoteAckStatus 297=0]. If the QUOTE REQUEST message is not valid, Turquoise sends a QUOTE ACKNOWLEDGEMENT message with [QuoteAckStatus 297=5].

Figure 28: Request for Quote



#### 4.5 Entry Of A User Defined Strategy (UDS)

A trader can request the creation of a user defined strategy (UDS) by submitting a SECURITY DEFINITION REQUEST. The SECURITY DEFINITION REQUEST must include the strategy leg information.

Strategy Creation requests can be accepted [SecurityResponseType 321=1], accepted but modified [SecurityResponseType 321=2] or rejected [SecurityResponseType 321=3].

If the creation is modified the SECURITY DEFINITION message includes the new instrument structure. The leg ordering sequence may differ from the original request but will not be marked as modified if the ratio and the verb for all legs remain the same.

Figure 29: Strategy instrument successfully created



Figure 30: Error on creating Strategy instrument



## 4.6 Unsolicited Services

### 4.6.1 Entry or Cancellation of an Order by Turquoise

Turquoise may enter or cancel orders on behalf of a participant.

The cancellation can be done for orders entered by Turquoise in the participant's account.

This action can take place during:

- Order Cancellation
- Trading Session

If Turquoise enters an order on behalf of a participant, the client does not receive any acknowledgements or receive any messages related to this order.

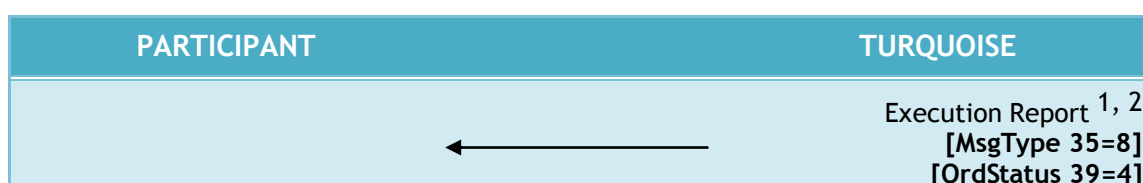
The participant that entered the initial order will receive the EXECUTION REPORT [OrdStatus 39=4 or 5] message for any orders cancelled by Turquoise.

## 4.6.2 Elimination of an Order

The table below describes all the scenarios where order elimination may occur **without** the participant sending a cancellation message.

Reason for Elimination	
The order price is outside the instrument limit price	EXECUTION REPORT [OrdStatus 39=F or G] message sent to the Participant who initially entered the order
During the instrument opening Market Order without opposite order are eliminated.	EXECUTION REPORT [OrdStatus 39=4] message sent to the Participant who initially entered the order
Participant disconnection eliminates While Connected Order.	EXECUTION REPORT [OrdStatus 39=I] message sent to the Participant who initially entered the order
Instrument state does not allow order with disclosed quantity.	EXECUTION REPORT [OrdStatus 39=4] message sent to the Participant who initially entered the order
Cancellation of an order by Turquoise	Possible during: Order Cancellation, Trading Session, Turquoise Intervention, Consultation End of Day, and Group Interruption.
	EXECUTION REPORT [OrdStatus 39=4] message sent to the Participant who initially entered the order
Instrument has expired, updated or is deleted	Carried out during Mini Batch or Post-session.
	If the TICK INCREMENT for prices is modified, all prices that do not respect the new TICK INCREMENT are purged. The others remain on the order book.
Validity of the order is reached	Carried out at the end of each trading day just before or during Maintenance.
	Also carried out at the end of the week (last trading day of the weekly session) just before Post-session

Figure 21: Global Cancellation of all Orders for a Member Initiated by Turquoise



1. Will be sent for every booked order posted by the member
2. No [OrigClOrdID 41] is sent

## 4.7 Cancellation of a Trade by Turquoise

If required, Turquoise can cancel a trade that took place during the day. This cancellation can be initiated in accordance with Turquoise rules.

This can take place during:

- Order Cancellation
- Pre-Opening
- Trading Session
- Suspended
- Turquoise Intervention
- Consultation End
- On an Interrupted group

Turquoise sends the two clients concerned an EXECUTION REPORT ([ExecTransType 20=1]) message. This message specifies all the parameters relating to the cancelled trade.

If the trade involved a strategy instrument, Turquoise will cancel a trade on a leg-by-leg basis. For each leg trade cancellation, Turquoise sends an EXECUTION REPORT ([ExecTransType 20=1, MultiLegReportingType=2]) to each of the two Participants. When all the legs-trades have been cancelled, Turquoise also sends an EXECUTION REPORT ([ExecTransType 20=1, MultiLegReportingType=3]) to the participant(s) who entered the strategy order.

Figure 22: Cancellation of a Trade with Impact on the Last Price Made by Turquoise



## 5 Queries

In order to assist clients manage and synchronize their trading database, Turquoise offers two types of queries: Order Mass Status and Security Definition.

### 5.1 Order Mass Status

This query returns all orders that were entered during the day for the participant.

One EXECUTION REPORT [ExecTransType 20=3] is returned for each active order of the Participant.

The maximum number of requests is limited to 5 per Participant per day.

### 5.2 Security Definition

This query returns all listed instruments on Turquoise. This request generates one message per instrument. For strategies, SECURITY DEFINITION responses include the definition of each leg.

The maximum number of requests is limited to 3 per participant per day and they are only permitted before the Market Opening.

## 6 APPENDIX - Supported Message Types

The table below lists the Turquoise FIX interface message names and types:

Type	FIX Messages	Originator
Application	D - New Order Single	Participant
	G - Order Cancel/Replace Request	Participant
	F - Order Cancel Request	Participant
	R - Quote Request	Participant
	8 - Execution Report	Turquoise
	9 - Order Cancel Reject	Turquoise
	b - Quote Acknowledgement	Turquoise
	c - Security Definition Request	Participant
	d - Security Definition	Turquoise
	AF - Order Mass Status Request <sup>1</sup>	Participant
Administrative	3 - Error / Reject	Participant / Turquoise
	0 - Heartbeat	Participant / Turquoise
	A - Logon	Participant / Turquoise
	2 - Resend Request	Participant / Turquoise
	5 - Logout	Participant / Turquoise
	1 - Test Request	Participant / Turquoise
	4 - Sequence Reset	Participant / Turquoise

1. Taken from FIX 4.3

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