MIAX Pearl Options Exchange

Options Order Management using FIX Protocol FIX Interface Specification

Revision Date: 05/23/2023
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1. Overview

MIAX Pearl FIX Orders Interface (FOI) is a messaging interface that allows MIAX Pearl members and sponsored firms to send and manage their Options orders. FOI also facilitates real-time electronic communication of transaction information corresponding to such Option orders.

FOI is a flexible interface that uses FIX protocol version 4.2 with minor customization of certain tags. FOI uses FIX protocol for both application messages and session level messages. This document describes the messages that will be supported by FOI. For detailed information regarding FIX protocol and session protocol, please refer to the FIX documentation provided by FIX Protocol Limited (FPL) on their website http://www.fixtradingcommunity.org/.

This specification is intended to only be used by MIAX Pearl member firms and the firms that are sponsored for MIAX Pearl access by MIAX Pearl member firms. MIAX Pearl will be referred to as Pearl in the rest of the document.

FOI Features:

FOI has been designed for flexibility, reliability, low latency and high throughput messaging. Some of the key features of the interface are:

- Use of FIX protocol that has been adopted by most of the participants in the Options industry. FIX tag/value messaging is a flexible messaging protocol that eliminates platform dependencies and allows to largely decouple exchange and firm deployments.
- FIX session layer is implemented over TCP/IP and facilitates sequenced transmission and recovery of messages across TCP/IP sessions thereby achieving reliable communication.
- FOI allows multiple connections per firm. On each FOI connection, Firms are allowed to send orders for any option symbol and any of their MPIDs. These features enable firms to achieve load balancing and higher resiliency. ClOrdID must be unique per MPID across all sessions per firm.
- FOI hides the intricacies of the Exchange architecture that includes many systems processing specific symbol ranges. FOI design, coupled with the Exchange architecture, facilitates low latency and high throughput messaging.
- FOI allows mass cancels of orders and Auto Cancel on Disconnect on each session thereby allowing firms to reduce their risk in bad market conditions or in case of system problems at their end.

1.1 Exchange Related Information

1.1.1 Hours of Operation for MIAX Pearl Options Exchange

Please refer to MIAX website at http://www.MIAXOptions.com for details about times for each of these events.

Note: Times specified below are as per timings of United States Eastern Time zone.

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Order Acceptance: Firms are allowed to connect and send orders to FOI. 7:30 a.m.

Opening Process: Start of trading session. 9:30 a.m.

Trading Session finished for Equity Options: 4:00 p.m. (ends at 1:00 p.m. on early closing days) Pearl stops accepting orders in these classes. Cancels are still allowed. Pearl may still send queued executions.

Trading Session finished for ETF and Index Options: 4:15 p.m. (ends at 1:15 p.m. on early closing days) Pearl stops accepting orders in these classes. Cancels are still allowed. Pearl may still send queued executions.

End of Order Cancel Acceptance: Pearl will stop accepting cancels for their orders. 4:25 p.m. (1:25 p.m. on early closing days)

Firms are expected to stay connected at least until End of Order Cancel Acceptance because system can send executions and cancels due to production closing logic. Disconnecting before that can result in not receiving key information about order status changes.

Dissemination of *Done for Day* Messages: Time range within which Firms can expect to receive a status message for open orders of the type that they are configured to receive status for. Start time will be anytime from 4:25 p.m. to 5:00 p.m. (1:25 p.m. to 2:00 p.m. on early closing days)

1.1.2 Obtaining More Information

Information such as (but not limited to) membership, rules, fees and support can be obtained by sending an email to Trading Operations or by visiting MIAX website at http://www.MIAXOptions.com.

1.2 Certification for Trading via FOI

Pearl will provide a test area for member firm's testing and certification needs. Please contact MIAX Trading Operations to obtain more information about this environment.

In order to connect to Pearl production, member firms must certify their application with Pearl. This certification testing is a manual process. In order to schedule a certification test, please email MIAX Trading Operations.

1.3 FAQs

Membership: Contact member services for details about membership. As a part of the membership, each member firm can get one or more unique MPIDs and one of those IDs will have to be sent in every message.

Routing strategies: Firms are allowed to designate each order as non-routable (DNR: do not route). Absence of the DNR attribute implies that the order is routable (route at opening each day or upon arrival and do not route when resting on book). Please refer to Pearl rules as to the order types are routable.

Mass Cancels: Firms can request mass-cancels of their orders on each session(connection). FOI allows firms to cancel by

- For an MPID: ALL or GTC or DAY orders
- For an MPID for a given Security Symbol (Class): ALL or GTC or DAY orders

Auto Cancel on Disconnect (ACOD): This feature allows firms to limit their exposure during outages by electronically instructing Pearl to cancel designated open orders upon connection loss.
Internally, the ACOD directive is marked on a newly received order when either of the following two conditions exist AND the order does not have a TIF of GTC:

1. Explicitly requested on a new order using ExecInst=o
2. Implicitly requested for all subsequently received new orders on a session established using RawDataLength=1 and RawData=1 in the Logon message.

Once an order is received and booked with the designated ACOD directive, the directive cannot be changed unless the order is subsequently modified with a TIF of GTC. Once an order becomes a GTC order, it is no longer eligible for ACOD.

When FOI detects a disconnect for any reason (whether due to graceful logout, a connection loss or loss of 2 heartbeats), it will trigger the auto cancel on disconnect process, whereby FOI will try to cancel all eligible orders (eligibility defined above). Upon completion of ACOD, the FOI will not accept connections from the Firm for a configured period of time (eg: 5 seconds – refer to Pearl Technical alerts for the latest setting).

The ACOD feature is designed to react to external connection loss scenarios only. Therefore, it does not cancel orders in the event of a Pearl system failure. The ACOD feature is provided on a best effort basis. Executions can occur while FOI is processing the ACOD event. As the technical circumstances initiating a disconnect may vary, Firms are advised to call Trading Operations to confirm the status of ACOD eligible open orders remaining at Pearl that were sent via the session(s) that disconnected.

The execution reports resulting from cancels or trades during the disconnect can be received upon a subsequent reconnect by the firm on the same day.

Auto Cancel on System Failure (ACOSF): In the event of a Matching Engine or FOI, process crash or hardware failure, that prevents a Firm's interaction with existing open orders, members can opt in to have the system automatically cancel their open orders for the impacted session(s). In case of FOI failure, orders submitted via any of the member's other sessions will not be affected. In case of any Matching Engine failure, orders submitted to any Matching Engines that are not impacted will not be affected.

<u>Members must select one of the following actions on a firm level and this action will be performed on the affected session(s):</u>

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- Cancel All Open Orders: All open orders (including GTC) in the impacted Matching Engine(s) or orders that were sent through the impacted FOI session(s) will be cancelled upon system failure.
- Do Not Cancel All Open Orders: This will disable Auto Cancel on System Failure and MIAX Pearl will not cancel any open orders from that session upon system failure. This is the default behavior for the session if the member does not opt in for ACOSF.

Note: This feature is available starting from the Live Order Window (LOW) till the Option close time.

The ACOSF feature is provided on a best effort basis. Executions can occur while the ACOSF event is being processed. As the technical circumstances initiating an ACOSF may vary, firms are advised to contact Trading Operations to confirm the status of ACOSF eligible open orders remaining at MIAX Pearl. The execution reports resulting from cancels or trades during the failure can also be received upon a subsequent reconnect, to primary or backup FOI, by the Firm on the same day.

Done for Day: For the firms that need status of orders at the end of day, Pearl can send out a *DoneForDay* report for each order that is still open. Firms can request that Pearl sends this report for GTC and/or DAY orders. Note that this is just a status report of open orders and this message does not cancel orders in Pearl engine. The GTC Orders that are open at the end of the day will be introduced back into the system by Pearl in the next Trading session for symbols that remain active.

Executions/Busts/Adjustments: All executions are conveyed to firms via FOI and Pearl FIX Drop. Busts (trade cancels) and adjustments (trade corrections) to Executions are not conveyed to firms via FOI. Firms can receive busts/adjustments via the Pearl FIX Drop.

Poss Dup: Pearl ignores the "Poss dup" flag in FIX header. Pearl only checks for uniqueness of ClOrdID for the MPID for the day. Sending orders and subsequent actions against them over more than one port is strongly discouraged as it results in unpredictable outcomes due to sequencing of messages over multiple ports.

Flow control: Upon receipt of a FIX message, FOI will not read the firm facing port until it sends back the response. Firms that do not strictly follow a one-in-flight paradigm are advised to limit the number of in-flight FIX messages to less than 50 for optimal TCP protocol performance; i.e. under certain limited circumstances, exceeding this limit could result in shrinking window size and/or dropped packets.

Failure/Recovery: In the event of a catastrophic hardware problem servicing FOI, Pearl will activate backup FOI services on alternative hardware with different IP addresses. Other than a change in IP address, the FIX session can be reestablished just as after a normal disconnect and resynchronized per normal FIX protocol. Note that selected outbound messages, from Pearl to the Firm, in transition during the failure, may be sent **or resent** with PossResend=Y. Firms may have already seen some of these messages before, with lower sequence numbers, and should handle the possible duplicate communications. Pearl will reject any retransmitted orders by checking ClOrdID uniqueness for each MPID.

Note that the backup FOIs are not available for connectivity testing during the trading day.
Firms are encouraged to conduct failover testing to ensure seamless interaction during such events.

1.4 Configuration

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Firms can configure their session(s) with the below properties.

Comp ID: All messages sent in either direction must contain SenderCompID and TargetCompID. Firms and Pearl will agree upon the values, to be used for these fields, at the time of initial setup. Firms are allowed to use a single *Comp ID* for each connection. Pearl will allow connections from a preconfigured computer (CompID).

Firm to Pearl		Pearl to Firm	
SenderCompID	**TargetCompID**	**SenderCompID**	**TargetCompID**
Firm Comp ID	Pearl	Pearl	Firm Comp ID

SenderSubID: All application messages sent in either direction must contain SenderSubID and TargetSubID. These are not required in administrative messages or User Notification Messages. Firms and Pearl will agree upon the value, to be used for this field, at the time of initial setup. Firms send in their Executing Broker MPID (Firm MPID) in this field and Firms are allowed to get multiple such IDs from Pearl. Firms can send in any of their IDs on each of their connections. Pearl will use the clearing details associated with this MPID in addition to the clearing information supplied in the order message.

Firm to Pearl			Pearl to Firm		
	SenderSubID	**TargetSubID**		**SenderSubID**	**TargetSubID**
Pearl Test Env	Firm MPID	TEST	**TEST**	TEST	Firm MPID
Pearl Prod Env	Firm MPID	PROD	**PROD**	PROD	Firm MPID

IP Address: At the time of setup, Pearl will require Firms source IPs and will allocate one or more Pearl FIX server IPs to your firm as agreed upon by the Firm and Pearl membership.

Port: At the time of setup, Pearl will allocate one or more Pearl FIX server ports as agreed upon by the Firm and Pearl membership.

Done For Day: Firms can request Pearl to configure their ports for receiving Done for Day reports at the end of the day for their open GTC and/or DAY orders.

Order Protection: Pearl provides a service to protect firms based on order size. These values can be set on a firm basis (not MPID level) and is calculated across all sessions belonging to a Firm.

- MaxOrderSize: An order will be rejected if the OrderQty is greater than this value.
- MaxOpenOrders: Orders will be rejected if the total outstanding open order count is greater than this value.
- MaxOpenContracts: Orders will be rejected if the inbound OrderQty plus the number of open contracts is greater than the configured value.

Check Sum verification: Firms can request the FIX Standard Trailer Check Sum calculation to be enabled or disabled. Enabled, the Pearl system will perform standard FIX verification of messages and reject message that fail the test. Pearl will not perform Check Sum calculations on inbound messages when disabled.

Risk Protection Monitoring: Firms participating in Pearl Risk Protection Monitoring can manage Risk Notification messages on a per session basis. The configuration of notification messages can be coordinated with Pearl Trading Operations. Each notification type (solicited or un-solicited) is independently configurable to be forwarded or dropped.

Self-trade prevention: Market Maker orders receive self trade prevention at the firm level across all MPIDs of the firm. If a Market Maker order locks or crosses the opposite side interest of the same firm for the same product, it will be accepted and the contra side will be canceled.

2. FIX Message Format and Delivery

Please refer to **FIX v4.2 Protocol** document (http://fixprotocol.org/specifications) for details about **FIX message format and delivery**. That section offers insights into the general format of a FIX message being comprised of a *standard header* followed by the message body fields and terminated with a *standard trailer*. It further states that the non-printing, ASCII "SOH" (#001, hex:0x01, referred to in this document as <SOH>) must be used as the field and message delimiter.

All tags must have a value specified. Optional fields without values should not be specified in the FIX message. An order that contains a missing required tag, or a tag with no associated value, will be rejected back to the user.

Data Types:

> Price field formats are specified in the messages
> Char String fields are case sensitive unless otherwise noted

2.1 Standard Message Header

The Standard Header precedes each administrative or application message in the FIX protocol. The header identifies the message type, length, destination, sequence number, origination point, and time. The following table contains the Standard Header tags processed by Pearl. Any other header tag will be ignored.

Tag	FIX Name	Req'd	Details
8	BeginString	Yes	Always the first field in a FIX message. Valid value: FIX.4.2
9	BodyLength	Yes	Always the second field in a FIX message. Length of message expressed as the number of characters in the message following the BodyLength field up to, and including, the delimiter immediately preceding the CheckSum tag ("10=").

Tag	FIX Name	Req'd	Details
35	MsgType	Yes	Always the third field in a FIX message. Defines the message type. Valid values - Administrative messages: '0' = Heartbeat '1' = Test Request '2' = Resend Request '3' = Reject (Session level reject) '4' = Sequence Reset '5' = Logout 'A' = Logon Valid values – Application messages: '8' = Execution Report '9' = Single Order Cancel Reject 'D' = New Order Single 'F' = Single Order Cancel Request 'G' = Single Order Cancel/Replace 'H' = Order Status Request 'j' = Reject (Business message reject)
34	MsgSeqNum	Yes	Message sequence number (numeric).
43	PossDupFlag	No	Ignored
49	SenderCompID	Yes	Identifies the party sending the message. The sending firm should use their Line Identifier as assigned by Pearl. Pearl will use "Pearl" when sending the messages to Firms.
50	SenderSubID	Cond.	Sub identifier of the party sending the message. Required for application messages sent from Firm to Pearl. See Configuration section (1.4 **Configuration**) for more detail.
52	SendingTime	Yes	Time of message transmission expressed in UTC (Universal Time Coordinated), also known as GMT. This value must be within 60 seconds of the current time; else the order will be rejected. Format: YYYYMMDD–HH:MM:SS.uuu
56	TargetCompID	Yes	Identifies the party receiving the message. Firms should use the value "Pearl." Pearl will use the Firm's Line ID when sending the messages to Firms.

Tag	FIX Name	Req'd	Details
57	TargetSubID	Cond.	Sub identifier of the party receiving the message. Required for application messages delivered to the firms from Pearl. See Configuration section (1.4 **Configuration**) for more detail.
97	PossResend	No	Ignored in messages sent to Pearl. Set to Y in messages from Pearl during certain failure/recovery scenarios.
115	OnBehalfOfCompID	Cond.	Only applicable to messages sent to Pearl: Identifies the end client that is the originator of the message. This will be returned in the DeliverToCompID of messages corresponding to this message.
116	OnBehalfOfSubID	Cond.	Only applicable to messages sent to Pearl: Sub identifier of the end client. This will be returned in the DeliverToSubID of messages corresponding to this message.
122	OrigSendingTime	Cond.	Required for resent messages. If no data is available, this value is set to the SendingTime value. Format: YYYYMMDD–HH:MM:SS.uuu
128	DeliverToCompID	Cond.	Only applicable to messages sent from Pearl: Pearl will reflect back the data sent in OnBehalfOfCompID field.
129	DeliverToSubID	Cond.	Only applicable to messages sent from Pearl: Pearl will reflect back the data sent in OnBehalfOfSubID field.

2.2 Standard Message Trailer

The Standard Trailer terminates each administrative or application message in the FIX protocol. The trailer is used to segregate messages and contains the three-digit character representation of the Check Sum value. Tag must be present even for Firms that have disabled Check Sum validation.

The following table contains the Standard Trailer tags processed by Pearl. Any other Trailer tag will be ignored.

Tag	FIX Name	Req'd	Details
10	CheckSum	Yes	Always the last field of a FIX message.

3. Session Protocol

Please refer to **FIX v4.2 Protocol** document (http://fixprotocol.org/specifications) for details about **FIX session protocol**. This protocol layer offers session management capabilities such as establishing a FIX session, authentication, application/administrative messaging over TCP/IP, sequencing of messages, heartbeats and gap fills.

Order sending firm will always be the *Initiator* of the FIX session and Pearl is the *Acceptor*.

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4. Administrative Messages

This section consists of administrative messages such as those that are used for session protocol.

4.1 Logon Request (MsgType = A)

Please refer to **FIX v4.2 Protocol** document for details about **FIX Logon Request**.

The logon message authenticates a user establishing a connection to a remote system. The logon message must be the first message sent by the Firm that needs to initiate a FIX session with FOI. Firms must wait for a Logon message as a response from FOI before sending other messages.

The message format is as follows:

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = A
95	RawDataLength	Cond	The number of bytes in RawData. When used, it must be set to 1. Omit tags 95 & 96 when Auto Cancel on Disconnect (ACOD) is not required.
96	RawData	Cond	Raw data that contains custom information and is of the length specified in RawDataLength. Valid Values: "1" = Activate Auto Cancel on Disconnect (ACOD) on disconnect or graceful logout
98	EncryptMethod	Yes	(always unencrypted)
108	HeartBtInt	Yes	Value specified in seconds. Note: Must be > 0 and same value must be used by both sides.
141	ResetSeqNumFlag	No	Indicates both sides of a FIX session should reset sequence numbers
	Standard Trailer	Yes	

Points to note:
- Firms can specify a heartbeat interval that is greater than zero and FOI will use the same. Both sides must use that same interval to check if the other side is alive. A Heartbeat interval of 5 seconds is recommended. Upon missing of a single heartbeat, FOI will send a *Test Request*. Upon missing of 2 heartbeats, FOI will send a logout and terminate the connection. Pearl recommends using as low of a value the reliability and latency of your telecommunications channel will allow.
- Encryption is not supported and hence the EncryptMethod field is ignored.
- When Firms reconnect due to a loss of connection, the login response from Pearl may contain a sequence number greater than what the firm expects. This will require the Firm to follow the FIX resend protocol to do a gap fill. Pearl will initiate a similar gap fill process if Pearl detects a gap. Pearl will also reject orders with a SendingTime > 60 seconds.

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- Auto Cancel on Disconnect (ACOD): In order to activate the feature for the session, both tag 95 and 96 must be present and both must be set to 1. If one tag is present and the other is absent, the Logon request is rejected.

4.2 Heartbeat (MsgType = 0)

Please refer to **FIX v4.2 Protocol** document for details about **FIX Heartbeat**.

The heartbeat format is as follows:

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = 0
112	TestReqID	Cond	Required when the heartbeat is the result of a Test Request message.
	Standard Trailer	Yes	

Points to note:
- Check the Logon message for details about the heartbeat interval
- Each side must send a heartbeat only when the agreed upon interval has elapsed since the last message was sent.

4.3 Test Request (MsgType = 1)

Please refer to **FIX v4.2 Protocol** document for details about **FIX Test Request**.

The test request message forces a heartbeat from the opposing application. The test request message checks sequence numbers or verifies communication line status. The opposite application responds to the Test Request with a Heartbeat containing the TestReqID.

The heartbeat format is as follows:

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = 1
112	TestReqID	Yes	
	Standard Trailer	Yes	

Points to note:
- If heartbeat interval + 1 second has elapsed since the last message was received, a Test request can be issued. After two such iterations, the connection must be dropped. This ensures a proactive detection and cleanup of a broken TCP connection.

4.4 Resend Request (MsgType = 2)

Please refer to **FIX v4.2 Protocol** document for details about **FIX Resend Request**.

The message format is as follows:

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = 2
7	BeginSeqNo	Yes	
16	EndSeqNo	Yes	
	Standard Trailer	Yes	

4.5 Reject – Session Level (MsgType = 3)

Please refer to **FIX v4.2 Protocol** document for details about **FIX Reject (session level)**.

FOI will disregard any message that is garbled, cannot be parsed or fails a data integrity check. Pearl will also terminate the connection.

The message format is as follows:

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = 3
45	RefSeqNum	Yes	MsgSeqNum of rejected message
371	RefTagID	Cond	Required if reject reason refers to a specific tag
372	RefMsgType	Yes	The MsgType of the FIX message being referenced
373	SessionRejectReason	Yes	Code to identify reason for a session-level Reject message Valid Values: "0" = Invalid tag number "1" = Required tag missing "2" = Tag not defined for this message type "3" = Undefined tag "4" = Tag specified without a value "5" = Value is incorrect (out of range) for this tag "6" = Incorrect data format for value "7" = *Unused/Not applicable* "8" = *Unused/Not applicable* "9" = Comp ID problem "10" = SendingTime accuracy problem "11" = Invalid MsgType
58	Text	No	Will be supplied if there is a need to supply more information regarding the reject
	Standard Trailer	Yes	

4.6 Sequence Reset (MsgType = 4)

Please refer to **FIX v4.2 Protocol** document for details about **FIX Sequence Reset (Gap Fill)**.

The message format is as follows:

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = 4
123	GapFillFlag	No	
36	NewSeqNo	Yes	
	Standard Trailer	Yes	

4.7 Logout Request (MsgType = 5)

Please refer to **FIX v4.2 Protocol** document for details about **FIX Logout Request**.

The logout message initiates or confirms the termination of a FIX session. Disconnection without the exchange of logout messages will be interpreted as an abnormal condition.

Before actually closing the session, the logout initiator must wait for the opposite side to respond with a confirming logout message. This gives the remote end a chance to perform any Gap Fill operations that may be necessary. The session may be terminated if the remote side does not respond in 5 minutes.

After sending the Logout message, the logout initiator should not send any messages unless requested to do so by the logout acceptor via a ResendRequest.

The message format is as follows:

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = 5
58	Text	N	Can be used to send readable information to the recipient. FOI will just log this and no alerts will be generated on any human readable display devices.
	Standard Trailer	Yes	

5. Application Messages

This section consists of application messages such as Order messages, cancel requests and execution reports.

5.1 New Order - Single (MsgType = D)

Users can send new orders to the Pearl exchange with the New Order Single message (MsgType = D). The following table contains the fields Pearl supports for the New Order Single message.

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = D
1	Account	No	Customer ID defined by the firms. Maximum length 10 characters. FOI will pass this through for clearing.
11	ClOrdID	Yes	Unique identifier of the order as assigned by the firm for the MPID used to populate the SenderSubID. Must be 30 characters or less. Uniqueness must be guaranteed within a single trading day (including GTC orders on the book from previous days) for an MPID regardless of FIX Session.
18	ExecInst	No	Valid values: f = Inter-market Sweep Order (ISO) o = Auto Cancel on connection loss (Firm requesting Auto Cancel on Disconnect (ACOD) for this Order) Note: If any other value is present the order will be rejected.
38	OrderQty	Yes	Number of contracts specified on the order. Valid Range: 1 to 999,999. Max length 6.
40	OrdType	Yes	Valid values: 1 = Market 2 = Limit
44	Price	Cond	Price for limit orders (OrdType = 2) Format follows standard OCC clearing format where a combined total digits before and after the decimal is 8 or less. 4 digits before the decimal can have 4 after Valid range published via Technical Circular Price should not be specified on market orders
54	Side	Yes	Side of order. Valid values: 1 = Buy 2 = Sell

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FIX Tag	FIX Name	Req'd	Details
55	Symbol	Yes	The 6 character OCC Security Symbol (Class) for an option.
59	TimeInForce	Yes	Specifies how long the order remains in effect. Valid values: 0 = DAY 1 = GTC (Good Till Canceled) 3 = IOC (Immediate or Cancel)
60	TransactTime	Yes	Time of execution/order creation expressed in UTC (Universal Time Coordinated), also known as GMT. Format: YYYYMMDD–HH:MM:SS.uuu
76	ExecBroker	No	Specifies order handling. Valid values: "DNR" = Do not route (Trade at Pearl or post to Pearl book. Never route away) Default: If this tag is absent, the order may be eligible for routing as per Pearl routing rules. "PO" = Post-Only (Day, Limit, DNR order which only trades as maker and never as a taker)
77	OpenClose	Cond	Specifies if this order opens a position or closes a position. Required except when CustomerOrFirm set to 4 = Market Maker or 5 = Non-Member Market Maker Valid values: O = Open C = Close.
167	SecurityType	Yes	Identifies type of instrument. Valid value = OPT (Options)
200	MaturityMonthYear	Yes	Expiration month and year. Format: YYYYMM (For example, 201009 is an expiration of September 2010.)
201	PutOrCall	Yes	Indicates whether an option is a put or a call. Valid values: 0 = Put 1 = Call
202	StrikePrice	Yes	Strike price for an option.
203	CoveredOrUncovered	No	Specifies whether the option position is covered or uncovered. Valid values: 0 = Covered 1 = Uncovered

FIX Tag	FIX Name	Req'd	Details
204	CustomerOrFirm	Yes	Specifies the order origin type. Valid values: 0 = Priority Customer 1 = Firm 2 = Broker/Dealer 4 = Market Maker (MM) 5 = Non-Member Market Maker 8 = Non-Priority Customer
205	MaturityDay	Yes	Expiration day of month, used along with MaturityMonthYear (200) to fully specify the maturity date for options. Format: DD (single digit allowed)
439	ClearingFirm	No	CMTA information of Order originator's clearing firm. Valid range: 1 – 99999
440	ClearingAccount	Cond	OCC sub-account (Multi-account). This is a required value for Non-member MM orders. Pearl Member MM can send their MPID in this tag in lieu of tag 109 It must be an UPPERCASE alphanumeric value, with a maximum of 5 characters. A value with up to 3 characters is generally used. (see Notes section below)
109	ClientID	Cond	For Pearl member Market Maker orders, MMs can send their MPID with this tag. Pearl Member MM can send in their MPID in tag 440 in lieu of tag 109 (see notes section below)
58	Text	No	Additional clearing information for the order that Pearl will send to OCC. Max 13 characters.
1090	MaxPriceLevels	No	MIAX Variable Protection (MVP) Unspecified (tag absent) = Use default configured in Pearl system. Valid Values to override Pearl default setting: 0 = Order is eligible to trade only at its Initial Reference Price (IRP). 1 through 20 = Maximum number of ticks (MPVs) that the order may trade beyond its IRP before being canceled back. Note that this MVP is capped to maximum allowed by Pearl. Greater than 20 = Order will be rejected. Changes to default or maximum value will be communicated via Technical circulars.
	Standard Trailer	Yes	

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Points to note:

- *Order Validation*: Pearl exchange will validate each order it receives by checking that the user sent all the required FIX fields for the order. FIX field level validation failure will result in a session reject. Business rule validation failures will result in rejection in the form of an Execution Report (MsgType = 8) with an Execution Type of Rejected (ExecType = 8). When the Firm message passes FIX field level validations and Business rule level validation and still has to be rejected, Pearl will send a Business reject message for them. Once the Order is accepted and Acked, any further Business rule validations that fail will result in an unsolicited cancel.
- *Order Acknowledgement*: Upon receipt of an order, Pearl validates the order and then sends an acknowledgement back to the client. This acknowledgement tells the user that a Pearl Matching Engine has received the order and has started to process it. This acknowledgement is in the form of an Execution Report (MsgType = 8) with an Execution Type of New (ExecType =0) and an Order Status of New (OrdStatus = 0). See the section "Execution Report (MsgType = 8)" for more information about the individual Execution Report fields.
- Pearl member Market Maker orders must be identified with their MPID. For flexibility, the MPID can be sent in either tag 440 or 109. When both tags have values, Pearl will validate them for equivalence and reject otherwise.
- Please refer to Pearl regulatory circulars for the MIAX Variable Protection default setting and Order types that support MIAX Variable Protection.
- *Auto Cancel on Disconnect (ACOD)*: Firms wishing to use the Pearl Auto Cancel on Disconnect feature on an order-by-order basis must send each order that they want Pearl to cancel upon disconnect with ExecInst=o. Orders that do not have this specified will not be canceled upon disconnect. Please refer to the FAQs for details on the Auto Cancel on Disconnect feature. This Order attribute will be ignored for GTC orders and GTC orders will not be canceled upon a disconnect.

5.2 Order Cancel Request (MsgType = F)

Firms can send a cancel request to Pearl to cancel the remaining quantity of an existing order or mass cancel many orders. The following table summarizes the format for the Order cancel request message.

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = F
11	ClOrdID	Yes	Unique identifier of the cancel request, which is assigned by the institution. Must be 30 characters or less.
9100	RequestType	Cond.	When absent, request is treated as a request for canceling a single order. Required for mass cancels. Valid values: 0 = Single order cancel 31 = Mass cancel of all orders for this MPID on this Session only 32 = Mass cancel of GTC orders for this MPID on this Session only 33 = Mass cancel of DAY orders for this MPID

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FIX Tag	FIX Name	Req'd	Details
			on this Session only 34 = Mass cancel of all orders for this MPID on this Session only and Security Symbol (class) 35 = Mass cancel of GTC orders for this MPID on this Session only and Security Symbol (class) 36 = Mass cancel of DAY orders for this MPID on this Session only and Security Symbol (class) 37 = Mass cancel of all orders for this Firm on this Session only Default = "0" when not present.
38	OrderQty	No	Not Required. No Validation if the tag is present. Valid values: 1 – 999,999
41	OrigClOrdID	Cond.	RequestType>0: Ignored RequestType=0 or missing: Required. ClOrdID of the targeted Order to cancel. Must be 30 characters or less.
54	Side	Cond.	RequestType>0: Ignored RequestType=0 or missing: Required. Side of order. Must match the original order. Valid values: 1 = Buy 2 = Sell.
167	SecurityType	Cond.	Identifies type of instrument. Valid value = OPT (Options) RequestType=31, 32 or 33: Ignored RequestType=34, 35 or 36: Required. RequestType=0 or missing: Required.
55	Symbol	Cond.	RequestType=31, 32, or 33: Ignored RequestType=34, 35 or 36: Required. The 6 character OCC Security Symbol (class) for an option. RequestType=0 or missing: Required. The 6 character Security Symbol (class) for an option. This value must match the original order.
60	TransactTime	Yes	Time request was initiated/released expressed in UTC (Universal Time Coordinated), also known as GMT. Format: YYYYMMDD–HH:MM:SS.uuu

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FIX Tag	FIX Name	Req'd	Details
200	MaturityMonthYear	Cond.	RequestType>0: Ignored RequestType=0 or missing: Required. Expiration month and year. Value must match the original order. Format: YYYYMM (For example, 201009 is an expiration of September 2010.)
205	MaturityDay	Cond.	RequestType>0: Ignored RequestType=0 or missing: Required. Expiration day of month, used along with MaturityMonthYear (200) to fully specify the maturity date for options. This value must match the original order. Format: DD (single digit allowed)
201	PutOrCall	Cond.	RequestType>0: Ignored RequestType=0 or missing: Required. Specifies whether the option is a put or a call. Must match the original order. Valid values: 0 = Put 1 = Call
202	StrikePrice	Cond.	RequestType>0: Ignored RequestType=0 or missing: Required. Strike price for an option, which must match the original order.
	Standard Trailer	Yes	

Points to note:
- ClOrdID in an Order Cancel Request must identify the cancel request uniquely. As a result, it cannot be the same as the ClOrdID of any order or replace.
- Upon receipt of a cancel request, Pearl responds with an Execution Report that has ClOrdID set to the ClOrdID of the cancel, OrigClOrdID set to the ClOrdID of the target order and OrdStatus and ExecType are both set to Pending Cancel(6).
- An order with a cancel pending must not be considered closed until Pearl sends an Execution message with a status indicating that the order is closed. For example, an Execution with ExecType = Cancelled, where ClOrdID refers to the ClOrdID of the cancel, and OrigClOrdID refers to the ClOrdID of the order.
- An order may have only one cancel pending at a time. Sending a second cancel while one is pending will result in the second cancel being rejected. Only after the first cancel is rejected can the firm send another cancel.
- An order may have been partially routed away when Pearl receives the Cancel Request. Pearl will immediately cancel contracts on the Pearl book and send an Execution Report in response. Tag 58 (Text) will contain the number of contracts canceled. Formatted "CxlQty:N" where N is a whole number.
- Upon receipt of a mass cancel request, Pearl will cancel each of the orders as per the request and send Execution report messages for each order that was canceled. If there are any orders that are not canceled due to them being in-flight on a separate FIX line, Firms are responsible to

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send separate cancels for them. Firms must not treat the request as a guarantee that all orders will be canceled in accordance with their book.

5.3 Order Cancel/Replace Request (MsgType = G)

The Pearl FIX Engine allows customers to replace orders. However, there are some fields such as ClientID and Symbol that cannot be changed on the replacement order. Refer to the table below for a complete list of fields in the Cancel/Replace Request message. Fields not listed below will be ignored.

FIX Tag	FIX Name	Req'd	Can Repl	Detalis
	Standard Header	Yes		MsgType = G
11	ClOrdID	Yes	Must	Unique ID of replacement order as assigned by the institution. Note that this identifier will be used in the ClOrdID field of the Cancel Reject Message if the replacement request is rejected. Uniqueness must be guaranteed within a single trading day (including GTC orders on the book from previous days) for an MPID regardless of Fix Session. Must be 30 characters or less.
38	OrderQty	Yes	Yes	The total intended order quantity. Valid value: 1 – 999,999. Max length 6.
40	OrdType	Yes	Yes	Order type of the replacement order. This value may be changed. Valid values: 1 = Market 2 = Limit
41	OrigClOrdID	Yes	N/A	ClOrdID of the targeted order when canceling or replacing an order.
44	Price	Cond	Yes	Price for limit orders (OrdType = 2) Format follows standard OCC clearing format where a combined total digits before and after the decimal is 8 or less. 4 digits before the decimal can have 4 after Valid range published via Technical Alert

Price should not be specified on market orders |
| 54 | Side | Yes | No | Side of order. Must match the original order. Valid values: 1 = Buy 2 = Sell |
| 55 | Symbol | Yes | No | The 6 character OCC Security Symbol (class) for an option. Value must match original order. |

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FIX Tag	FIX Name	Req'd	Can Repl	Detalis
58	Text	No	Yes	Additional information about the order. This value must be re-specified if it was on the original order and needs to be carried over.
59	TimeInForce	Yes	Yes	Specifies how long the order remains in effect. Valid replaces: DAY or GTC may be replaced to values DAY or GTC. Other replaces are rejected. Valid values: 0 = DAY 1 = GTC (Good Till Canceled)
60	TransactTime	Yes	Yes	Time request was initiated/released expressed in UTC (Universal Time Coordinated), also known as GMT. Format: YYYYMMDD-HH:MM:SS.uuu
77	OpenClose	Cond	Yes	Specifies if this order opens a position or closes a position. Required except when CustomerOrFirm set to 4 = Market Maker or 5 = Non-Member Market Maker Valid values: O = Open C = Close.
109	ClientID	Cond	No	For Pearl member Market Makers orders, MM can send their MPID. Must Match original order. Pearl Member MM can send their MPID in this tag in lieu of tag 440 (see notes section below)
167	SecurityType	Yes	No	Identifies type of instrument. Valid value = OPT (Options)
200	MaturityMonthYear	Yes	No	Expiration month and year. Value must match the original order. Format: YYYYMM (For example, 201009 is an expiration of September 2010.)
201	PutOrCall	Yes	No	Must match the original order. Valid values: 0 = Put 1 = Call
202	StrikePrice	Yes	No	Strike price for an option, which must match the original order.
203	CoveredOrUncovered	No	Yes	Specifies covered or uncovered options. If tag is absent, the value from target order is retained. Valid values: 0 = Covered 1 = Uncovered

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FIX Tag	FIX Name	Req'd	Can Repl	Detalis
204	CustomerOrFirm	Yes	No	Specifies the order origin type. Valid values: 0 = Priority Customer 1 = Firm 2 = Broker/Dealer 4 = Market Maker 5 = Non-Member Market Maker 8 = Non-Priority Customer
205	MaturityDay	Yes	No	Expiration day of month, used along with MaturityMonthYear (200) to fully specify the maturity date for options. Format: DD (single digit allowed)
439	ClearingFirm	Cond	No	Clearing Member Transfer Agreement. Required if value was on the original order and needs to be carried over. Provides CMTA information. Valid range: 1 – 99999
440	Clearing Account	Cond	No	OCC sub-account (Multi-account). This is a required value for Non-member MM orders. Must Match original order. Pearl Member MM can send their MPID in this tag in lieu of tag 109 It must be an UPPERCASE alphanumeric value, with a maximum of 5 characters. A value with up to 3 characters is generally used.
	Standard Trailer	Yes		

Points to note:
- Tags that are required and cannot be replaced must match the contents of the original order.
- Tags not listed in the Cancel/replace message above will be ignored.
- Increasing the OrderQty of the original order will result in the order losing it existing time priority in the book.
- An order may have only one cancel replace pending at a time. Sending a second cancel replace while one is pending will result in the second cancel replace being rejected. Only after the first cancel replace is accepted or rejected can the firm send another cancel replace.
- OrderQty may not be the actual open quantity of the new order. Pearl will subtract executed volume of the original (target) order from the OrderQty in the replace request and leave open any remaining contracts in the new order.
- If a cancel/replace is received when an order is routed away (partially or fully), Pearl will reject the cancel/replace. The original order will still be live.
- Pearl member Market Maker orders must be identified with their MPID. For flexibility, the MPID can be sent in either tag 440 or 109. When both tags have values, Pearl will validate them for equivalence and reject otherwise. The MPID on the replace order must match what was given on the original order.

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5.4 Don't Know Trade (MsgType = Q)

The Pearl FIX Engine **does not** accept a DK Trade message. If the firm has any questions or issues with a trade, please contact Pearl Trading Operations with the details.

5.5 Order Cancel Reject (MsgType = 9)

If any of the validations of a Cancel or a Cancel/replace request fail, Pearl responds with an Order Cancel reject message. One such example is if it is too late to cancel an order. Firms are always receiving parties for this message.

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = 9
11	ClOrdID	Yes	Unique order ID assigned by institution to the cancel request or to the replacement order.
39	OrdStatus	Yes	Status of order after the Cancel Reject function is applied.
41	OrigClOrdID	Yes	ClOrdID of the order that cannot be canceled or replaced. This value does **not** apply to the initial order of the day.
58	Text	Yes	Text describing error specified in Appendix C: **Error Code table** Format: 'Error Code': 'Description' Eg. 46: ClientID Mismatch
102	CxlRejReason	Yes	Code to identify reason for cancel rejection. Valid values: 0 = Too late to cancel 1 = Unknown order 2 = Broker Option (Details provided in Text tag, See Appendix C) 3 = Previous cancel or cancel/replace request is still pending
434	CxlRejResponseTo	Yes	Identifies the type of request in which Cancel Reject is the response. Valid values: 1 = Order Cancel Request 2 = Order Cancel/Replace Request
	Standard Trailer	Yes	

Points to note:
- Note that when a cancel or cancel/replace request is rejected, the target order is still live.

5.6 Execution Report (MsgType = 8)

The Pearl FIX Engine transmits execution reports (MsgType = 8) back to the Firm who sent the order.
The execution report message is used to:
- Confirm the receipt of an order
- Confirm changes to an existing order (i.e. accept cancel and replace requests)
- Relay order status information
- Relay fill information on working orders
- Reject orders
- Report post-trade fees calculations associated with a trade.

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = 8
1	Account	No	As specified on the order. Optional field.
6	AvgPx	Yes	Always filled with 0 (zero).
11	ClOrdID	Yes	Unique identifier of the order. This value uses the ID from the original order. Value must be 30 characters or less.
14	CumQty	Yes	Total number of filled options. Valid values: 0 – 999,999
17	ExecID	Yes	Unique identifier for each Execution Report message. Uniqueness is guaranteed within a single trading day.
18	ExecInst	No	Instructions for order handling on exchange. Will be the same value as entered in the order (if used). Valid values: f = ISO o = Auto Cancel on connection loss (Firm requesting Auto Cancel on Disconnect (ACOD) for this Order). If ACOD is requested either for the session or in the order, this tag will be populated in execution reports for ACOD applicable orders.
20	ExecTransType	Yes	Identifies the trade type. Valid values: 0 = New 3 = Status
31	LastPx	No	Price of the last fill. This field is not required for ExecTransType = 3 (Status). (the number of decimal places might vary and is not limited to 3).
32	LastShares	No	Quantity of bought/sold contracts on the last fill. This field is not required for ExecTransType = 3 (Status). Valid values: 0 – 999,999

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FIX Tag	FIX Name	Req'd	Details
37	OrderID	Yes	OrderID, as assigned by Pearl, is required to be unique for each chain of orders.
38	OrderQty	No	The number of contracts (total order quantity).
39	OrdStatus	Yes	Identifies the current status of an order. Valid values: 0 = New 1 = Partially Filled 2 = Filled 3 = Done for day 4 = Canceled 5 = Replaced 6 = Pending Cancel 8 = Rejected
40	OrdType	No	Order type that is specified on the order. Valid values: 1 = Market 2 = Limit
41	OrigClOrdID	No	ClOrdID of the canceled or replaced order. This is the target order of the previous request and **not** the initial order of the day.
44	Price	Cond	Price for limit orders (OrdType = 2) Format follows Price field as described in MsgType D & G.
54	Side	Yes	Side of order. Valid values: 1 = Buy 2 = Sell
55	Symbol	Yes	The 6 character OCC Security Symbol (class) for an option.
58	Text	Cond	Reject Reports (ExecType = 8) contain text describing error specified in Appendix C: Error Code table Format: 'Error Code':' Description' Eg. 46: ClientID Mismatch User requested Cancel and Replace with ExecType equal to "6" or "E" contain partial Canceled Quantity Format: CxlQty:'value' Eg. CxlQty:40 Unsolicited Canceled (ExecType = 4) will contain a freeform human readable reason for the cancel. (See Error Code 0 in Appendix C)
59	TimeInForce	No	Specifies how long the order remains in effect. Valid values: 0 = DAY

FIX Tag	FIX Name	Req'd	Details
			1 = GTC (Good Till Canceled)
			3 = IOC (Immediate or Cancel)
60	TransactTime	No	Time of execution/order creation expressed in UTC (Universal Time Coordinated), also known as GMT. Format: YYYYMMDD–HH:MM:SS.uuu
76	ExecBroker	No	Specifies order handling. Valid values: "DNR" = Do not route (Trade at Pearl or post to Pearl book. Never route away) **Default**: If this tag is absent, the order may be eligible for routing as per Pearl routing rules. "PO" = Post-Only (Day, Limit, DNR order which only trades as maker and never as a taker)
77	OpenClose	Cond	Specifies if this order opens a position or closes a position. Required except for Pearl member or Non-Member Market Maker orders Valid values: O = Open C = Close
103	OrdRejReason	No	The reason the order was rejected. Valid values: 0 = Broker Option (Details listed in Text Field; See Appendix C) 1 = Unknown Symbol 2 = Exchange Closed 3 = Order Exceeds Limit 4 = Too Late to Enter 5 = Unknown Order 6 = Duplicate Order (such as duplicate ClOrdID) 8 = Stale Order 11 = Unsupported Order Characteristic
150	ExecType	Yes	Identifies the type of execution report. Valid values: 0 = New 1 = Partially filled 2 = Filled 3 = Done for day 4 = Canceled 5 = Replaced 6 = Pending Cancel 8 = Rejected
151	LeavesQty	Yes	Number of open contracts for further execution. If the OrdStatus is Canceled or Rejected (no

FIX Tag	FIX Name	Req'd	Details
			longer active) then LeavesQty = 0, otherwise LeavesQty = OrderQty - CumQty.
167	SecurityType	No	The type of security. Valid values: OPT
200	MaturityMonthYear	No	Expiration month and year, as specified on the order. Format: YYYYMM (For example, 201009 is an expiration of September 2010.)
201	PutOrCall	No	As specified on the order. Valid values: 0 = Put 1 = Call
202	StrikePrice	No	Strike price for an option, as specified on the order.
204	CustomerOrFirm	No	Specifies the order origin type that is specified on the order. Valid values: 0 = Priority Customer 1 = Firm 2 = Broker/Dealer 4 = Market Maker 5 = Non-Member Market Maker 8 = Non-Priority Customer
205	MaturityDay	No	Expiration day of month, used in along with MaturityMonthYear (200) to fully specify the maturity date for options. Format: DD
207	SecurityExchange	Cond	Exchange ID (MIC code) of the Exchange on which this execution occurred when it occurs on an exchange other than Pearl. Example codes from http://www.iso10383.org/ Example Valid Values: "AMXO" = NYSE/AMEX Options "BATO" = BATS Options "EDGO" = EDGX Options Market "XBOX" = BOX Options "C2OX" = C2 Options "XCBO" = CBOE Options "XISX" = ISE Options "GMNI" = ISE Gemini Options "MCRY" = ISE Mercury Options "ARCO" = NYSE/ARCA Options "XNDQ" = Nasdaq Options Market "XPHO" = Nasdaq OMX PHLX Options "XBXO" = Nasdaq BX "XMIO" = MIAX Options

FIX Tag	FIX Name	Req'd	Details
			"EMLD" = MIAX Emerald Options "MXOP" = MEMX Options
1003	TradeID	Cond	The unique ID that identifies the trade at Pearl. Only available on Fill (ExecType 1 or 2) messages.
9730	AdditionalBillingParameters	Cond	For Order Executions (ExecType=1 or 2): A field containing additional (not contained elsewhere in Execution report or Order) parameters required for Pearl billing. See Appendix D: Additional Billing Parameters for details. For other Execution reports (ExecType is not 1 or 2): Tag will not be sent.
	Standard Trailer	Yes	

Points to note:

- Order Rejects: If field level validations fails, FOI will send a session reject. Cancel and cancel/replace rejections are sent in the form of cancel reject message. Most other validation failures will result in reject via an Execution report message. If a validation failure does not fit into any of the above mentioned categories, Pearl sends a Business reject message. When rejecting an order the FIX engine will send back an Execution Report (MsgType = 8) with execution type set to 'Rejected' (ExecType = 8).
- Cancel/Replace Responses: The Pearl FIX Engine sends acknowledgements of cancels and cancel/replaces using Execution Report (MsgType='8') message.
- Unsolicited Cancel Reports: Pearl can send unsolicited cancel reports under circumstances listed in Pearl rule book. To do this Pearl would send an Execution Report (MsgType=8') with ExecType='4' (Canceled). Pearl will set the OrdRejReason on the order for the cancel. Also Pearl would not fill in the OrigClOrdID field.
- Done for the Day messages (NothingDone): For orders that remain open past the end of trading day, Pearl can send a "done for day" message back to preconfigured firms telling them the status of the order. Open DAY orders expire and are thrown out. **Open GTC orders for active symbols are reentered into the system on the next trading day**. Pearl would send an Execution Message (MsgType=8') with the ExecType='3' (Done for Day). The LeavesQty should reflect the number of contracts that are open on the order.

5.7 Order Status Request (MsgType = H)

Firms can send Order Status Request message to check on the status of their orders. In response, Pearl sends an Execution Report with indicating (ExecTransType = 3) that this is the status for the requested order.

The following table contains the fields for the Order Status Request message.

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = H

FIX Tag	FIX Name	Req'd	Details
11	ClOrdID	Yes	The ClOrdID of the order being requested. Must be 30 characters or less.
54	Side	Yes	Order side, which must match the original order. Valid values: 1 = Buy 2 = Sell
55	Symbol	Yes	The 6 character OCC Security Symbol (class) for an option.
167	SecurityType	No	Valid value: OPT
	Standard Trailer	Yes	

5.8 User Notification (MsgType = CB)

Firms configured to use Risk Protection Monitoring will receive User Notification communicating the status of Risk checks. Tag 9003 (Event Type) is used to determine the reason for the notification.

The following table contains the fields for the User Notification message.

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = CB TargetSubID will not be provided.
926	UserStatus	Yes	6 = other
60	TransactTime	Yes	Time of event creation expressed in UTC (Universal Time Coordinated), also known as GMT.
9000	MPID Group ID	Yes	Firm Assigned Group ID Alphanumeric, Max length 32
9001	Metric ID	Yes	Metric ID for the group Alphanumeric, Max length 32
9011	Routing ID	Yes	Firm assigned Routing ID Alphanumeric, Max length 32
9002	MetricType	Yes	"C" = Rate of Executed Order Contracts "O" = Rate of New/Replace Orders Received '*' (asterisk) = New value masked for backward compatibility. Upgrade to new version to see new values.

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FIX Tag	FIX Name	Req'd	Details
9003	Event Type	Yes	"S" = Period Status/Pulse Notification "T" = Safeguard Trigger "R" = Reset Risk Metric "W" = Warning Only "D" = "Metric Deleted" "A" = "Metric Added" "P" = "Metric Paused" "U" = "Metric Un-Paused" '*' (asterisk) = New value masked for backward compatibility. Upgrade to new version to see new values.
9004	MessageID	Yes	Unique ID assigned by Pearl for this event. Can be used to order solicited messages. Unsolicited message will have a value of zero(0) (numeric)
9005	Configured Counting Time Period	Yes	Configured time period in milliseconds which is used to consider events for this Metric ID (numeric)
9006	Configured Max Quantity	Yes	Configured max threshold of counted items for the Configured Counting Time interval for this Metric ID. Defines rate for the counting time period. (numeric)
9007	Current Quantity	Yes	Current counted quantity at the time of the event for this Metric ID. (numeric)
9008	Max Peak Quantity	Yes	Max peak for Current Quantity during pulse interval
9009	Percentage Level	Yes	Current Percentage for the Counted Quantity in relationship to Configured Max Quantity. Valid values from 0 to 255%. Actual percentages greater than 255 will be reported as the max (255)
9010	Protection Type	Yes	"B" = Block all MPIDs for this MPID Group ID "M" = Block all MPIDs for this MPID Group ID and also mass-cancel all day orders for MPIDs in the group "W" = Warning only '*' (asterisk) = New value masked for backward compatibility. Upgrade to new version to see new values.
	Standard Trailer	Yes	

Points to note:
- Event Types (9003) are treated as solicited (T, R, W, D, A, P, U) or unsolicited (S). See configuration section how to control what types are published on the session.
- Status Notifications are sent periodically on a best effort basis at one minute intervals. Intra-day configurations may delay updates one interval.

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- Pearl will deliver warnings on a best effort basis. If a metric rapidly produces multiple warnings, initial or older warning levels may be dropped. The latest, or most current, warning will be delivered. If a new Event Type is published using an older App Protocol version, it will be mapped to a '*' (asterisk) for backward compatibility purposes. They will be published as unsolicited or solicited based on the new event type.

5.9 Business Reject (MsgType = j)

The Business Message Reject <j> message is used to reject an application-level message which fulfills session-level rules and cannot be rejected via any other means. For example, receipt of a valid unsupported business level message type will result in a business reject (j).

Note that if the message fails session level checks (e.g. incorrect body length, required tag missing, etc.), a session level reject (3) will be issued.

FIX Tag	FIX Name	Req'd	Details
	Standard Header	Yes	MsgType = j
45	RefSeqNum	Yes	MsgSeqNum of rejected message
372	RefMsgType	Yes	MsgType of the FIX message being rejected
379	BusinessRejectRefID	Yes	RefID of the message being rejected. This is the ExecID in case an Execution report is being rejected and this is the ClOrdID in case an Order/Cancel message is being rejected.
380	BusinessRejectReason	Yes	Code to identify reason for Business rejection. Valid values: 0 = Other 1 = Unknown ID 2 = Unknown Security 3 = Unsupported Message Type 4 = System not available 5 = Required or conditional tag missing 6 = Matching engine for this symbol is not available
58	Text	Cond	Required if BusinessRejectReason = 0
	Standard Trailer	Yes	

Appendix A: Table of Permitted Origins, Types and Prices Table

Refer to the Pearl rules for further information.

Appendix B: MIAX Pearl Options Order Types

Order Type	FIX Tags	Description
Market Order	OrdType (40)=1 (market). Price (44) must not be specified.	An order to buy or sell that is to be executed at the best price obtainable.
Limit Order	OrdType (40) = 2 (limit). Price (44) must contain a price.	An order to buy or sell at a specified price or better. A marketable limit order is a limit order to buy/sell at or above/below the consolidated best offer/bid for the security.
IOC (Immediate Or Cancel)	OrdType (40) = 1 (market) or 2 (limit) TimeInForce (59) = 3	A limit or market order that is to be executed in whole or in part as soon as such order is received. The portion not so executed is to be treated as cancelled. IOC's only execute on Pearl and do not route.
ISO Intermarket Sweep Order (available under RegNMS)	ISO IOC order OrdType (40) = 2 ExecInst (18) = f TimeInForce (59) = 3	-ISO IOC – Sweep the Pearl Book to the price, cancel any remaining balance, and ignore all away market quotes. ISO Orders will interact with all resting orders and quotes. ISO Orders are never routed out.
Good Till Cancel	TimeInForce(59)=1(GTC)	Orders that will stay live until cancelled by the client.
Post-Only Order	ExecBroker(76)="PO" OrdType (40) = 2 (limit) TimeInForce(59)=0(DAY)	Designates an order to trade as "Maker" while resting on the book and never as a "Taker"

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Appendix C: Error Code table

Order and cancel rejects will be identified with the below error code in the Text Tag following format:
'Error Code':' Description' Eg. 15: Invalid Price

FIX specification states the Text tag is a free format text string. Pearl will provide as much information as possible but reserves the right to add new errors codes or change meaning as required.

Code	Description	Code	Description	Code	Description
0	Reserved for free form text	34	Invalid CoveredUncovered	65	Missing TimeInForce
1	Unknown Symbol	35	Invalid CustomerOrFirm	66	Missing CustomerOrFirm
2	Exchange Closed	36	Invalid OpenClose	67	Missing TransactTime
		37	Invalid Account	68	SenderSubID Mismatch
4	Too Late To Enter			69	Symbol Mismatch
5	Unknown Order			70	Side Mismatch
6	Duplicate Order	40	Invalid ClientID	71	TransactTime Mismatch
8	Stale Order	41	Invalid MaturityMonthYear	72	MaturityMonthYear Mismatch
11	UnsupportedOrderCharacteristic	42	Invalid Text	73	MaturityDay Mismatch
12	User Requested Cancel	43	Invalid TransactTime	74	PutOrCall Mismatch
13	IOCOrder	44	Invalid PutOrCall	75	StrikePrice Mismatch
14	Timeout	45	Invalid MaturityDay	76	CustomerOrFirm Mismatch
15	Supervisory	46	Invalid StrikePrice	77	ClearingFirm Mismatch
		47	Missing ClearingAccount	78	ClearingAccount Mismatch
17	System Unavailable	48	Missing ClearingFirm	79	ClientID Mismatch
18	Invalid SenderSubID	49	Missing ClOrdID	80	AllocAccount Mismatch
19	Invalid OnBehalfOfCompID	50	Missing OrigClOrdID	81	RoutingPolicy Mismatch
20	Invalid OnBehalfOfSubID	51	Missing OrderQty	82	Account Mismatch
21	Invalid ClOrdID	52	Missing Side	83	MaxOpenOrders Exceeded
22	Invalid OrigClOrdID	53	Missing SecurityType	84	MaxOrderSize Exceeded
23	Invalid Side	54	Missing Symbol	85	MaxOpenContracts Exceeded
24	Invalid SecurityType	55	Missing MonthYear	86	Order Routed Away
25	Invalid Option	56	Missing PutOrCall	87	AuctionID Invalid For TIF
26	Invalid ExecInst	57	Missing StrikePrice	88	Price On Market Order

27	Invalid ClearingDetails	58	Missing MaturityMonthYear	89	SenderSubID Not An EEM
28	Invalid OrderQty	59	Missing MaturityDay	90	Unknown Option
29	Invalid OrdType			91	Risk Protection
30	Invalid Price	61	Missing ClientID	92	Option Restricted To Closing
31	Invalid TimeInForce	62	Missing OpenClose	93	TooLateToCancel
32	Invalid ExecBroker	63	Missing Account	94	Cxl Or Replace Pending
33	Invalid OptionPosition	64	Missing OrdType	95	Auto Canceled on Disconnect

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Appendix D: Additional Billing Parameters

Pearl will provide parameters used by Pearl for billing in tag 9730 of *execution report* message for all executions (trades). The following table gives the breakup of that field:

Position	Number of Characters	Parameter Name	Description
1	1	OrderOrigin	Origin (CustomerOrFirm) of the firm's side of the order
2	1	ContraOrigin	Origin (CustomerOrFirm) of the opposite side of this trade
3	1	ClassType	Indicates whether the underlying is being billed as maker/taker. 'M' = Maker/Taker '*' (asterisk) = New value masked for backward compatibility. Upgrade to new version to see new values.
4	1	LiquidityIndicator	'M' = Maker 'T' = Taker 'N' = Not Applicable '*' (asterisk) = New value masked for backward compatibility. Upgrade to new version to see new values.
5	1	PbboMPV	'P' = PennyAlways 'N' = Penny/Nickel 'D' = Nickel/Dime
6	1	MarketState	'N' = Normal Trading 'O' = Opening '*' (asterisk) = New value masked for backward compatibility. Upgrade to new version to see new values.
7	1	FreeTradingCondition	'1' = Regular, '2' = ABBOUncrossed, ' ' = Not Applicable (space) '*' (asterisk) = New value masked for backward compatibility. Upgrade to new version to see new values.
8	6	RoutedOrderQty	Total Routed Away Quantity. Populated when the trade is executed at away exchange. Format: Fixed length integer prepended with zero I.E. 000012
14	1	ContraTimeInForce	0 = DAY 1 = GTC (Good Till Canceled) 3 = IOC (Immediate or Cancel)

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			'*' (asterisk) = New value masked for backward compatibility. Upgrade to new version to see new values.

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Appendix E: Contact List

Please visit Pearl website at http://www.MIAXOptions.com for obtaining most up-to-date contact list and other such information.

Appendix F: Revision History

Revision Date	Version	Description
Sep 30, 2016	1.0	First release.
Jun 10, 2018	1.1	Message type= 8 – Support for MIAX Emerald market. Added a clarification that Market Maker orders receive Self-trade prevention. This will now be at the firm level across all MPIDs of the firm.
Oct 21, 2020	1.1b	Added details for ACOFF feature.
Dec 14, 2020	1.1c	Covered additional system failure scenarios and renamed the feature as ACOSF.
May 23, 2023	1.1d	SecurityExchange: Added 'MXOP'(MEMX Options)

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