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FUNDAMENTAL INTERACTIONS NEUTRON DIRECT

Order Routing FIX Specifications

Version 1.1

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INTRODUCTION

OVERVIEW

The information in this Fundamental Interactions Neutron Direct FIX document describes the adaptation of the standard FIX 4.2 for vendors and subscribers to communicate with the Fundamental Interactions Neutron Direct quotation and execution platform. FIX 4.2 tags, as described in detail on the Financial Information Exchange Protocol Committee website, www.fixprotocol.org as well as custom tags are used extensively in this document and the reader should familiarize themselves with the latest updates to this release.

If an application message in Financial Information Exchange Protocol version 4.2, or previous FIX versions, is not included in this document, the message is ignored by MPID.

THE FUNDAMENTAL INTERACTIONS NEUTRON DIRECT PLATFORM

MPID is a venue for market participants to post orders and firm quotes in the trading system.

FUNDAMENTAL INTERACTIONS NEUTRON DIRECT ROUTING

Orders will be compared to the external venue BBO data and routed to the venue displaying the best price for execution. Subscribers identify their orders as routable. Routable orders are a Directed order where a venue is selected and routed to the venue.

HOURS OF OPERATION

The following table identifies the hours of operations. The Fundamental Interactions Neutron Direct operational hours will be 8:00 am to 5:00 pm ET. The table below also indicates when each trading service are available.

Market Centers	Sessions	Hours	Descriptions
MPID	Pre-Market	XXXXXX	Accept orders from XXXX am to XXXX am
	Normal Market Hours	XXXXX	Trading is available
	After Hours	XXXXXX	

SUPPORTED ORDER TYPES

Fundamental Interactions Neutron Direct supports a variety of order types whether supported by the venue or synthetic to automate trading preferences for subscribers. The Fundamental Interactions Neutron Direct support standard order types as well as more advanced types.

Order Type	Description
Directed Orders	A Directed Order is when instructions are given; the firm determines the routing destination. Orders can be directed to other exchanges, member firms, and or special-order types like a Smart Router that sends orders to external destinations.
Limit Order	A limit order is an order to buy or sell a stock at a specific price or better. A buy limit order can only be executed at the limit price or lower, and a sell limit order can only be executed at the limit price or higher. A limit order can only be filled if the stock's market price reaches the limit price.
Primary Peg	The primary peg order follows the best bid, when buying a security, and the best offer when selling a security. Pegged to the Best Bid and Best Offer on the same side of the market Buy orders are pegged to the bid, with or without an offset. Sell orders are pegged to the offer, with or without an offset.

SYMBOLOLOGY

For inbound FIX message to MPID, we expect customer to send root symbol in tag 55 suffix in tag 65.

Security Categorization	CMS Suffix	NASDAQ/B Integrated Platform Suffix
TEST symbol	TEST	~

CONNECTING TO MPID & MPID FIX

PHYSICAL CONNECTION

Connections to Fundamental Interactions Neutron Direct FIX are established through direct connections provided by established financial extranets or layer II connectivity providers or hosting facility cross-connects. Fundamental Interactions Neutron Direct staff will assign IP address and port numbers for connectivity to MPID FIX through your communications provider.

LOGIN CREDENTIALS AND CONNECTION PROCEDURES

IP address, port number, SenderCompID and TargetCompID are required to establish a connection to MPID and MPID FIX. The ID assigned to each subscriber is used in the client message header as SenderCompID. The TargetCompID for each message submitted to Fundamental Interactions Neutron Direct FIX must contain the value "MPID".

IP Address	Assigned by Staff	Validated during initial connection
Port	Assigned by Staff	Validated during initial connection
SenderCompID	Assigned by Staff	Validated upon TCP connectivity
TargetCompID	Always "MPID"	Validated upon TCP connectivity

1. The client establishes a TCP connection to MPID FIX through a proprietary or commercial FIX engine using the assigned destination IP address and port.
2. The incoming IP address and port are examined, and connectivity is established upon successful validation. The connection is refused if the credentials do not pass validation.
3. The logon message is the first message MPID FIX expects to receive after TCP connectivity. (See the format of the Logon message in section 3 below)
4. SenderCompID and TargetCompID received in the logon header message is examined and connectivity to the MPID FIX gateway is established upon validation. The TCP connection is terminated if these credentials do not pass validation.
5. MPID FIX responds with a Logon acknowledge message upon establishing a successful session.

FIX MESSAGES

This section outlines the FIX messages, how they are supported, and to what extent the business data is translated within the FIX Gateway.

FIX MESSAGES SUPPORTED

The following FIX messages are supported by the FIX Gateway:

Message Category	Message Name	Message Type	Message Direction	Message Function
Administrative	Heartbeat	O	Inbound	Monitors FIX gateway status during periods of inactivity.
			Outbound	
	Logon	A	Inbound	Identifies and authenticates a user/member establishing a connection to the FIX gateway.
			Outbound	
	Test Request	1	Inbound	Verifies communications line and other FIX gateway parameters.
			Outbound	

	Resend Request	2	Inbound Outbound	Initiates a re-transmission of messages from the FIX gateway.
	Reject	3	Inbound Outbound	Rejects messages that cannot be processed by the FIX gateway.
	Sequence Reset (Gap Fill)	4	Inbound Outbound	Message has two modes: Sequence Reset – Gap Fill and Sequence Reset-Reset. Sequence Reset Gap Fill - used to fill or mark the gap Sequence Reset – Reset - used to force synchronization
	Logout	5	Inbound Outbound	Used to terminate a FIX session.
	New Order – Single	D	Inbound	Submits a market or limit priced bid or offer order for a security listed within a market. May contain time in force terms such as day, open, good til date.
	Execution Report	8	Outbound	
	Don't Know Trade	Q	Inbound	Rejects an execution report that was processed and sent by the FIX gateway.
	Order Cancel / Replace Request	G	Inbound	Request message to change the details of an existing order.
	Order Cancel Request	F	Inbound	Request to cancel an order.
	Order Cancel Reject	9	Outbound	Reject message for an Order Cancel / Replace Request or Order Cancel Request that cannot be processed by the FIX gateway.
	Order Status Request	H	Inbound	Request for querying the details of an order.

	Business Message Reject	j	Outbound	Rejects any message that cannot be processed by the FIX gateway and is cannot be rejected via another message.
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CUSTOM FIX TAGS

MPID FIX has defined the following list of FIX tags that extend the FIX 4.2 protocol.

Tag	Field Name	Req'd	Comments
43210	Order Destination	No	MPID specific tag. If present, indicate order is a directed order to venue. If not present, indicate order is staged in MPID. Available value:
43211	Execution Venue	No	MPID specific tag. Specify where the trade happens, can be different from 43210, for example, "MPID" indicates an the external venue
43212	Execution Contra Broker	No	MPID specific tag. Indicate who your contra broker here is. If it is a internal cross, it will carry customer's own firm id
43214	Liquidity Indicator	No	If available from venue, carry venue's raw liquidity indicator. For Internal crossed trade, four possible values, 'P', provided liquidity 'T', took liquidity
43226	Attributable	o	MPID specific tag. Specified if an order is to be entered as Attributable Market Maker Quote <ul style="list-style-type: none"> • Set to 'Y' • Default is 'N'

FIX MESSAGE HEADER & TRAILER

The message header and message trailer prefix and suffix all FIX messages. They contain the common information to uniquely identify and route the messages. Please refer to the description of each supported message to determine the required header and footer tags.

MESSAGE HEADER

Tag	Field Name	Req'd	Comments
8	BeginString	Yes	"FIX.4.2"
9	BodyLength	Yes	(Always unencrypted, must be second field in message)
35	MsgType	Yes	(Always unencrypted, must be third field in message)
49	SenderCompID	Yes	Provided by MPID system administrator, must be specified in all FIX messages to MPID and it will be echoed back in TargetCompID in all FIX messages to customers.
56	TargetCompID	Yes	Provided by customer, always echoed back in SenderCompID in all FIX messages to customers.
115	OnBehalfOfCompID	No	Required for service bureau connection
34	MsgSeqNum	Yes	(Can be embedded within encrypted data section.)
43	PossDupFlag	No	Always required for retransmitted messages, whether prompted by the sending system or as the result of a resend request. (Can be embedded within encrypted data section.)
97	PossResend	No	Ignored by MPID
52	SendingTime	Yes	Required
122	OrigSendingTime	No	Required for message resends. If data is not available set to same value as SendingTime (Can be embedded within encrypted data section.)

MESSAGE TRAILER (ALL)

All messages are to contain the following required tags in the trailer.

Tag	Field Name	Req'd	Comments
10	Checksum	Yes	(Always unencrypted, always last field in message)

DROP COPY SESSIONS

The FIX Gateway offers Drop Copy sessions which provide copies of Execution Report messages that were originally sent to other FIX sessions from the same firm. These Drop Copy sessions must be pre-configured by Market Operations, and no special logon is required. All Administrative messages are supported on a Drop Copy session, and retransmission functions as per a regular FIX session.

When a Drop Copy session copies out an Execution Report to a client, this message will be indicated as a copy with CopyMsgIndicator = Y, as well as the OnBehalfOfCompID field providing the CompID of the FIX session to which the message was originally sent.

Execution Report messages where ExecType = 8 (Rejected) will not be copied out by a Drop Copy session. Any attempt by a client to submit an Application message on a Drop Copy session will be rejected by the server.

ADMINISTRATIVE MESSAGES

The administrative messages are designed to meet the utility needs of the protocol. As a rule they contain no business information and consequently are handled internally within the FIX gateway. All administrative messages are supported.

Message	MsgType	Comments
Logon	A	This is sent after connection to identify and authenticate the customer and to establish a FIX session.
Heartbeat	0	Sent by FIX servers at predefined interval during login in tag 108.
TestRequest	1	This message will be sent if data has not been received for a within the specified HeartBeat interval.
ResendRequest	2	Notify the opposite party to resend messages that may have been missed.
Reject Message	3	Used in response to a message that could not be processed
Sequence Reset	4	Used to reset the FIX session sequence number
Logout	5	This is sent by the client to terminate the FIX session and perform a clean disconnect.

HEARTBEAT (MSGTYPE = 0)

The heartbeat message should be sent if agreed upon HeartbeatInterval has elapsed since the last message sent. If any proceeding HeartbeatInterval a Heartbeat message need not be sent.

LOGON (MSGTYPE = A)

The logon message identifies and authenticates the user or member and establishes a connection to the FIX Gateway.

The FIX gateway accepts Logon messages as per the FIX specification. Further, the FIX gateway supports the logon sequence required for session authentication.

After a successful logon as described in the specification the FIX gateway will:

- 1 Initiate retransmission processing via a resend request if the Logon sequence number is greater than the value expected

- 2 Initiate logout processing via a Logout message with an appropriate error message, then waits for a confirming Logout before disconnecting if the Logon sequence number is less than expected. If the confirming Logout has not been received within a short period of time the session will be disconnected.
- 3 Handle retransmission requests
- 4 Initiate a Logon using the SenderCompID in the message header.
- 5 Will forwarded to the FIX client messages that are waiting in the outbound queue
- 6 Begin regular message communication.

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = A
108	HeartBtInt	Yes	Heartbeat interval in seconds
	Standard Trailer	Yes	

TEST REQUEST (MSGTYPE = 1)

This message requests the return of a heartbeat message and verifies the communications line and other FIX parameters.

Inbound test request messages result in the appropriate heartbeat response.

If a Heartbeatinterval + 1 second have elapsed since the last message received, a Test Request should be issued. If another Heartbeatinterval + 1 second go by without receiving a message, the TCP connection should be dropped.

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = 1
112	TestReqID	Yes	Identifier included in Test Request message to be returned in resulting Heartbeat
	Standard Trailer	Yes	

RESEND REQUEST (MSGTYPE = 2)

The resend request message initiates the retransmission of messages. The FIX client or Gateway may generate a resend request when a message sequence number gap is detected.

A Resend Request message should be processed even if it is received ahead of sequence. Only after resending the request range (all marked PossDup= "Y", including gap fills) should Resend Request issued in the opposite direction.

Tag	Field Name	Req'd	Comments
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35	Standard Header	Yes	MsgType = 2
7	BeginSeqNo	Yes	Message sequence number of first record in range to be resent
16	EndSeqNo	Yes	Message sequence number of last record in range to be resent. If request is for a single record BeginSeqNo = EndSeqNo. If request is for all messages subsequent to a particular message, EndSeqNo = 0

REJECT (MSG TYPE = 3)

This message is used by the FIX Gateway to reject messages that violate session level rules and are unable to be processed. The gateway checks inbound messages for the presence of its required tags. It also validates the message type tag. In the case where the message type is missing (tag 35 on the inbound message), the reject message issues a value of "Unknown" in tag 58, as the FIX gateway is unaware of what the message is.

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = 3
45	RefSeqNum	Yes	MsgSeqNum of rejected message
58	Text	No	Where possible, message to explain reason for rejection

SEQUENCE RESET (MSGTYPE = 4)

This message is used to reset the incoming sequence number of the opposing side. This message supports two modes:

1. Sequence Reset-GapFill - GapFillFlag=Y
2. Sequence Reset-Reset - GapFillFlag=N (only used to recover from Disaster)

The GapFill can be used to mark a place of a message(s) or administration messages that are not being resent. To view the complete functionality of the Sequence Reset (Gap Fill) message refer to the FIX protocol.

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = 4
123	GapFillFlag	No	Y=Gap fill beginning at NewSeqNo N=NewSeqNo is ignored – manual recovery attempted
36	NewSeqNo	Yes	Next requested sequence number
	Standard Trailer	Yes	

LOGOUT (MSGTYPE = 5)

The Logout message initiates or confirms the termination of a FIX session.

The FIX gateway will receive and generate logout messages as required by the FIX Protocol. The gateway follows the prescribed sequence of messages for the proper termination of the session.

Messages received by the gateway after the client logs out are stored in a log file for transmission to the client once the client logs in again within the same trading day. The messages to be transmitted are dependent on the sequence number reconciliation that occurs on a logon handshake.

Upon receipt of a Logout message:

1. A confirming logout message will be sent by the gateway to the client; then,
2. The session will be disconnected.

The FIX gateway should never initiate a logoff except when a severe error has occurred.

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = 5
58	Text	No	Free format text string (Note: this field does not have a specified maximum length) If the Logout message has been sent by the the FIX gateway, then this field will contain the text "Session closed".
	Standard Trailer	Yes	

Note: Logout is not required.

APPLICATION MESSAGES – CUSTOMER TO MPID

NEW ORDER – SINGLE (MSGTYPE = D)

This message is used to submit an order to the trading system for processing.

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = D
11	ClOrdID	Yes	Unique identifier of the order. Must be unique for each session, max 32 chars.
1	Account	No	Optional identifier from customer, will be passed back in Execution Report Account mnemonic as agreed between broker and institution.
18	ExecInst	No	Can contain multiple instructions, space delimited. 'H' = Hidden 'M' = Midpoint Peg 'R' = Primary Peg

			For directed order to venue, accepts values specified in venue's spec, but not listed above.
110	MinQty	No	Minimum quantity of an order to be executed.
111	MaxFloor	No	The quantity to be displayed. Required for reserve orders. On orders specifies the qty to be displayed, on execution reports the currently displayed quantity.
55	Symbol	Yes	Ticker symbol. Common, "human understood"
65	SymbolSfx	No	See explanation in Symbology section
54	Side	Yes	'1' = Buy '2' = Sell '5' = ShortSale
38	OrderQty	Yes	Number of shares ordered. This represents the number of shares for equities
43229	FractionBase	Y	If fraction is 100, qty field = 1 means, it is 0.01 If fractionbase is
40	OrdType	Yes	'1' = Market '2' = Limit 'P' = Peg Order *Pegged requires ExecInst 18=M or R
44	Price	No	Required for limit OrdTypes
59	TimeInForce	No	'0' = DAY (Expires at end of market day.) '3' = IOC (Immediate-Or-Cancel) '5' = GTX (Expires at end of extended day) '6' = GTD (Expires at specified ExpireTime) For directed order to venue, accepts values specified in venue's spec, but not listed above.
114	LocateReqd	No	Optional, processed for Sell Short or Sell Short Exempt N=Client affirms ability to borrow Y= Client does not affirm ability to borrow, results in a reject
126	ExpireTime	No	Required if TimeInForce = GTD GMT time
168	EffectiveTime	No	Specify the starting time of the order GMT time
211	PegOffset	No	Representing a price offset, which can be mathematically

			added to a "Price". The number of decimal places is two places.
47	Capacity	No	<p>'P' = Principal 'A' = Agency</p> <p>If not present, will use default account value</p> <p>For directed order to venue, accepts values specified in venue's spec, but not listed above.</p>
43210	Order Destination	No	<p>MPID specific tag.</p> <p>If present, indicate order is a directed order to venue. If not present, indicate order is staged in MPID.</p> <p>Available value: 'ATS 1' = Venue 1 "ATS 2" = Venue 2 ?ATS 3" = Venue 3</p>
43226	Attributable	No	<p>MPID specific tag.</p> <p>Specified if an order is to be entered as Attributable Market Maker Quote</p> <ul style="list-style-type: none"> • Set to 'Y' • Default is 'N'
	Standard Trailer	Yes	

ORDER CANCEL REQUEST (MSGTYPE = F)

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = F
41	OrigClOrdID	Yes	ClOrdID of the previous order
37	OrderID	No	Unique identifier of most recent order as assigned by broker.
11	ClOrdID	Yes	Unique ID of cancel request as assigned by the institution.
55	Symbol	Yes	
65	SymbolSfx	No	
54	Side	No	<p>'1' = Buy '2' = Sell</p>

			'5' = ShortSale
38	OrderQty	No	
58	Text	No	
	Standard Trailer	Yes	

ORDER CANCEL/REPLACE REQUEST (A.K.A. ORDER MODIFICATION REQUEST) (MSGTYPE = G)

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = G
37	OrderID	No	Unique identifier of most recent order
41	OrigClOrdID	Yes	ClOrdID of the previous order
11	ClOrdID	Yes	Unique identifier of replacement order as assigned by institution.
1	Account	No	Account mnemonic as agreed between broker and institution.
18	ExecInst	No	Can contain multiple instructions, space delimited.
110	MinQty	NO	
111	MaxFloor	No	
55	Symbol	Yes	Must match original order
65	SymbolSfx	No	
54	Side	Yes	Must match original side.
38	OrderQty	Yes	
40	OrdType	Yes	
44	Price	No	Required for limit OrdTypes.
59	TimeInForce	No	Absence of this field indicates Day order
126	ExpireTime	No	Required if TimeInForce = GTD
168	EffectiveTime	No	Specify the starting time of the order GMT time
47	Capacity	No	
	Standard Trailer	Yes	

APPLICATION MESSAGES – MPID TO CUSTOMER

EXECUTION REPORT (DROP COPY) (MSGTYPE 8)

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = 8
37	OrderID	Yes	MPID system assigned order ID
11	ClOrdID	No	Copied from Customer's request
41	OrigClOrdID	No	Copied from Customer's request
17	ExecID	Yes	MPID assigned execution ID
20	ExecTransType	Yes	
19	ExecRefID	No	Required for Cancel and Correct ExecTransType messages
150	ExecType	Yes	
39	OrdStatus	Yes	0=New 1= PartiallyFilled 2=Filled 3=DoneForDay 4=Canceled 5=Replaced 6=PendingCancel 7=Stopped 8=Rejected A=PendingNew C=Expired E=PendingReplace
1	Account	No	Copied from Customer's request
55	Symbol	Yes	Based on customer's input. If customer uses NASDAQ/B format in tag 55, then we send back same thing to customer
65	SymbolSfx	No	
54	Side	Yes	'1' = Buy '2' = Sell '5' = ShortSale (client affirms ability to borrow)
38	OrderQty	Yes	

40	OrdType	No	'1' = Market '2' = Limit 'P' = Peg Order
44	Price	No	Price per share
211	PegDifference	No	Representing a price offset, which can be mathematically added to a "Price". The number of decimal places is two places.
59	TimeInForce	No	
126	ExpireTime	No	
18	ExecInst	No	Can contain multiple instructions, space delimited.
47	Capacity	No	
32	LastShares	Yes	Quantity of shares bought/sold on this (last) fill.
31	LastPx	Yes	Price of this (last) fill.
151	LeavesQty	Yes	Amount of shares open for further execution.
14	CumQty	Yes	Currently executed shares for chain of orders.
6	AvgPx	Yes	Calculated average price of all fills on this order.
43211	Execution Venue	No	MPID specific tag. Specify where the trade happens, can be different from 43210, for example "MPID" indicates a displayed market.
43212	Execution Contra Broker	No	MPID specific tag. Indicate who your contra broker here is. If it is a internal cross, it will carry customer's own firm id
43214	Liquidity Indicator	No	If available from venue, carry venue's raw liquidity indicator. For Internal crossed trade, four possible values, 'P', provided liquidity 'T', took liquidity
58	Text	No	Optional free style text message
	Standard Trailer	Yes	

ORDER CANCEL REJECT (MSGTYPE =9)

Tag	Field Name	Req'd	Comments
35	Standard Header	Yes	MsgType = 9
37	OrderID	Yes	
11	ClOrdID	Yes	Unique order id assigned by institution to the cancel request or to the replacement order.
41	OrigClOrdID	Yes	ClOrdID which could not be canceled/replaced. ClOrdID of the previous order (NOT the initial order of the day) when canceling or replacing an order.
39	OrdStatus	Yes	OrdStatus value after this cancel reject is applied.
102	CxlRejReason	No	
58	Text	No	Optional explanation message
	Standard Trailer	Yes	



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