CBOE

CBOE FIX Protocol Support

Version 9.0.2

Volume 3A: FIX 4.2 Session Layer

Programmer's guide to the CBOE FIX 4.2 Service session layer

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15 July 2011

Document #[FIX-03A]

Production Release Update

Front Matter

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Portions of this document have been taken from the Fix 4.2 Specification, which is property of FIX Protocol Ltd. (http://www.fixprotocol.org). The FIX 4.2 Specification is property of FIX Protocol Ltd.

Change Notices

The following change notices are provided to assist users of the CBOE FIX Services in determining the impact of changes to their applications.

Date	Version	Description of Change
15 Jul 2011	9.0.2	No changes
29 Apr 2011	9.0.1	Noted in the Logon Message field, ConcurrentOrder/QuoteIndicator[9192], that the concurrent threading model is now the standard.
14 Jan 2011	9.0	Modified the existing Logon message, *MsgType[35]* = A, to include a new UDF, OrderTypeLogonIndicator [9318].
08 Jan 2009	7.0	No changes
14 Aug 2009	6.1	Added "MMHH" to TargetSubID[57]
22 May 2009	6.0	No changes
25 Nov 2008	5.3	Added "COMPEXECID" to TargetSubID[57]
		Add UDF ConcurrentOrder/QuoteIndicator[9192] to the Logon message
03 Oct 2008	5.2	No changes
23 July 2008	5.1	No changes
06 May 2008	5.0	Added a section for Multiple Resend Request behavior
29 Feb 2008	5.0	No changes
18 Jan 2008	4.2.4	No changes
02 November 2007	4.2.3	Changed the default number of contras in a compressed fill report to 30 from 50.
01 June 2007	4.2.2	New section for FIX Compressed Fill Report
23 Feb 2007	4.2.1	No changes
15 Dec 2006	4.2	No changes.
20 Sept 2006	4.1	No changes
25 May 2006	4.0	No changes.

Date	Version	Description of Change
06 Jan 2006	3.2b	Updated the Logon Message (*MsgType=A*) to include UDF SuppressOrderStatus[9191] for order status suppression
		Added "Example 4 Request the suppression of Execution Reports at Logon"
		Added COMPPRODSUB to TargetSubID[57]
		Added "Example 3 Logon requesting Product Status messages in the Compact Mass Message Format"
12 Aug 2005	3.2	No updates
29 July 2005	3.2	No changes
08 Apr 2005	3.1a	Documentation Errata
30 Nov 2004	3.1	Document updates for internalization and auctions
20 July 2004	3.0a	Documentation Updates
18 June 2004	3.0	API Enhancements
28 April 2004	2.52	Version Changes
06 February 2004	2.63	New Version
08 July 2003	2.51	Hybrid Documentation Errata Release
24 Jan 2003	2.1	Support for P orders.
07 Oct 2002	2.01	Errata release for CBOEdirect® 2.0 that includes specifications for order routing through the Options Linkage Authority.
22 Apr 2002	2.0	Production Release
27 Feb 2002	2.0b	Now only contains the session layer. Moved order routing for fix-03b
15 Feb 2002	2.0a	Specified changes to customer order type, completed FAQ questions, expanded examples.
01 Feb 2002	2.0	Preliminary documentation for Version 2.0 of FIX 4.2 for CBOEdirect 2.0. Support for order routing to the floor, complex orders, book depth subscription.

Support and Questions Regarding This Document

Questions regarding this document can be directed to The Chicago Board Options Exchange at 312.786.7300 or via e-mail: api@cboe.com.

The latest version of this document can be found at the CBOE web site http://systems.cboe.com.

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About This Document

Purpose

This document is intended to provide information and guidance on how to connect to the FIX 4.2 service to access the CBOEdirect System, which includes the ability to route orders to the CBOE Order Routing System, providing access to existing open outcry markets.

Intended Audience

Management requiring a deeper technical understanding of CBOE's support for FIX 4.2 in making decisions on how best to participate in CBOE markets and developers of applications that will use the FIX 4.2 service to communicate with CBOE markets.

Related Documents

Document Number	Document Description
FIX-RELNOTES	CBOE FIX Release Notes Version 2.0
FIX-ROADMAP	CBOE FIX Document Road Map
FIX-01	CBOE FIX Volume 1: Overview & Concepts
FIX-03A	CBOE FIX Volume 3A: FIX 4.2 Programmer's Guide: FIX Session Layer
FIX-03B	CBOE FIX Volume 3B: FIX 4.2 Programmer' Guide: Application Layer: Fundamentals and Field (Tag) Dictionary
FIX-03C	CBOE FIX Volume 3C: FIX 4.2 Programmer' Guide: Order Routing
FIX-03D	CBOE FIX Volume 3D: FIX 4.2 Programmer' Guide: Market making
FIX-06	CBOE FIX Volume 6: FIX 4.2 Certification Guide
FIX-07	CBOE FIX Volume 7: FIX 4.2 CBOE Market Data FIX Engine (CFIX)
NET-01	CBOE Network Connectivity Guide
	Financial Information Exchange Protocol (FIX) Version 4.2 (http://www.fixprotocol.org)
	Financial Information Exchange Protocol (FIX) Version 4.3 (http://www.fixprotocol.org)

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Usage and Conventions

The FIX 4.2 Specification contains definitions for all standard FIX messages and tags. With the exception of the Tag Dictionary, the standard definitions for FIX messages have been omitted from this document. This was done for brevity and to not obscure the text describing CBOE's particular implementation of a message or a tag. In the Tag Dictionary, the standard definition is provided next to CBOE's usage.

Fields that follow the FIX standard and are not subject to any CBOE specific constraints are denoted with the phrase "**Per standard.**"

Fragments of FIX messages are shown in the courier new font. The ^ is used to represent the FIX field separator (ASCII 01).

```
55=IBM^48=1237^167=OPT^200=200010^201=0^202=105.00^207=W^
```

FIX Tags are shown are presented by name in italics followed by the tag number in brackets [].

SecurityType[167]

Symbol[55]

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Introduction to the CBOE FIX 4.2 Session Layer

The CBOE FIX 4.2 Service supports the standard FIX 4.2 session protocol. You should refer to the FIX 4.2 documentation for a detailed description of the FIX Session level protocol.[1]

Firms using a commercially available product or developing their own engines per the FIX 4.2 specification should have minimal problems connecting to CBOE using FIX.

High Availability Considerations

The CBOE FIX 4.2 Service is designed for high availability. The IP address and TCP Port number to which you connect will automatically fail over to a backup server in case of a network, system, or application failure at CBOE. Your application will receive a TCP timeout should this happen. Fail over takes several seconds to complete (15 to 30 seconds). Your engine should be configured to continuously retry the login until a connection is re-established. Messages that were queued for delivery to you but not delivered due to the failure will be transmitted once your connection and FIX session is re-established.

Firm System Failure Considerations

CBOE restricts a single FIX connection to one IP address.

In a minimal configuration, a firm is encouraged to maintain two FIX connections to CBOE. In case of failure of one connection, the firm should design their application to route orders and receive Execution Reports over the alternative line.

Security within the FIX engine is done by validating the IP address of the firm against their connection id (*SenderCompID[49]*). If a mismatch occurs, the session is terminated. CBOE does not provide a mechanism to define backup IP addresses for a connection.

The inability to be able to define multiple IP addresses per connection is why CBOE encourages firms to use network address translation (NAT) on their site. NAT will enable a back up host to be presented to CBOE as the same external IP address. This permits the firm to switch to a backup FIX engine quickly in case of failure of their primary fix engine.

Commercial high-availability FIX engines are also supported by CBOE. A high-availability FIX engine usually migrates the IP address of the primary server to a hot backup FIX server in the event of a failure. The backup FIX server then reinitiates the connection automatically by re-establishing the connection and re-logging on.

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[1] The FIX 4.2 Specification is available on the FIX Protocol Organization Web Site (http://www.fixprotocol.org).

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Standard FIX Message header and trailer support

All FIX messages have a standard header and trailer field. CBOE is fully compliant in its usage of the standard header and trailer. Refer to the FIX 4.2 Specification available from the FIX Protocol Ltd. website (http://www.fixprotocol.org) for additional information on the standard FIX header.

CBOE assigns the connection identifiers (CompIDs) used as the *SenderCompID[49]* and *TargetCompID[56]* that represent the CBOE side and the firm side of the connection.

Firm CompIDs

CBOE uses an abbreviation of the firm name combined with a connection number to identify the firm in the *SenderCompID[49]* field (for messages sent to CBOE from the firm) and the *TargetCompID[56]* (for messages sent to the firm from CBOE).

For example: Firm Smith and Jones, Inc. is connecting to CBOE. CBOE may choose to assign a compid such as "*SMJN01*"for the first connection, "*SMJN02*" as the second connection, and so on.

The maximum length of a firm CompID is 8 characters.

CBOE CompIDs

The format of CBOE CompIDs is "**XFIXNN"**

> where

> > **X** is the type of environment:

> > > *D* for Developer unattended testing

> > > *T* for Assurance Testing (attended)

> > > *P* for Production

> > **NN** is the engine number in the range of [01-99]

For example: A firm may be assigned to CBOE's FIX engine number one for developer testing that has a CompID of "*DFIX01*". For production, that same firm may be assigned to the third production engine, "*PFIX03*".

Table 1 Standard Header Field Usage

Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
8	BeginString	Y	Y	Per standard "FIX.4.2"
9	BodyLength	Y	Y	Per standard
35	MsgType	Y	Y	Per standard
49	SenderCompID	Y	Y	Firm CompID on messages inbound to CBOE CBOE CompID on messages outbound from CBOE
56	TargetCompID	Y	Y	CBOE CompID on messages inbound to CBOE Firm CompID on messages outbound from CBOE

Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
115	OnBehalfOfCompID	N	N	For the following message types inbound from the firm to CBOE: New Order Single (*MsgType*=**D**), Order Cancel Replace Request (*MsgType*=**G**), Mass Quote (*MsgType*=**i**), Quote (*MsgType*=**S**) value will be returned on subsequent responses relating to the request in the *DeliverToCompID[128]* field Useful for firm routing applications
128	DeliverToCompID	N	N	For the following message types outbound to the firm from CBOE: Execution Reports(*MsgType*=**8**), Quote Acknowledgement (*MsgType*=**a**), Quote (*MsgType*=**S**) will contain the value provided for *OnBehalfOfCompID[115]* onthe original request
90	*SecureDataLen*	*N*	*N*	*Not used in CBOE FIX 4.2 Service*
91	*SecureData*	*N*	*N*	*Not used in CBOE FIX 4.2 Service*
34	MsgSeqNum	Y	Y	Per FIX standard.

Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
50	SenderSubID	N	Y[2]	For Logon *(MsgType=A)* must contain:
				UserId:Password
				or
				UserId:Password:LogonType
				Where:
				UserID – is the CBOE assigned user id
				Password – is the CBOE assigned password
				LogonType – is an optional logon type of "**PRI"** for Primary (default) or "**SEC"** for Secondary logon. Most firms should use the default. Contact the CBOE API relations team if you feel your application warrants use of multiple logins.
				This field does not have to be used after successful logon on subsequent messages.
				For the following message types inbound from the firm to CBOE:
				New Order Single *(MsgType=D)*, Order Cancel Replace Request *(MsgType=G)*, Mass Quote *(MsgType=I)*, Quote *(MsgType=S)*
				value will be returned on subsequent responses relating to the request in the *TargetSubID[57]* field
				Useful for firm routing applications
142	SenderLocationID	N	N	For the following message types inbound from the firm to CBOE:
				New Order Single *(MsgType=D)*, Order Cancel Replace Request *(MsgType=G)*, Mass Quote *(MsgType=I)*, Quote *(MsgType=S)*
				value will be returned on subsequent responses relating to the request in the *TargetLocationID[143]* field
				Useful for firm routing applications

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[2] Required for Login Message only.

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Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
57	TargetSubID	N	Y[3]	For Logon (*MsgType*=**A**):
				Environment
				Where:
				Environment – is one of the following:
				"**TEST**", "**PROD**"
				If you require order status to be published immediately following successful logon you must append:
				"**:WITHORDERPUBLISH**"
				after the *Environment*.
				THE DEFAULT BEHAVIOR FOR VERSION 2.0 IS TO NOT PUBLISH ORDER STATUS UPON LOGIN.
				For the following message types outbound to the firm from CBOE:
				Execution Reports(*MsgType*=**8**), Quote Acknowledgement (*MsgType*=**a**), Quote (*MsgType*=**S**)
				will contain the value provided in the *SenderSubID[50]* field from the original request.
143	TargetLocationID	N	N	For New Order Single (*MsgType*=**D**):
				For orders destined to open outcry markets, can be used to specify routing to a specific BART terminal.
				The BART Terminal ID must be specified as: "BARTID=**N**"
				Where **N** – is a BART Terminal ID with a value between **0** and **9**.
				For the following message types outbound to the firm from CBOE:
				Execution Reports(*MsgType*=**8**), Quote Acknowledgement (*MsgType*=**a**), Quote (*MsgType*=**S**)
				will contain the value provided in the *SenderLocationID[142]* field from the original request.
116	OnBehalfOfSubID	N	N	For the following message types inbound from the firm to CBOE:
				New Order Single (*MsgType*=**D**), Order Cancel Replace Request (*MsgType*=**G**), Mass Quote (*MsgType*=**I**), Quote (*MsgType*=**S**)
				value will be returned on subsequent responses relating to the request in the *DeliverToSubID[129]* field
				Useful for firm routing applications

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[3] Required for Logon Message Only

Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
144	OnBehalfOfLocationID	N	N	For the following message types inbound from the firm to CBOE: New Order Single (*MsgType*=**D**), Order Cancel Replace Request (*MsgType*=**G**), Mass Quote (*MsgType*=**I**), Quote (*MsgType*=**S**) value will be returned on subsequent responses relating to the request in the *DeliverToLocationID[145]* field.
129	DeliverToSubID	N	N	For the following message types outbound to the firm from CBOE: Execution Reports(*MsgType*=**8**), Quote Acknowledgement (*MsgType*=**a**), Quote (*MsgType*=**S**) will contain the value provided in the *OnBehalfOfSubID[116]* field from the original request.
145	DeliverToLocationID	N	N	For the following message types outbound to the firm from CBOE: Execution Reports(*MsgType*=**8**), Quote Acknowledgement (*MsgType*=**a**), Quote (*MsgType*=**S**) will contain the value provided in the *OnBehalfOfLocationID[144]* field from the original request.
43	PossDupFlag	N	N	Usage per standard
97	PossResend	N	N	Usage per standard
52	SendingTime	Y	Y	Usage per standard Time upon input is expected to be in Universal Time Coordinated (UTC) – see FIX specification.
122	OrigSendingTime	N	N	Usage per standard
212	XmlDataLen	N	N	Used on the Quote Status Request Message (*MsgType*=**a**) when sending Quote Risk Monitoring requests and responses.
213	XmlData	N	N	Used on the Quote Status Request Message (*MsgType*=**a**) when sending Quote Risk Monitoring requests and responses.
347	*MessageEncoding*	*N*	*N*	*Not used in CBOE FIX 4.2 Service*
369	LastMsgSeqNumProcessed	N	N	Not used in CBOE FIX 4.2 Service Can be used by firms for documentation – the value will appear in CBOE message logs. The value will not be persisted within the engine nor will it be forwarded to the CBOEdirect system.
370	OnBehalfOfSendingTime	N	N	Not used in CBOE FIX 4.2 Service Can be used by firms for documentation – the value will appear in CBOE message logs. The value will not be persisted within the engine nor will it be forwarded to the CBOEdirect system.

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Header Examples

For the following example assume that the firm name is "Smith and Jones Trading" and the CBOE has assigned a connection identifier of "SMJN01". The CBOE connection identifier assigned for purposes of this example is "PFIX01".

For this example assume that the userid assigned by CBOE is "smg", the password is "son123".

Example 1: header information for a logon message inbound from the firm to CBOE:

```
8=FIX.4.2^9=length^35=A^49=SMJN01^56=PFIX01^34=msgSeqNum^50=smg:son123^5
7=PROD^52=20100401-12:01:01:001
```

Example 2: header information for the logon response message outbound from CBOE to the firm:

```
8=FIX.4.2^9=length^35=A^49=PFIX01^56=SMJN01^34=msgSeqNum^142=PROD^52=201
00402-01:30:01:001
```

Firm Message Routing Considerations

Users are able to the FIX Standard Header information to provide firm level routing information. This permits firms to provide routing information with order messages and quotes so that orders can be internally routed at the firm after receipt from CBOE.

The information is stored with the order or quote within the CBOEdirect system. Subsequent messages reporting state of the order or quote will have the routing information provided by the firm added to the outbound messages using the following FIX standard mappings. This means that each order or quote could have its own unique routing information provided.

This capability is provided to maximize routing alternatives for order and quote messages within the firm. This routing capability can be used to create a FIX message hub for multiple users or customers. The routing capability could be used to provide one FIX engine to service multiple traders or order desks.

Table 2 Firm Routing Information

Messages Inbound to CBOE	Messages OutBound from CBOE sent as a response to Inbound Message
New Order Single (*MsgType=***D**) Order Cancel/Replace Request(*MsgType=***G**)	Execution Report (*MsgType=***8**)
Mass Quote (*MsgType=***i**), Quote (*MsgType=***S**)	Quote Acknowledgement (*MsgType=***a**), Quote (*MsgType=***S**), Execution Reports (*MsgType=***8**) for Quote Fills
Inbound Fields that will be returned on subsequent outbound messages	Outbound fields that are set from the Inbound fields
SenderSubID[50]	*TargetSubID[57]*
SenderLocationID[142]	*TargetLocationID[143]*
OnBehalfOfCompID[115]	*DeliverToCompID[128]*
OnBehalfOfSubID[116]	*DeliverToSubID[129]*
OnBehalfOfLocationID[144]	*DeliverLocationID[145]*

Logon Message (*MsgType=A*)

You will initiate a FIX session by sending a Logon message to CBOE. You must acquire a CBOEdirect login and password before you can use FIX 4.2. This is provided as part of the certification process (refer to document FIX-06). The connection must be configured on the CBOE FIX 4.2 Server prior to attempting a connection to CBOE. A connection consists of the following information: IP Address, TCP/IP Port Number, and a ConnectionID (CompID) assigned by CBOE (see discussion of CompIDs above). After the firm sends a Logon message to CBOE, the firm must not send any other messages to CBOE until after the firm receives a Logon acknowledgement from the CBOE. This can take anywhere from 1-3 minutes.

Note: FIX user IDs (SenderSubId) may not establish multiple user sessions using the same ID.

Table 3 Logon Message

Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
	Standard Header	Y	Y	*MsgType[35]* = A *Header fields SenderSubID[50] and TargetSubID[57] are required.*
50	*SenderSubID[4]*	Y	Y	For Logon *(MsgType=*A*)* must contain: *UserId*:*Password:LogonType* Where: *UserID* – is the CBOE assigned user id *Password* – is the CBOE assigned password *LogonType* – is an optional logon type of "**PRI"** for Primary (default) or "**SEC"** for Secondary logon. Most firms should use the default. Contact the CBOE API relations team if you feel your application warrants use of multiple logins. Note: FIX user IDs (SenderSubId) may not establish multiple user sessions using the same ID.

---

[4] Part of the FIX Standard Header

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Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
57	*TargetSubID*[5]	Y	Y	For Logon (*MsgType=*A): Used to specify the type of environment either "TEST", "PROD" If you require order status to be published immediately following successful logon you must append: ":WITHORDERPUBLISH" after the *Environment.* The default behavior for Version 2.0 is to NOT publish order status upon logon. If you would like to handle SecurityStatus messages in the compact mass message format, you must append: ":COMPPRODSUB" after the *Environment*. To compress fill report messages, you must append: ":COMPFILLRP" after the *Environment*. To compress ExecID [17], you must append: ":COMPEXECID" after the *Environment*. CBOE will publish an ExedID[17] field that will be a maximum of 30 characters. To participate in Market Maker Hand Held trade functionality and notifications, you must append: ":MMHH" after the environment.
98	EncryptMethod	Y	Y	CBOE does not support encryption at this time.
108	HeartBtInt	Y	Y	This tag is the heartbeat interval in seconds. It is determined by the user at login time. The firm's heartbeat interval should be greater than 5 seconds. If the user fails to respond to 3 test requests following missed "heartbeats", CBOE will log out the user.
95	RawDataLength	N	N	Not used
96	RawData	N	N	Not used
141	ResetSeqNumFlag	N	N	CBOE *does not* support this tag.

---

[5] Part of the FIX Standard Header

Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
9003	*UDFSupportIndicator*	*N*	*Y*	Possible values: 0 = Does not support UDF messages 1 = Supports UDF in messages 2 = Supports UDF in repeating groups in all messages 3 = Supports UDF in repeating groups in Mass Quote Message 4 = Supports UDF in repeating groups in Market Data Message Firms that plan to enter orders only (no quote entry or market data) may leave this tag out of the Logon message. However CBOE requires this tag for quote entry and market data. On trading FIX Engines (non CFIX engines), only 9003=3 will be supported and the logon will be rejected if 9003 is set to 4. For Logons to the CFIX engines, only 9003 = 4 will be supported and the logon request will be rejected if the tag 9003 is set to 3. Also this would mean that firms doing Market Data via CFIX should have CFIX as their first engine instead of the trading engine.
9191	*SuppressOrderStatus*	*N*	*Y*	Users can request the suppression of certain types of Execution Reports through the use of this tag. This tag can have multiple comma-separated values. Valid values are the same as OrdStatus[39]. Status of the order. **Options and Futures**: 0 = New 1 = Partially filled 2 = Filled 3 = Done for day 4 = Canceled 6 = Pending Cancel/Replace A = Pending New
9192	*ConcurrentOrder/QuoteIndicator*	*N*	*N*	This field is optional. It is used to select the usage of the concurrent threading model. The concurrent threading model is the standard. Valid values are: 1=Enable concurrent quote Model 2=Enable concurrent order Model 3=Enable both concurrent order and quote model
9318	*OrderTypeLogonIndicator*	*N*	*N*	This field specifies what order type will be sent to CBOE. Valid values are: 0 = Only Light orders 1 = Only Regular orders 2 = Both Light and Regular orders Without specifying this field, the system will assume that the user will only send in regular orders.
	Standard Trailer	*Y*	*Y*	*Per standard.*

Logon Message Examples

For the following example, assume that the firm name is "Smith and Jones Trading" and the CBOE has assigned a connection identifier of "SMJN01". The CBOE connection identifier assigned for purposes of this example is "PFIX01".

For this example assumes that the userid assigned by CBOE is "smg" and the password is "son123".

Example 1 Normal logon using defaults

Example of an inbound logon request message from the firm to CBOE:

```
8=FIX.4.2^9=length^35=A^49=SMJN01^56=PFIX01^34=msgSeqNum^50=smg:son123^5
7=PROD^52=20100401-12:01:01:001^98=0^108=30^10=checksum
```

The outbound logon acknowledgement message from CBOE to the firm for the above logon would be::

```
8=FIX.4.2^9=length^35=A^49=PFIX01^56=SMJN1^34=msgSeqNum^52=20100402-
01:30:01:001^98=0^108=30^10=checksum
```

Note: Order status for existing orders would not be returned in this case.

Logon Request with UDF support for Mass Quote message flag

```
8=FIX.4.2^A9=0088^A35=A^A50=CBOE:CBOE^A57=TEST^A34=52^A49=AAS^A56=AFIX20
1^A52=20040614-16:48:53^A98=0^A108=30^A9003=3^A10=088^A
```

Figure 1 Logon Message Sequence
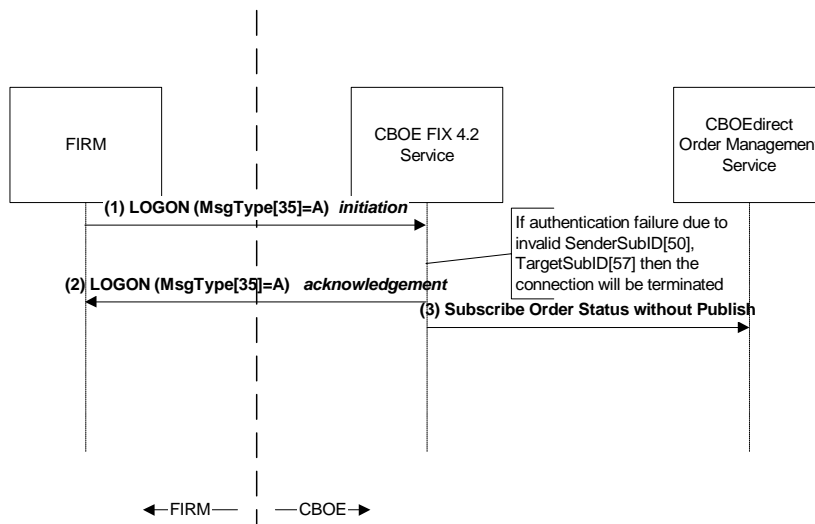
Logon Message Example for Market Maker Hand Held (MMHH) Interest

Below is a logon message example for a user indicating interest in participating in MMHH trade functionality and notification.

```
8=FIX.4.2|9=0089|35=A|50=X01:X01|57=TEST:MMHH|34=1|49=TEST701|56=DFIX701|52=20090714
-20:30:26|98=0|108=30|10=211|
```

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Transmission of order status after logon

The CBOEdirect system can send Execution Reports for all outstanding orders maintained within the CBOEdirect Order Management System (this includes electronic and open outcry destined orders) if requested by the user at logon type by appending ":WITHORDERPUBLISH" to the TargetSubID[57] field.. These Execution Reports will have an *ExecTransType[20] =Status*.

The following example shows logging on to the production environment requesting order status be published at logon time:

## Example 2 Logon requesting Order Status Publication for existing orders:

Example of an inbound logon request message from the firm to CBOE:

```
8=FIX.4.2^9=length^35=A^49=SMJN01^56=PFIX01^34=msgSeqNum^50=smg:son123^5
7=PROD:WITHORDERPUBLISH^52=20100401-12:01:01:001^98=0^108=30^10=checksum
```

Note: In this case Execution Reports with ExecTransType[20]=3(Status) will be issued for all existing orders immediately after valid login.

CBOE recommends firms carefully consider order volume prior to using this feature – as the number of messages returned by CBOE could be sizeable and impact firm recovery time.

Figure 2 Logon Message Sequence using `WITHORDERPUBLISH` option specified on TargetSubID[57]
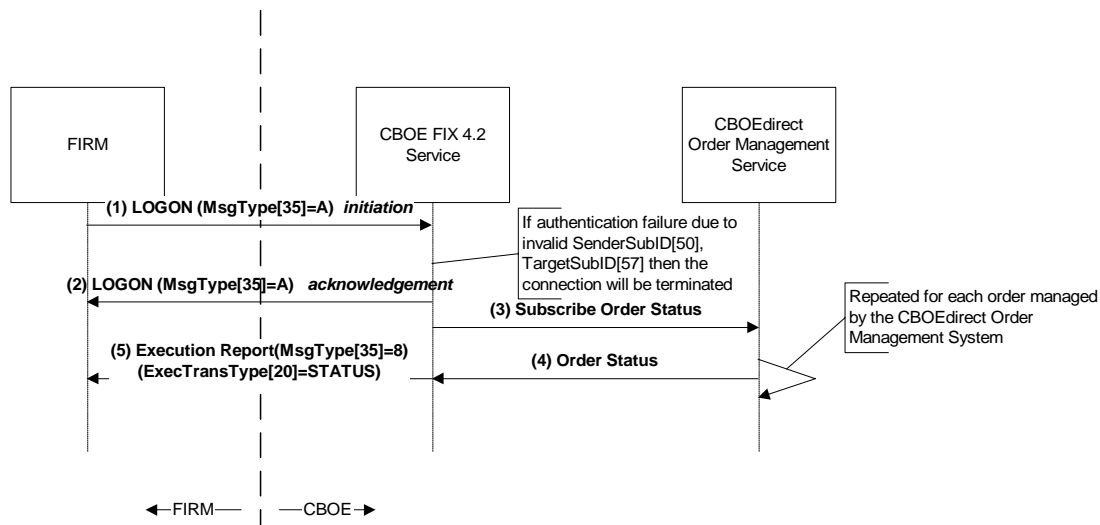
Example 3 Logon requesting Product Status messages in the Compact Mass Message Format:

```
8=FIX.4.2^ 9=0084^ 35=A^ 34=1^ 49=ZZCBOE4^ 56=PFIX203^ 52=20020923-15:53:16^
50=SOX:SOX^ 57=PROD:COMPPRODSUB^ 98=0^ 108=30^ 10=021^
```

Or

```
8=FIX.4.2^ 9=0084^ 35=A^ 34=1^ 49=ZZCBOE4^ 56=PFIX203^ 52=20020923-15:53:16^
50=SOX:SOX^ 57=PROD:WITHORDERPUBLISH:COMPPRODSUB^ 98=0^ 108=30^ 10=021^
```

Note: Users can choose either format of the login message for respective SecurityStatus messages.

Example 4 Request the suppression of Execution Reports at Logon:

Example: A user that wants to block out receiving "Nothing Done" at the end of the day, could send in a request to suppress Execution Reports at logon using UDF SuppressOrderStatus[9191].

```
8=FIX.4.2^ 9=0084^ 35=A^ 34=1^ 49=ZZCBOE4^ 56=PFIX203^ 52=20020923-15:53:16^
50=SOX:SOX^ 57=PROD:COMPPRODSUB^ 98=0^ 108=30^ 10=021^
```

Or

```
8=FIX.4.2^ 9=0084^ 35=A^ 34=1^ 49=ZZCBOE4^ 56=PFIX203^ 52=20020923-15:53:16^
50=SOX:SOX^ 57=PROD:WITHORDERPUBLISH:COMPPRODSUB^ 98=0^ 108=30^ 10=021^
```

Or
```
8=FIX.4.2^ 9=0084^ 35=A^ 34=1^ 49=ZZCBOE4^ 56=PFIX203^ 52=20020923-15:53:16^
50=SOX:SOX^ 57=PROD:COMPPRODSUB^ 98=0^ 108=30^ 9191=3^ 10=021^
```

Or

```
8=FIX.4.2^ 9=0084^ 35=A^ 34=1^ 49=ZZCBOE4^ 56=PFIX203^ 52=20020923-15:53:16^
50=SOX:SOX^ 57=PROD:WITHORDERPUBLISH:COMPPRODSUB^ 98=0^ 108=30^ 9191=3,0^ 10=021^
```

FIX Compressed Fill Report

When Fill Reports from CBOE are translated into FIX Execution Reports, extremely large messages can be generated. The primary cause for this is that when multiple Contra Parties participate in a single trade, each of the individual Contra Party participations in the fill is reported in that one message. Also, if an individual Contra Party has more than one transaction involved in the fill, each of those transactions are also listed in the list of Contra Parties (e.g. if Contra Party "A" has 2 1-lot orders involved in the trade, the list of Contra Parties will include Contra Party A, two times). In order to alleviate this, CBOE is introducing an optional feature designed to minimize the size of FIX Execution Reports representing fills.

In order to use this optional feature, it must be designated at Login, and will be in effect for that login session. This is done by adding ":COMPFILLRPT" to TargetSubID (tag 57), after the required environment type. For example,

[8=FIX.4.2^A9=0127^A35=A^A50=BUF:BUF^A57=TEST**:COMPFILLRPT** ^A34=1^A49=TEST301^A56=DFIX301^A52=20070517-18:37:29^A98=0^A108=30^A10=048^A]

Three Levels of Compressed Fill Reports

Level 1: When Compressed Fill Reports are requested, this limits the number of Contra Parties in any one FIX Execution Message to a maximum (default of 30). If the "raw" or standard fill report does not exceed that maximum, it is sent out normally.

To ease testing, it is possible to set this maximum number of Contra Parties to a different value at login by appending ".<num>" to the ":COMPFILLRPT" switch. For example, ^A57=TEST:`COMPFILLRPT.3` would set a maximum of 3 Contra Party entries.

Level 2: Contra Party Unit Summarization – this feature sums all of the entries for any one Contra Party into a single entry in the array of Contra Parties, rather than an entry of each transaction. If this "unit summarization" reduces the number of Contra Parties to the maximum (or less), the message is sent out with the "summarized" Contra Party array in place of the "raw" Contra Party array.

Level 3: If, after unit summarization, there are still in excess of the maximum number of Contra Parties to be listed, then the report is "split", and sent out in multiple messages (each of which will have, at most, the maximum number of unit summarized Contra Parties listed).

Example

The Contra Limit was set to 3. Four Contras put in 3 orders each (3 1-lots from "A", 3 10-lots from "B", 3 100-lots from "C", and 3 1000-lots from "D"). Below is what was generated when a single order for quantity 3333 was entered on the other side.

The Order and the Ack

```
[8=FIX.4.2_9=0194_35=D_34=5_49=TEST301_56=DFIX301_52=20070517-18:38:39_11=YUL0003-
20070517_76=690_21=1_40=2_55=A_167=OPT_200=200609_202=25.00_201=1_54=2_38=3333_44=3.00_47=C_6
0=20041020-12:00:00_386=1_336=W_MAIN_10=020_]
```

```
[8=FIX.4.2_9=0334_35=8_34=24_49=DFIX301_56=TEST301_52=20070517-18:38:43_6=0_11=YUL0003-
20070517_14=0_84=0_426=0_425=0_424=3333_389=0_76=CBOE:690_17=58314:121.0:0.1_20=0_150=0_22=8_31=0_3
2=0_151=3333_205=16_200=200609_37=58314:121_38=3333_39=0_40=2_44=3_201=1_47=C_207=W_48=276448507_
167=OPT_54=2_202=25_55=A_59=0_336=W_MAIN_60=20070517-18:38:43_9369=2_10=195_]
```

The "split" Execution Reports

```
[8=FIX.4.2_9=0552_35=8_34=25_49=DFIX301_56=TEST301_52=20070517-18:38:43_6=3_11=YUL0003-
20070517_14=3333_84=0_426=3_425=3333_424=3333_389=0_76=CBOE:690_17=58314:121.58311:2300831.0_20=0_1
50=2_22=8_31=3_32=3330_151=0_205=16_200=200609_442=1_382=3_375=CBOE:690_337=XXH_437=300_438=2007
0517-18:38:43_375=CBOE:110_337=XXH_437=30_438=20070517-
18:38:43_375=CBOE:009_337=XXH_437=3000_438=20070517-
18:38:43_37=58314:121_38=3333_39=2_40=2_44=3_201=1_47=C_198=18_207=W_48=276448507_167=OPT_54=2_20
2=25_55=A_59=0_336=W_MAIN_60=20070517-18:38:43_9369=2_9465=CBOE:BUF_9433=XXH_9730=R_10=041_]
```

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[8=FIX.4.2_9=0447_35=8_34=26_49=DFIX301_56=TEST301_52=20070517-18:38:43_6=3_11=YUL0003-20070517_14=3333_84=0_426=3_425=3333_424=3333_389=0_76=CBOE:690_17=58314:121.58311:2300831.0.1_20=0_150=2_22=8_31=3_32=3_151=0_205=16_200=200609_442=1_382=1_375=CBOE:549_337=XXH_437=3_438=20070517-18:38:43_37=58314:121_38=3333_39=2_40=2_44=3_201=1_47=C_198=18_207=W_48=276448507_167=OPT_54=2_202=25_55=A_59=0_336=W_MAIN_60=20070517-18:38:43_9369=2_9465=CBOE:BUF_9433=XXH_9730=R_10=234_]

Things to Consider

(1) Both (all) Execution Reports, will have the same ExecType (tag 150), OrderStatus (tag 39), CumQty (tag 14), etc. values as a report that had "not" needed splitting. E.g. in the above example, that means 2 messages reporting complete fills for 3333 units.

(2) The LastShares (tag 32) for each "split" report will match the contents of the ContraBroker entries listed in the message, and each "split' message will have a unique ExecID (tag 17) value.

Invalid Logon

Invalid logon attempts will result in the connection being terminated by CBOE in compliance with the FIX 4.2 specification. Invalid logon attempts are logged at CBOE. There is no message acknowledging the invalid logon attempt.

Primary and Secondary Logins

Firms cannot login multiple times using the same UserID. A login session can be in a *Primary* or *Secondary* mode. A login session in Primary mode is monitored by CBOEdirect for application termination. It does not matter if the application termination is normal via logout or abnormal due to an application or network failure. If an application connected as primary terminates, the login session for that UserID is terminated using the forced logout capability of CBOEdirect. The major reason for using a Primary login session is to ensure that the quotes belonging to a user of the application are removed from the market if the application becomes unavailable.

Login sessions that are in Secondary mode are not monitored for application termination.

Logout Message (*MsgType=5*)

Logout from a session can be initiated either by the firm or by CBOE. If CBOE initiates the logout, the *Text[58]* field will contain the reason for the logout. As per the FIX 4.2 specification, the firm should respond with a Logout acknowledgement message. Also a reasonable time period should be permitted prior to breaking the connection to permit the side receiving the logout request to process any gap fills.

Table 4 List of messages and reasons for CBOE initiated logout

Text[58] content when the CBOE FIX 4.2 Service initiates a logout	Explanation
CBOE Market Unreachable or Unavailable	The CBOE FIX Engine cannot access the CBOEdirect system
Forced logout due to lost of connection	
Forced logout due to closing session	
Critical components unreachable due to process failure	Failure of a CBOEdirect component caused FIX session to be terminated
Admin request to force leave session	The help desk or operations staff has forced a logoff of the session.
Forced session close since Session Management Service process has been lost	A connection to the CBOEdirect service for system management has been lost

Table 5 Logout Message

Tag	Field Name	FIX Req'd	CBOE Req'd	Comments
	Standard Header	Y	Y	*MsgType[35]* = 5
58	Text	N	N	Will be ignored when the firm initiates the logout. CBOE will always provide a reason for logout initiation.
	Standard Trailer	Y	Y	Per standard.

Logout Message Examples

For the following example assume that the firm is Smith and Jones Trading and the CBOE has assigned a connection identifier of "SMJN01". The CBOE connection identifier assigned for purposes of this example is "PFIX01".

Firm Initiated Logout

Example firm initiates logging off by sending a Logout Message to CBOE:

```
8=FIX.4.2^9=length^35=5^49=SMJN01^56=PFIX01^34=msgSeqNum^52=20100401-
12:01:01:001^10=checksum
```

The firm should wait for a reasonable length of time for CBOE to reply and perform any potential gap fills and then send a confirmation logout. If there is no reply after this unspecified reasonable period then per the FIX specification you should close the sockets connection. After confirming the logout, the firm should wait a minimum of 30 seconds before attempting to send a logon request message to CBOE.

In exceptional circumstances, CBOE may perform gap fills.

Normally CBOE will immediately reply with a confirming logout.

```
8=FIX.4.2^9=length^35=5^49=PFIX01^ 56=SMJN01^34=msgSeqNum
^50=PROD^52=20100402-01:30:01:001^10=checksum
```

CBOE Initiated Logout

In this example due to an error condition or scheduled down time, CBOE initiates a logout by sending a Logout Message to the Firm.

```
8=FIX.4.2^9=length^35=5^49=PFIX01^56=SMJN01^ 34=msgSeqNum
^50=PROD^52=20100401-12:01:01:001^58=ReasonForLogout^10=checksum
```

At this point, the CBOE FIX 4.2 Service will wait a reasonable period of time, about 30 seconds, for the firm to perform gap fills – if required.

The firm, per FIX specification, should reply with a confirming Logout Message:

```
8=FIX.4.2^9=length^35=5^49=PFIX01^ 56=SMJN01^34=msgSeqNum ^52=20100402-
01:30:01:001^10=checksum
```

After confirming the logout, the firm should wait a minimum of 30 seconds before attempting to send a logon request message to CBOE.

Refer to the error handling discussions regarding the contents of the *Text[58]* field upon CBOE initiated logout.

Reject Message (*MsgType=3*)

The Reject Message will only be used for session level rejects in FIX 4.2. Firm applications should provide a mechanism for reporting or logging the value in the Text[58] field of the reject message which will contain the reason for the reject. Refer to the Reject Reason table below.

> **The CBOE FIX 4.2 Service has reduced the role of the Reject Message to session level errors only, in keeping with the FIX 4.2 Specification.**

- Malformed or garbled message or check sum error received

  The Reject Message will be used to reject malformed or invalid FIX messages. This type of reject is normally encountered due to a communications error and will most likely not be encountered. This type of error will often result in a checksum error being encountered by the receiver of the message. Refer to the FIX specification for more details on recovery from this type of error.

- CBOE FIX Engine is unable to communicate with CBOEdirect

  If the CBOE FIX Engine is unable to communicate with CBOEdirect – the FIX Engine will place all connections in a "Hold status". When connections are placed in a hold status – all incoming messages are rejected with a Reject Message with the *Text[58]* field set to "`CBOEdirect is currently unavailable or unreachable`".

  NOTE: A change from FIX/ORS to FIX 4.2 is introduced. Invalid Data in otherwise valid FIX Messages is now rejected using the *Business Reject Message Reject (MsgType="j")*.

Table 6 Reject Message

Tag	Field Name	Req'd	Comments
	Standard Header	Y	*MsgType[35]* = 3
45	RefSeqNum	Y	MsgSeqNum of rejected message
58	Text	N	Message that explains reason for rejection.
	Standard Trailer	Y	

The first column of this table contains the literal text that will be transmitted as part of the *Text[58]* field in the *Reject Message*. This is provided to permit firms to parse or trap specific errors to improve detection and automation of error recovery.

Table 7 Reject Message Possible values for tag *Text[58]*

Reject Message Text	Further Description and Recommended Firm Response
`Unsupported FIX Message –` *Message-name*(`MsgType`) `[ SenderCompID=`*header.SenderCompID* `SequenceNumber=`*header.MsgSeqNum* `]`	A FIX 4.2 message that is not supported by the FIX 4.2 Service was received. The message is logged to a reject file at CBOE. A notice is sent to CBOE personnel to investigate the error. After an application is certified, this error should never occur. If it does, this should be considered very serious and will most likely require software maintenance at the firm to correct the problem.

CBOE does not accept inbound Reject Messages

CBOE will verify through firm testing that your application will not generate any session level reject messages.

If inbound Reject Messages (*MsgType=*3) are received by CBOE, CBOE will suspend the firm connection and require the firm to repeat the certification process.

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Other Session Messages

The commercial FIX Engine used by CBOE provides the full session management capability specified in the FIX 4.2 specification. *Heartbeat, Test Requests*, *Resend Request*, and *Sequence Reset (Gap Fill)* messages operate according to the FIX 4.2 specification.

Multiple Resend Request Behavior

Beginning in early May 2008, CBOE will respond differently to multiple resend request messages from a counter party. The new behavior is as follows:

Upon receipt of a Resend Request Message (*MsgType35*=2) from a counter party, in addition to processing the Resend Request, the CBOE FIX engines will begin tracking subsequent Resend Request Messages for a specified time interval (default is 5 seconds). If more than a certain number of Resend Request Messages (default is 5) arrive during that time interval, the CBOE FIX engine will disconnect the counter party's FIX session. The 5 seconds window and the maximum of 5 Resend Requests are both configurable parameters.

Questions regarding the FIX Session Layer

How is a connection to the CBOE FIX service obtained?

You obtain a FIX connection by contacting the API Relations Group at 312.786.7300 or by sending an email to api@cboe.com. The API Relations Group will establish a contact point within CBOE for your firm depending on your planned usage of the FIX interface.

If you have problems in obtaining service, have any other questions, or concerns you can contact Doug Hoffman, Director of API Relations, at 312.786.7699 or via email at dhh@cboe.com.

How is a userid and password used to initiate a FIX logon session obtained?

The CBOE API Liaison group or the CBOE System liaison group, working in conjunction with the membership and help desk areas, will assign a userid and password for your FIX connection. For market maker firms, the userid will be a badge acronym. For order routing firms, the userid will be assigned based upon a badge or a value made up of the firm acronym.The userid and password are assigned as part of the initial setup for testing.

Is there a test environment available?

Refer to the NET-01 (CBOE Network Connectivity) and FIX-06 (Volume 6: FIX 4.2 Certification and Testing Guide) documents for an overview of connectivity and testing. A test environment is available for unattended firm testing and for attended firm testing.

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