



CBOE FIX Protocol Support

Version 2.0 Beta 1

Volume 4: Connecting to CBOE FIX Services

A Guide to obtaining connections to CBOE FIX services

CBOE Proprietary Information

01 February 2002

Document #[FIX-04]

Front Matter

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Preface

CBOE is providing the FIX protocol to support order routing to all CBOE markets. This will include the current open outcry markets, as well as the planned electronic trading system. CBOE has provided a leadership role in expanding the FIX protocol standard for use in accessing exchange based derivatives markets.

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Change Notices

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

Date	Version	Description of Change
01 Feb 2002	2.0	Beta 1 release
06 Mar 2001	1.0	Updated the Introduction and Reference sections.
15 Aug 2000	1.0	Production release
12 July 2000	0.7	New Document

About This Document

Purpose

This document is intended to provide information and guidance on how to connect to the FIX/ORS service to route orders to the CBOE Order Routing System (ORS).

Intended Audience

Firm representatives responsible for establishing and maintaining network connections to CBOE.

Related Documents

Document Number	Document Description
FIX-Roadmap	FIX Document Road Map
FIX-01	CBOE FIX Volume 1: Overview & Concepts
FIX-02	CBOE FIX Volume 2: FIX/ORS Programmer's Guide
FIX-03A,B,C	CBOE FIX Volume 3: FIX 4.2 Programmer's Guide
FIX-05	CBOE FIX Volume 5: FIX/ORS Certification Guide
FIX-06	CBOE FIX Volume 6: FIX 4.2 Certification Guide
NET-01	CBOE Network Connectivity
	CBOE Systems Overview
	Financial Information Exchange Protocol (FIX) Version 4.1, April 1, 1998 (available from http://www.fixprotocol.org)
	Financial Information Exchange Protocol (FIX) Version 4.2 Final Draft, March 2000 (available from http://www.fixprotocol.org)

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>.

Terms used in this document

You should understand the following terms before reading the remainder of this document.

Table 1 Terms Used in this Document

Term	Definition
Acceptor	Receiving party of the FIX session. Responsible for authenticating the initiator and accepting the connection by acknowledging the initiator's logon message. CBOE is the acceptor in the FIX/ORS implementation. This is referred to as the Sell side in FIX terminology.
BART	Booth Automated Routing Terminal—workstation in booths for managing orders.
COMPASS	CBOE order routing interface based upon OSC guidelines.
ECN	Electronic Communication Network – firm, such as Archipelago and Redibook, that provide for crossing of orders between market participants.
EIGRP	Enhanced Interior Gateway Routing Protocol
FIX	Financial Information Exchange Protocol —standard supported by industry participants for automating trading of securities.
FIX 4.2 Service	CBOE FIX interface to all markets that adheres to the FIX 4.2 standard.
FIX Engine FIX Server	Combination of hardware and software responsible for establishing FIX sessions, then transmitting and receiving FIX messages.
FIX Session	Connection between two firms established to transmit FIX messages.
FIX/ORS Service	FIX interface to the CBOE Order Routing System.
Gateway	A computing device, such as a router, computer, or firewall, that sits between two networks to deliver messages between the two networks.
ICMP	Internet Control Message Protocol (ICMP), documented in RFC 792 , is a required protocol tightly integrated with IP. ICMP messages, delivered in IP packets, are used for out-of-band messages related to network operation. (definition taken from http://www.freesoft.org/CIE/Topics/81.htm)

CBOE – FIX Development Environment

Term	Definition
Initiator	Firm that establishes the connection and initiates a FIX session via transmitting a Logon message. This is often referred to as the Buy Side. In the FIX/ORS implementation the Firm is the Initiator. This is referred to as the Buy side in FIX terminology.
Mobile PAR	Wireless version of PAR.
NAT	<p>Network Address Translator- In its simplest configuration, the Network Address Translator (NAT) operates on a router (gateway) connecting two networks together. One of these networks (designated as inside) is addressed with either private or obsolete addresses that need to be converted into legal addresses before packets are forwarded onto the other network (designated as outside). The translation operates in conjunction with routing, so that NAT can simply be enabled on a customer-side Internet access router when translation is desired.</p> <p>Use of a NAT device provides RFC 1631-style network address translation on the router platform.</p> <p>(definition taken from: http://www.cisco.com/warp/public/701/60.html)</p>
ORS	Order Routing System—CBOE’s Order Routing System for current open outcry markets.
ORS Simulator	Computer software that runs on the FIX cluster that simulates the behavior of the mainframe based ORS system.
ORS Test Environment	Version of the mainframe based ORS system that is running in test mode. The ORS Test Environment not only describes the ORS program on the mainframe, it also refers to the hardware, communication processors (host gateways), and networks configured and used for testing.
OSC	Options Standards Committee—Defunct organization that specified a common order routing mechanism for options. This standard serves as the basis for CMS order routing.
OSPF	Open Shortest Path First IGP (ospf) Routing Protocol
PAR	Public Automated Routing—Electronic trading terminal for order execution and routing for CBOE open outcry markets.

CBOE – FIX Development Environment

Term	Definition
PPP	Point to Point Internet Protocol – Alternative to SLIP – IP protocol optimized for connection over point to point dial up or dedicated networks. Widely used for connections over modems.
RAES	Retail Automated Execution System—CBOE automated execution system for marketable orders.
ROS	Rapid Opening System—CBOE electronic order matching system for orders in the open outcry markets. ROS greatly benefits market participants by minimizing the time traditionally needed to open all option series in a class and allows options trading to begin within seconds of the opening of the underlying stock.
SLIP	Serial Line Internet Protocol – Alternative to PPP – IP protocol optimized for connection over point to point dial up or dedicated networks. Widely used for connections over modems.

Introduction

CBOE has taken a leadership position in expanding the FIX protocol for exchange style derivatives trading by participating in the ECN and Exchange Working Group during the definition of the FIX 4.2 protocol. CBOE is continuing that leadership with participation in the Futures & Options Working Group as FIX 4.3 enhancements for support of equity derivatives are defined.

The initial version of FIX support referred to as the *FIX/ORS* Service provides a basic order management interface to the CBOE Order Routing System (ORS) for products trading on existing open outcry markets. FIX/ORS is based upon the FIX 4.1 standard with the addition of new fields that are defined in the FIX 4.2.

FIX/ORS is meant to be an alternative to COMPASS. COMPASS is the CBOE version of the OSC order routing system. FIX/ORS is designed to simplify transition from COMPASS to FIX. This interim version provides order-handling semantics that are similar to COMPASS.

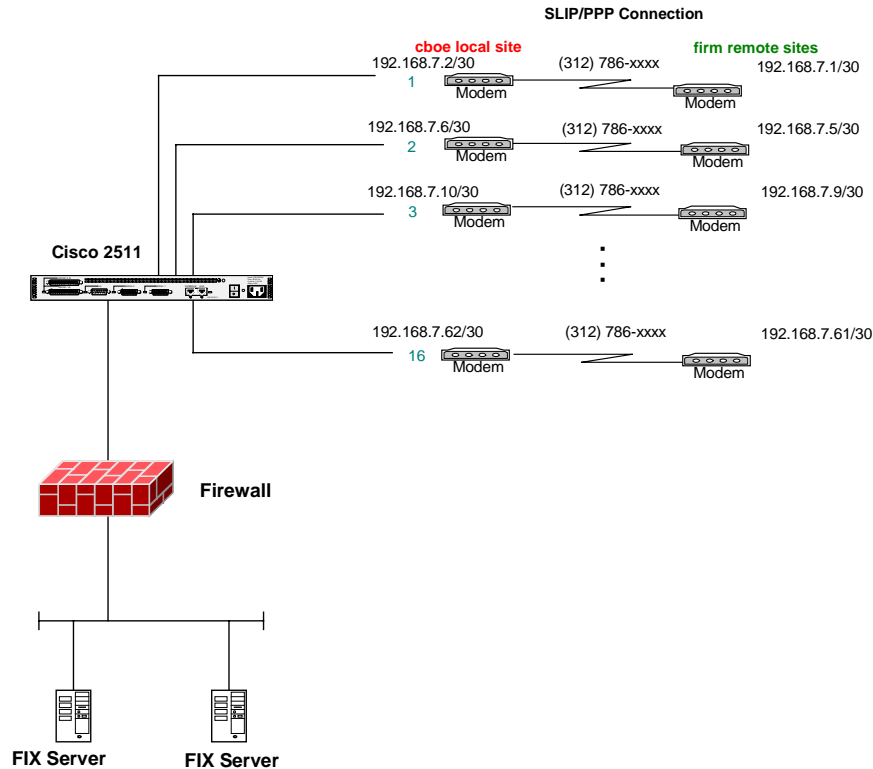
The second version of FIX support that is planned referred to as the *CBOE FIX 4.2 Service* will include many enhancements over FIX/ORS. The CBOE FIX 4.2 Service will provide these additional capabilities:

- Mass quoting to selected CBOE markets
- Improved inquiry of order status
- Support for standard FIX 4.2 order handling semantics
- Ability to receive bust and reinstate reports from selected CBOE markets
- Automated definition and routing of complex orders (e.g., spreads, option strategies)
- Ability to download product information (class and series)
- Subscription to product trading status, including intra-trading session addition of series
- Subscription to trading session status information

FIX Testing Environment

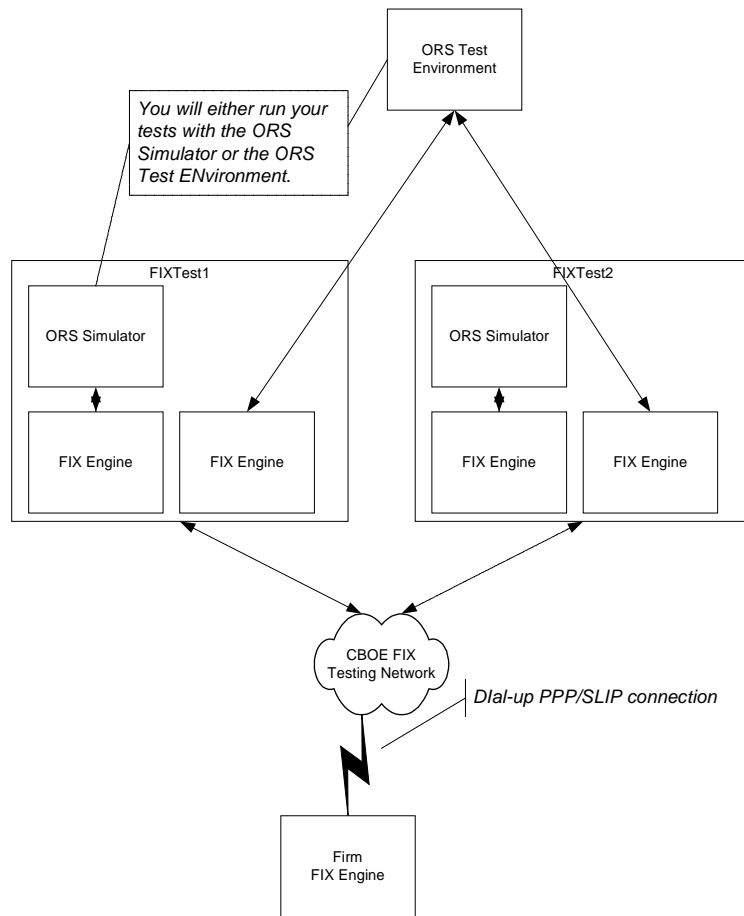
The testing environment for CBOE FIX Services consists of cluster of FIX servers configured in high availability mode. Access to the FIX testing environment is accomplished via dial up SLIP/PPP connections. CBOE has a bank of modems connected to a Cisco 2511 router. CBOE has a firewall between the router and the FIX test servers.

Figure 1 FIX Test Network



The FIX cluster used in the testing environment is identical to the production environment. The FIX cluster in the testing environment talks to either an ORS simulator or the ORS test environment. Firms run through initial testing phases using the ORS simulator. Certification testing with the ORS test environment is only done after successfully completing the initial phases of testing as defined in FIX-05.

The following diagram shows the logical configuration of the CBOE FIX testing environment.

Figure 2 Logical View of FIX Testing Environment

Firm side testing network configurations

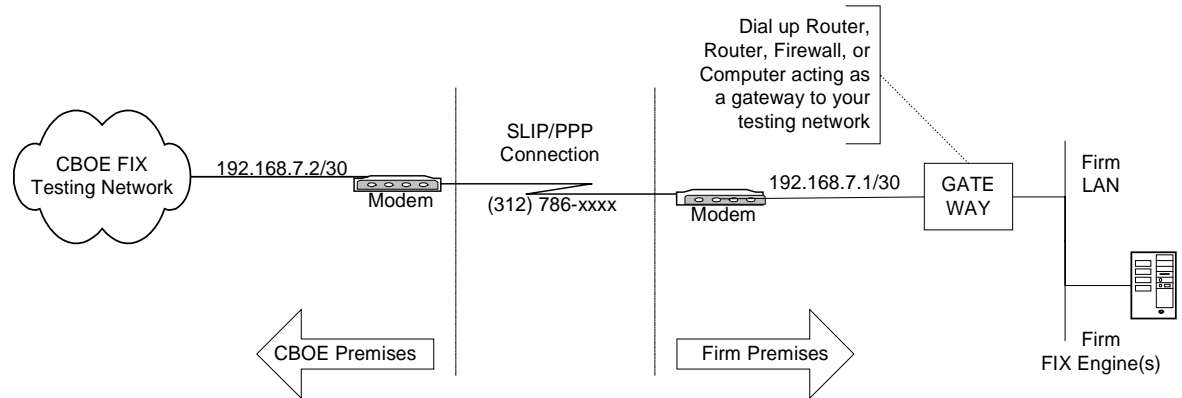
The firm is responsible for providing the dial up connection on their side of the testing environment. This can be accomplished by using a router, firewall, or computer connected to a modem to act as a gateway for the FIX engine. CBOE highly recommended that the test environment at the firm site be as close as possible to the production environment that will be used, in order to minimize the risk of problems when moving into production testing.

Test Network Configuration

CBOE recommends that a separate router, firewall, or computer be used as the gateway to the CBOE FIX testing network. The gateway can use either PPP or SLIP to communicate over the modem to CBOE.

The serial port of the gateway must be configured with the Firm Gateway IP Address (192.168.7.1/30 in the following diagram).

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Figure 3 Recommended Test Network Configuration**Firewall considerations**

The firm can use a Firewall between their LAN and the CBOE test environment.
 Firms can use Network Address Translation (NAT).

Authentication Password for serial connections

Use userid: *cboe* and password: *cboe* for the test PPP/SLIP connection authentication.

Obtaining a connection to the FIX Testing Environment

Contact fixconnect@cboe.com in order to have a connection defined and configured for testing.

A worksheet [Worksheet T] is provided at the end of this document that must be used to request connections to the CBOE FIX test environment. This form should be completed then sent via facsimile (312.786.7409) OR e-mail (fixconnect@cboe.com) to the CBOE Systems Liaison group. On the worksheet you will find reference numbers to specific fields that need to be completed – these numbers will be referenced within the following instructions.

On the worksheet you are asked to provide the following information about your FIX engine configuration.

[T.1] Provide company information and the names [T.1.1] of contacts at the firm location. In addition to specifying telephone [T.1.2] and e-mail addresses [T.1.3], please specify the role or responsibility for each contact [T.1.4] (such as network engineer, software testing, etc.).

[T.2] There will be separate FIX engine connections for stand alone testing and testing with a test ORS environment. For each connection you must provide the IP address of your FIX engine [T.2.1]¹. Also indicate whether you intend to use PPP or SLIP to connect to CBOE [T.2.2]

[T.4] Indicate when the connection is required. CBOE will make every effort to comply with the request, but cannot guarantee meeting the request.

[T.5] Provide the name and contact information for the individual initiating the request at the firm site.

Once this information is received, CBOE will provide the following information to you on the form and send it back to you via e-mail and/or facsimile:

[T.2] CBOE will assign connection names and IP addresses for CBOE test FIX engines.

[T.2.3] CBOE will assign a connection name for each connection based on your firm acronym that is used for trading with CBOE. The connection name is limited to four characters. The connection name must be used as the SenderCompId(49) in the standard header of all messages sent to CBOE. CBOE will use this connection name in the TargetCompId(56) field in all messages sent to your firm.

[T.2.4] The CBOE Test FIX Engine Connection name. The CBOE connection name that is to be used as the TargetCompId(56) in all

¹ You can use the same IP addresses for your FIX engine connections when testing stand alone or when testing with ORS.

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messages sent to CBOE. CBOE will use this in the SenderCompId(49) in all messages sent to your firm.

[T.2.5, T.2.6] CBOE will assign a test FIX Engine IP address and port number for each requested connection.

[T.3] CBOE will assign the dial up network connection information.

[T.3.1] The CBOE gateway IP address.

[T.3.2] The Firm gateway IP address – you must use in configuring your router or gateway.

[T.3.3] The dial up telephone number you will use to establish the connection.

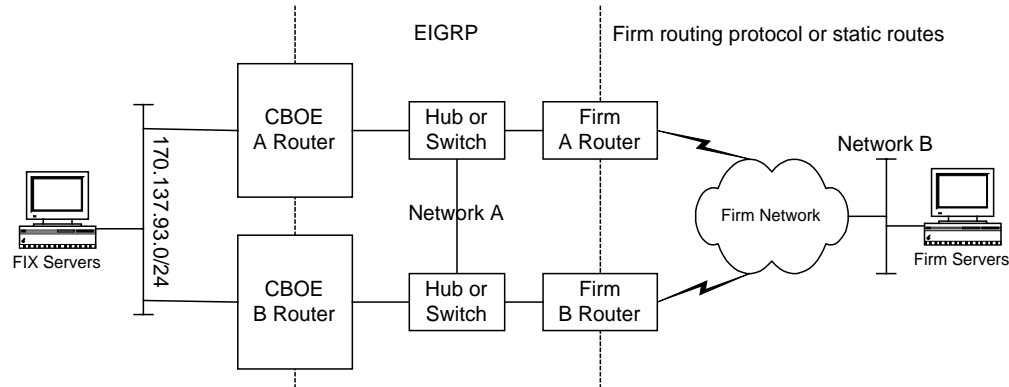
Special Notice about maintain a testing environment with CBOE

CBOE strongly requests that firms maintain the test configuration for future testing, even after testing has been successfully completed. Maintaining a testing capability will keep your firm ready to test additional capabilities and services planned by CBOE in the near future.

Production Environment

This diagram shows the standard network design that CBOE has developed for Production FIX firm connections. This standard was developed to provide complete redundancy and rapid and automatic fail-over in the event of problems.

Figure 4 FIX Production Environment



Firms are required to provide redundant routers and serial links to CBOE. They are also encouraged to investigate the redundancy of their own networks. CBOE will provide Ethernet interfaces on redundant routers. The CBOE network is also fully redundant.

The two CBOE routers and the two firm routers are connected to a single common network (Network A). The firm must provide two 10baseT Ethernet compatible hubs or switches. The hubs or switches must have an RJ-45 port to connect to the CBOE router. CBOE will provide the cabling between the firm hubs (or switches) and the CBOE routers.

A common EIGRP routing process is used to exchange routing information between the four routers and provide automatic and rapid fail-over in the event of an outage. If the firm does not use Cisco routers, OSPF can be used as the common routing process. To prevent potential routing conflicts and to increase network security, the common routing process must be different than the routing process used in either the firm or CBOE networks. Redistribution is used to exchange routes between the different routing processes. Again to prevent potential routing conflicts and to increase network security, route-maps and access-lists must be used to limit the redistribution to only those routes that are required.

Access lists on the CBOE routers will only permit traffic going to the FIX servers and using the FIX TCP port number. ICMP is also permitted to aid in troubleshooting.

The example configuration below assumes that the firm is using EIGRP 100, the common EIGRP process is 150, Network A is 172.20.150.0/28 and Network B is 192.168.1.128/25.

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On the firm routers, 192.168.1.128 will be redistributed from EIGRP 100 into EIGRP 150 so that the CBOE routers learn it.

```
firm#
router eigrp 150
  network 172.20.0.0
  passive-interface (all except 172.20.150.x interface)
  redistribute eigrp 100 route-map to-firm
  no auto-summary
route-map to-firm permit
  match ip address firm
ip access-list standard firm
  permit host 192.168.1.128
```

The CBOE routers will advertise 170.137.93.0 in EIGRP 150 so that the firm routers learn it.

```
cboe#
router eigrp 150
  network 170.137.0.0
  network 172.20.0.0
  passive-interface (all except 172.20.150.x interface)
  no auto-summary
```

Finally the firm routers will redistribute this route from EIGRP 150 into EIGRP 100 for the other routers in the firm network.

```
firm#
router eigrp 100
  network (firm network)
  passive-interface (172.20.150.x interface)
  redistribute eigrp 150 route-map to-cboe
  no auto-summary
route-map to-cboe permit
  match ip address cboe
ip access-list standard cboe
  permit host 170.137.93.0
```


Note: If the firm is using static routes instead of a routing protocol, the first redistribution will be redistribute static and the last redistribution is not required. Instead, static routes for 170.137.93.0 will be required on all firm routers between the firm server network and CBOE.

Obtaining a connection to the FIX Production Environment

Firms can either provide a new TCP/IP connection to the CBOE or they may chose to use an existing connection.

The table below lists the various types of connections and order throughput (with confirming Execution Reports) that are expected for CBOE FIX Services.

Table 2 FIX/ORS Network Connection bandwidth and estimated throughput rates

Bandwidth	Throughput Estimate²
56Kbps	10 orders per second
128Kbps	20 orders per second
1.544Mpps	Greater than 20 orders per second

Connection to the FIX production environment will only be permitted after the firm has completed testing with the ORS simulator and the ORS test environments.

It is the responsibility of the firm to ensure that there is adequate bandwidth available to support their computing needs when the connections is being used for multiple applications.

Firms requiring a new network connection to the CBOE

At this time firms are required to provide their own TCP/IP connections to CBOE, as described above in the section. The firm is expected to contact a network provider to obtain this TCP/IP connection. The acquisition and installation of this interface must be coordinated with the Systems Liaison group (fixconnect@cboe.com).

As specified above, the firm must provide the network termination equipment for their CBOE connection. CBOE requires a 10baseT compatible hub or switch with an available straight through, RJ-45 connector port for each network connection.

Use the CBOE FIX Production Connection Worksheet

Firms that have existing TCP/IP connectivity to CBOE

If you are planning on using an existing physical connection to CBOE, you must specify the location of the equipment at CBOE, the type of equipment, and router IP addresses, to establish a connection to the CBOE FIX Production Environment.

² CBOE has not completed capacity testing at this time. These numbers are preliminary estimates only.

Completing the CBOE FIX Production Connection Request Worksheet

You should use the worksheet [Worksheet P] provided at the end of this document to specify the production network connection. This form should be completed and sent via facsimile (312.786.7409) OR e-mail (fixconnect@cboe.com) to the CBOE Systems Liaison group. On the worksheet you will find reference numbers to specific fields that need to be completed – these numbers will be referenced within the following instructions.

On the worksheet you are asked to provide the following information about your FIX engine configuration.

[P.1] Provide company information and the names [P.1.1] of contacts at the firm location. In addition to specifying telephone [P.1.2] and e-mail addresses [P.1.3], please specify the role or responsibility for each contact [P.1.4] (such as network engineer, software testing, etc.).

[P.2] Please specify if the connections to CBOE that will be used for FIX are new or existing. If the existing network connectivity or termination equipment is being upgraded as part of this effort please indicate this by checking the last box on the form.

[P.3] In order to provide improved service to member firms, CBOE requests that you provide details regarding the type of connections and the specific network termination equipment that is to be used. It is preferred, that in addition to the worksheet, that you provide a network diagram, using Visio or some similar drawing package if possible, that lists the equipment that is used. Be sure to include the router IP addresses if you will be using an existing connection.

[P.5.1] For each production FIX engine connection required by the firm, please provide the IP address. CBOE will use this information to assign connection names, IP addresses and TCP port numbers.

[P.6] Please specify the date that the connection is requested to be in production. CBOE will make every attempt to work with you to meet this timeframe, subject to schedule constraints.

[P.7] Name and contact information for the initiator of the request.

Once this information is received, CBOE will provide the following information to you on the form and send it back to you via e-mail and/or facsimile:

[P.4] CBOE will provide you with the gateway addresses for your TCP/IP connections.

[P.5.2] CBOE will assign a connection name for each connection based up your firm acronym that is used for trading with CBOE. The connection name is limited to four characters. The connection name must be used as the SenderCompId(49) in the standard header of all messages sent to CBOE. CBOE will use this connection name in the TargetCompId(56) field in all messages sent to your firm.

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[P.5.3] The CBOE Production FIX Engine Connection name. The CBOE connection name that is to be used as the TargetCompId(56) in all messages sent to CBOE. CBOE will use this in the SenderCompId(49) in all messages sent to your firm.

Worksheet [T.] CBOE FIX TEST CONNECTION REQUEST (Page 1 of 1)

[T.1] Company Name			
[T.1.1] Contact Name	[T.1.2] Telephone	[T.1.3] E-mail Address	[T.1.4] Role / Responsibility

[T.2] FIRM FIX ENGINE INFORMATION

You should complete this column with the IP address for each FIX engine you will be testing			The following information will be provided by CBOE			
Firm Connection	[T.2.1] Firm IP Address	[T.2.2] Connection Type (Circle One)	[T.2.3] Firm Connection Name	[T.2.4] CBOE Connection Name	[T.2.5] IP Address	[T.2.6] TCP Port Number
Stand Alone Testing Connections						
1		<i>SLIP PPP</i>				
2						
ORS Testing Connections						
1		<i>SLIP PPP</i>				
2						

[T.3] DIAL UP NETWORK CONNECTION INFORMATION

The following information will be provided by CBOE		
[T.3.1] CBOE Gateway IP Address	[T.3.2] Firm Gateway IP Address	[T.3.3] Dial UP Telephone Number

[T.4] Connection Requested By This Date	
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[T.5] Requestor Name	[T.5.1] Facsimile	[T.5.2] Telephone	[T.5.3] E-mail Address

Worksheet [P.] CBOE FIX PRODUCTION CONNECTION REQUEST WORKSHEET (Page 1 of 2)

[P.1] Company Name			
[P.1.1] Contact Name	[P.1.2] Telephone	[P.1.3] E-mail Address	[P.1.4] Role / Responsibility

[P.2] CONNECTION STATUS

<input type="checkbox"/> This will be a NEW Connection to CBOE	<input type="checkbox"/> This is an EXISTING Connection to CBOE	<input type="checkbox"/> This is an EXISTING Connection to CBOE that will be CHANGED
--	---	--

[P.3] NETWORK CONNECTION INFORMATION

Please answer the following questions about the firm network equipment that will be used to connect to the CBOE Production FIX Service.

Please provide a network diagram of the proposed (or existing) connection to CBOE. (Please include the type of equipment, manufacturer, and network addresses on the diagram).

[P.3.1] What vendor is providing the network connections between your external firm network and your network equipment located on the CBOE premises?	
[P.3.2] What are the types and speeds of each external connection to CBOE (example: Frame Relay, 56Kbps; T.1, 1.5Mbps, etc.).	
[P.3.3] What network devices will be used to connect to the CBOE network (router, bridge, switch, etc.)? Please specify manufacturer name and product model number.	
[P.3.4] Please specify any other applications for which this connection will be shared (house systems, Vendor Quote, NCC, NCC/SEF, CWN).	
[P.3.5] If this equipment is already installed at CBOE premises – please specify the physical location (floor, cabinet, etc.).	
[P.3.6] Current Router IP addresses	

Worksheet P. CBOE FIX PRODUCTION CONNECTION REQUEST WORKSHEET (Page 2 of 2)

[P.1] Company Name (repeated from first page)

[P.4] NETWORK CONNECTION INFORMATION

The following information will be provided by CBOE	
[P.4.1] CBOE Gateway IP Address	[P.4.2] Firm Gateway IP Address

[P.5] FIRM FIX ENGINE INFORMATION

	You should complete this Column with the IP address for each FIX engine connection	The following information will be provided by CBOE			
Firm Connection	[P.5.1] Firm IP Address	[P.5.2] Firm Connection Name	[P.5.3] CBOE Connection Name	[P.5.4] IP Address	[P.5.5] TCP Port Number
1					
2					
3					
4					
5					
6					

[P.6] Connection Requested By This Date		[P.7] Requestor Name	[P.7.1] Facsimile	[P.7.2] Telephone	[P.7.3] E-mail Address
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