



US Options Complex Book Process

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Contents

1	Overview	4
2	Complex Order Basics	5
2.1	Ratios	5
2.2	Net Price	5
2.3	Availability of Complex Order Functionality	5
2.3.1	Eligible Classes	5
2.3.2	Number of Legs	6
2.3.3	Order Capacities.....	6
2.4	Synthetic BBO and Synthetic NBBO Calculations.....	6
2.4.1	Signed Values on SBBO and SNBBO	6
3	Complex FLEX Order Functionality (C1 only)	7
3.1	Leg prices and Leg Products	7
3.1.1	Eligible Classes	7
3.1.2	Number of Legs	7
3.1.3	Order Capacities.....	7
4	Complex Instruments	8
4.1	Instrument Creation.....	8
4.2	Complex Instrument Structure.....	9
4.2.1	CIC Request Examples.....	9
5	Order Entry	11
6	Order Book Matching	12
6.1	Legging into Individual Series.....	12
7	Complex Order Auction (COA)	13
7.1	Complex Order Auction (COA) on Cboe Options Exchange (C1 only).....	13
7.2	Initiating COA Orders	13
7.3	Responding to COA Orders	14
7.4	Execution Priority of COA.....	14
7.5	Early Termination.....	14
8	Complex Automated Improvement Mechanism (Complex AIM) (C1 and EDGX only)	16
8.1	Response Orders	16
8.2	Early Termination.....	16
9	Complex Solicitation Auction Mechanism (Complex SAM) (C1 Only)	17
9.1	Response Orders	17
9.2	Early Termination.....	17
10	Complex Qualified Contingent Cross (Complex QCC) (C1 and EDGX only)	18

US Options
Complex Book Process (Version 1.2.11)

10.1	Complex QCC Examples.....	18
11	Complex Orders with Stock Legs (C1 only)	20
11.1	Instrument Creation.....	20
11.2	COA for Complex Orders with Stock Legs.....	20
11.3	Early Termination.....	21
11.4	AIM and SAM for Complex orders with Stock Legs.....	21
11.5	QCC for Complex orders with Stock Legs.....	21
11.6	Pricing.....	21
11.7	Printing and Clearing Stock Legs.....	22
12	Floor Trading Support (C1 Only).....	23
12.1	Routing Complex Orders to PAR.....	23
12.2	Cash Spreads	23
12.3	Combo Trade Condition Code	23
13	Opening Process	24
13.1	Queuing Period.....	24
13.2	Complex Instrument Opening Process.....	24
13.3	Opening Price Calculation	25
14	Risk Controls	27
14.1	Risk Management.....	27
14.2	Price Validations.....	27
14.2.1	Minimum Price Checks.....	27
14.2.2	Maximum Price Checks	27
14.2.3	Fat Finger Protection	27
14.2.4	Maximum Size Checks.....	28
14.2.5	Market Order/Limit Order Drill-Through	28
14.3	Match Trade Prevention (“MTP”).....	28
15	Market Data	29
15.1	OPRA.....	29
15.2	PITCH	29
15.2.1	Complex Multicast PITCH.....	29
15.2.2	Complex Multicast Top	30
15.2.3	Complex Auction Multicast PITCH	30
16	Cross Product Spread Symbol List (C1 Only).....	31
17	References	32
17.1	Order Entry	32
17.2	Market Data	32
18	Support.....	32

1 Overview

The Complex Book Process document is used to communicate the basic complex order functionality on the exchange. The Complex Order Book is available on the Cboe Options Exchange (C1), C2 Options Exchange (C2), and EDGX Options Exchange (EDGX).

2 Complex Order Basics

A complex order is an order for two or more different options series “legs” sent to the exchange as a single order. The order, if filled, is guaranteed to execute within a net price and ratio, unlike sending two or more individual orders. Complex orders on C1 may include an equity leg (see section 11). Complex orders must use the New Order Multileg message.

2.1 Ratios

The quantity of each leg of a complex order broken down to the lowest terms will determine the ratio of the complex order. All legs must be reduced (i.e., 2:2 must be sent as 1:1) in order to be accepted by the system. The ratio will allow the exchange to partially execute the complex order in smaller pieces when possible while maintaining the proper proportions of each leg in the customer’s strategy.

2.2 Net Price

Complex orders are quoted in net price terms combining the cost of obtaining each leg of a complex order in its proper ratio. For example, assume a customer wanted to buy five contracts of Option 1 at a price of \$2.00 each and sell 15 contracts of option 2 at a price of \$0.50 each. The ratio for this order is 1:3 and the customer’s limit price would be a net debit price of \$0.50. That is, a debit of $\$2.00 \times 1 = \2.00 for option 1 and a credit of $(\$0.50) \times 3 = (\$1.50)$ for option 2, which would result in a net debit price of \$0.50. **Note:** For details on the Net price of a Complex order with a stock leg, please see Section 11 below.

2.3 Availability of Complex Order Functionality

Complex orders are available on the exchange as further detailed below. This section contains information regarding certain parameters employed by the exchange in offering complex order functionality on the exchange. The information immediately following only applies to non-FLEX Complex order types. **Note:** For Complex FLEX orders please refer to Section 3 below.

2.3.1 Eligible Classes

Complex Book: The exchange currently permits entry of complex orders in all classes traded on the exchange. Similarly, the exchange allows complex orders to rest on the complex book in all classes traded on the exchange.

Eligible for Legging: The exchange currently permits complex orders to leg in to the simple book in all classes traded on the exchange.

Complex Order Auction (“COA”): The exchange currently permits a COA to be initiated in all classes traded on the exchange.

2.3.2 Number of Legs

Complex Book: The exchange permits creation of complex instruments with a minimum of 2 legs and a maximum of up to twelve legs for all classes traded on the exchange.

Eligible for Legging: The exchange currently limits complex orders from legging into the simple book to orders with four or fewer legs for all classes.

2.3.3 Order Capacities

Complex Book: On BZX, C2, and EDGX Options, orders with all capacities (e.g., Customer, non-BD Customer, Firm, etc.) are eligible for entry to and may rest on the complex book. On C1, orders in SPX and SPXW with a capacity of “M” (Market Maker) or “N” (Away Market Maker) cannot rest on the complex book during RTH.

Eligible for Legging: Orders with all capacities are eligible for legging into the simple book.

COA: Similarly, orders with all capacities are permitted to commence a COA, provided they are otherwise eligible.

2.4 Synthetic BBO and Synthetic NBBO Calculations

The prices at which a complex instrument can be bought or sold is based only on the best bids and offers on the single leg book on the exchange is referred to as the Synthetic BBO (“SBBO”). The prices at which a complex instrument can be bought or sold that is based on the best bids and offers on the single leg books at all markets is referred to as the Synthetic NBBO (“SNBBO”). **Note:** For details on the Synthetic BBO and Synthetic NBBO calculations of a Complex order with a stock leg, please see section 11 below.

2.4.1 Signed Values on SBBO and SNBBO

- Bids and offers for complex instruments can be positive values or negative values.
- The bid is always looked at from the perspective of the buyer.
 - Since a buyer usually expects to pay in a transaction, a positive bid value means the buyer is paying (net debit) and the seller is being paid (net credit).
 - A negative bid value means the buyer is being paid and the seller is paying.
- The offer is always looked at from the perspective of the seller.
 - Since a seller usually expects to be paid in a transaction, a positive offer value means the seller is being paid (net credit) and the buyer is paying (net debit).
 - A negative offer value means the seller is paying and the buyer is being paid.

3 Complex FLEX Order Functionality (C1 only)

Unless otherwise specified below, all features and functionality described in section 2 (Complex Order Basics) above will also apply to FLEX.

3.1 Leg prices and Leg Products

Complex FLEX order legs must be for the same underlying product. Complex FLEX order legs must be for the same exercise style (American or European). Complex FLEX order legs must be for the same settlement type if using Asian or Cliquet, however, AM or PM settlement type may be mixed. No Complex FLEX order leg can be listed as a standard option.

Complex FLEX orders must contain an auction start price for each leg in addition to the net package price for the order. Responses will be in net price only. When an order is filled at the final net price, the system will generate leg fill prices that are as close as possible to the submitted leg price.

3.1.1 Eligible Classes

FLEX can trade on any certified underlying product (Equity, ETF, or Index). The product does not have to be listed on any other options exchange (standalone FLEX). FLEX products are defined by a set of attributes that include the underlying instrument, the exercise style and the settlement style. FLEX OSI Root names use a numeric value to identify Settlement/Exercise combinations along with underlying product symbol.

FLEX OSI Root names for Asian and Cliquet products use a numeric to identify Settlement/Exercise combinations along with an abbreviated underlying product symbol. This is done to accommodate additional information in the FLEX product symbol. The Asian and Cliquet product symbol abbreviations are listed in the following sections.

FLEX OSI Root names can be pre-defined prior to the start of the trading for everything other than Asian and Cliquet names. Asian and Cliquet OSI Roots will be added as needed based on incoming orders and trades of those FLEX products.

3.1.2 Number of Legs

Complex FLEX orders may have up to 100 legs. There will be no resting complex order book. There is no legging for FLEX complex orders.

3.1.3 Order Capacities

The following order capacities are supported by FLEX:

Customer (C), Firm (F), Market Maker (M), Market Maker Away (N), Broker-Dealer (B), Non-TPH Affiliate (L), Joint Back Office (J), Non-TPH Broker-Dealer (FLEX only) (D) and Professional Customer (U).

4 Complex Instruments

A complex instrument represents the specific leg and ratio details for a complex strategy.

For example, if a customer wanted to buy five contracts of June 150 IBM Calls and sell 15 contracts of June 175 IBM Calls they would first be required to request that the complex instrument be created using a two-step process. A customer using FIX can also enter an order using a one-step process (see details below).

Once created, a complex order book would be opened for this strategy and the complex instrument would look similar to the below record in the system:

Instrument ID	Legs	Symbol	Side	Ratio	Expiration	Strike	Class Type
CI0001	Leg 1	IBM	Buy	1	June	150	Call
	Leg 2	IBM	Sell	3	June	175	Call

A complex instrument only needs to be created once and will exist in the system for the remainder of the trading day unless tied to a working GTC order. Any customer can submit orders using the Instrument ID to trade this specific strategy without having to recreate the instrument.

If the customer wanted to buy five contracts of June 150 IBM Calls and sell 15 contracts of June 175 IBM Calls, they would submit a complex order that looks like the following: Buy 5 CI0001 @ Net Limit Price of \$0.50.

If the customer wanted to sell two contracts of June 150 IBM Calls and buy six contracts of June 175 IBM Calls, they would submit a complex order that looks like the following: Sell 2 CI0001 @ Net Limit Price of \$0.50.

4.1 Instrument Creation

The process that customers will use to request a complex instrument is referred to as the Complex Instrument Creation (“CIC”) process.

FIX order entry supports two distinct styles of request: a short form and a long form. The long form request requires the complete set of OSI symbol information for each leg to be specified on the FIX message. The short form requires two steps. First, the instrument must be created by submitting a security definition request, and then the resulting complex symbol id is used to submit the short form order message. BOE order entry supports the short form only. Refer to the US Options FIX and BOE Specifications for more details.

All complex instruments not tied to a working GTC will be purged at the end of each trading day and will not carry over to the next day.

4.2 Complex Instrument Structure

The structure of the complex instrument, as created through the CIC request process, will be the ultimate determining factor as to whether a complex order will be posted as a bid or as an offer. Complex instruments will always be defined from the perspective of the buyer and will be communicated back on to the requestor on the `Security Definition` message following a `Security Definition Request` message. If a spread contract contains multiple OSI Roots and one contract from each root has the same side, class, strike, and expiration, then the legs will be ordered lexicographically by OSI Root (see example 4).

All CIC requests will be re-sorted according to the following method when defined and communicated back to the exchange customers:

- a. All buy legs
 - i. Calls
 1. Lowest strike
 - a. Earliest expiration
 - ii. Puts
 1. Highest strike
 - a. Earliest expiration
- b. All sell legs
 - i. Calls
 1. Lowest strike
 - a. Earliest expiration
 - ii. Puts
 1. Highest strike
 - a. Earliest expiration

4.2.1 CIC Request Examples

Example 1: *Sorting Legs for New CICs*

CIC request: Sell 1 XYZ Aug \$5 Put
 Buy 1 XYZ Jun \$15 Call
 Sell 1 XYZ Aug \$10 Put
 Buy 1 XYZ Jun \$10 Call

Result: Buy 1 XYZ Jun \$10 Call
 Buy 1 XYZ Jun \$15 Call
 Sell 1 XYZ Aug \$10 Put
 Sell 1 XYZ Aug \$5 Put

US Options
Complex Book Process (Version 1.2.11)

Example 2: *Complex Instrument Already Exists*

CIC request: Buy 1 XYZ Jun \$10 Call
Buy 2 XYZ Jun \$15 Call

Result: Acknowledgement indicates that the requested complex instrument already exists and includes the Complex Instrument ID.

Example 3: *Complex Instrument Is Created From Perspective Of The Seller*

CIC request: Sell 1 XYZ Jun \$10 Call
Sell 2 XYZ Jun \$15 Call

Result: If a complex instrument is sent to the exchange from the perspective of the seller, the exchange will reverse all sides of the CIC request and define the instrument from the perspective of the buyer.

Buy 1 XYZ Jun \$10 Call
Buy 2 XYZ Jun \$15 Call

Example 4: *Sorting legs for CICs with Multiple OSI Roots*

CIC request: Sell 3 VXX2 Mar \$14 Put
Sell 1 VXX Mar \$14 Put
Buy 3 VXX2 Jan \$12 Call
Buy 1 VXX Jan \$12 Call

Result: Buy 1 VXX Jan \$12 Call
Buy 3 VXX2 Jan \$12 Call
Sell 1 VXX Mar \$14 Put
Sell 3 VXX2 Mar \$14 Put

5 Order Entry

Complex orders must use the order entry messages defined in either the [US Options FIX Specification](#) or [US Options BOE Specification](#). Additionally, details regarding current and future order types will be further described in the [Cboe Options Exchange \(C1\) Rule Book](#), [C2 Exchange Rule Book](#) and [EDGX Exchange Rule Book](#).

6 Order Book Matching

Complex orders will be matched on the complex book in a similar manner as orders on the simple book are matched today. For example, a multi-legged complex order to buy will only be represented as a single buy order on the complex book. However, there may be differences in order priority between the simple book and the complex book. Please see the Exchange Rules for further details.

6.1 Legging into Individual Series

Often, the best price available for a complex order can be obtained by “legging” the complex order into the individual series books that make up the complex instrument. In order for this to happen, the combination of the individual books must be able to fill at least part of the complex order quantity in the proper ratio.

All two-leg Complex Order Auction (“COA”) eligible Customer complex orders will be allowed to leg in without restrictions. However, not all complex orders are eligible to leg into the individual series book.

The following complex orders cannot leg into the simple book:

- Non-Customer (COA eligible or not) and Non-COA eligible Customer complex orders with two options legs where both legs are buying or both legs are selling; **AND** both legs are calls or both legs are puts.
- Complex orders with three or four options legs where all legs are buying or all legs are selling.
- Complex orders with five or more options legs.
- AONs resting on the Simple Book will not trigger resting or inbound Complex Orders to leg into the Simple Book.
- Complex-to-Complex Transaction will trade without regard to AONs resting on the Simple Book.
- A Complex Order that legs into the Simple Book based on displayed liquidity at the contra side SBBO will trade with better priced AONs if the size contingency on the AON can be met.
- Complex orders in Cross Product Spreads where the products do not operate on the same matching unit (ie SPX/SPXW, IWM/RUT, DIA/DJX, VIX/VXX, MNX/NDX). For a list of Cross Product Spreads refer to section 16 below.

7 Complex Order Auction (COA)

Complex Order Auction (COA) provides execution opportunity by exposing marketable complex orders prior to (1) canceling the order back or (2) booking the order to the complex order book. The period of time the COA will be exposed (or “Response Time Interval”) is 100 ms but may be adjusted by the exchange with appropriate notice.

New complex orders will initiate an auction on entry if the Net Limit price of the buy (sell) complex order is equal to or greater (less) than the Synthetic Best Bid (Synthetic Best Offer) and better than any resting buy (sell) orders on the complex order book.

If there are any Priority Customer orders on the individual leg book at the SBB (SBO), the auction will only be initiated if the Net Limit price of the complex order is at least \$0.01 better than the SBB (SBO) (EDGX only). If the Net Limit price on the buy (sell) order is greater (less) than the SBO (SBB), the order will still be auctioned at the complex order’s Net Limit price but will be restricted to executing within the SBBO at the end of the auction period.

Other Exchange customers can interact with a COA by entering regular complex orders or Response Orders.

7.1 Complex Order Auction (COA) on Cboe Options Exchange (C1 only)

COA for C1 will work the same as it does today for C2 and EDGX with the following differences:

- COA will have separate priority configuration from the COB (i.e. COA can be P/T and COB can be Pro Rata for Class).
- Resting orders on the Complex Book that arrive before the start of a COA auction will have the same priority as Complex orders and Response orders that arrive after the start of the COA auction.
- COA auctions will be allowed to start and execute through AON orders on the Simple Book.
- COA auction messages will be displayed on both the Complex Auction Feed and Pitch Feed.

7.2 Initiating COA Orders

A customer may decide if its order is eligible to initiate an Auction. All Book Only, non-IOC complex orders will be eligible for COA upon entry to the complex order book by default unless otherwise specified on the order. Book Only, IOC complex orders will not initiate a COA by default. Customers may opt-in or opt-out of initiating a COA by specifying one of the following 2nd character *RoutingInst* (9303) values:

- L = Do not expose order via COA (default for IOC)
- S = Expose order via COA (default for non-IOC)

Customers may override the default on an order-by-order basis using the appropriate *RoutingInst* (9303) values or configure alternative port level defaults by submitting a “Modify” Logical Port Request into the [Customer Web Portal](#).

7.3 Responding to COA Orders

Customers may interact with a COA with either a Response Order or a regular complex order that is resting on the book at the completion time of the COA. Response Orders must be priced equal to or more aggressive than the auction price and also include a valid *AuctionID* (9370) of the targeted auction for the Response Order to interact with the COA. Response Orders that are priced less aggressive than the auction price will be held and canceled at the end of the auction period.

A customer may submit multiple responses to the same COA priced at increments of \$0.01.

Response orders that are priced equal to or more aggressive than the auction price will be held for the duration of the exposure period and continue to be eligible for execution until the COA either fully executes or terminates early. Response Orders may be cancelled or modified anytime.

Response orders that are not fully executed against the targeted COA order will be cancelled back following the conclusion of the auction.

For details relating to responding to COAs of a Complex order with a stock leg, please see section 11 below.

7.4 Execution Priority of COA

The execution priority will be set at the Class and/or Exchange level.

Any remaining quantity on a Non-IOC COA order following the end of the auction will be placed on the book if it cannot be executed in full.

7.5 Early Termination

A COA order will continue to be exposed and eligible for execution until the exposure period is over or the auction terminates early as a result of the following scenarios:

- Customer cancels the original order that initiated the COA.
- A new, non-COA eligible, complex order is entered on the same side with a better price than a COA in progress. The system will end the auction immediately and attempt to execute the COA order before handling the newly arrived non-COA eligible complex order.
- An order is received on an individual series leg that improves the SBBO on the same side as a COA in progress to a price that is better than the Auction Price. The system will end the auction immediately and attempt to execute the COA order.

US Options
Complex Book Process (Version 1.2.11)

- A Priority Customer order is received on an individual series that joins or improves the SBBO on the same side as a COA in progress to a price that is equal or better than the Auction Price. The system will end the auction immediately and attempt to execute the COA order (EDGX only).
- A halt in the underlying security occurs while a COA is in progress, the COA will be terminated and no executions will be applied.
- A LULD Limit State or Straddle state goes into effect while a COA is in progress, if the COA order is a Market Order, the COA will be terminated and no executions will be applied. COAs for Limit Orders will not be affected by LULD.

8 Complex Automated Improvement Mechanism (Complex AIM) (C1 and EDGX only)

The system will support an Automated Improvement Mechanism (Complex AIM) for two-sided complex auctions. Complex AIM auctions will function in a similar manner to simple book AIM auctions, however, executions will be allowed outside of the SNBBO for the Complex Instrument but must be within the SBBO.

The information below will detail the important differences for Complex AIM relative to AIM. Unless mentioned below, all other behaviors for AIM (described in the [US Options Auction Process Specification](#)) should be assumed to also be applied Complex AIM.

- Complex AIM orders may only be entered after all individual component legs have opened.
- The system will always enforce Customer Priority for both Simple Book orders and Complex Book orders for Complex AIM auctions even if Customer Priority is not enabled for the series.
- Drill Through protections will be applied to both the Agency side and contra side of the Complex AIM order.
- All Complex Pricing Checks that apply to standard COB orders (i.e. Minimum or Maximum Price, Strategy Specific Price Restrictions) will apply to Complex AIM orders.
- The Complex AIM auction message will be published on the separate Complex Order Auction Feed and on the Complex Depth of Book Feed (Complex Pitch).
- Complex AIM orders cannot be canceled or modified.
- Complex AIM orders may specify a Preferred Market Maker (PMM) on the order that will receive the Marketing Fees but will not receive any priority benefits in the auction.
- Customer to Customer Complex AIM orders, regardless of size, will be executed immediately and will not be subjected to an exposure period if the auction price is in between the SBBO, or equal to or better than resting COB orders.

8.1 Response Orders

Response orders to Complex AIM auctions must follow the same guidelines defined for AIM auctions. Responders will need to include the Auction ID of the Complex AIM auction on their response in order for their order to be considered as a Response Order. Responses for Complex AIM will be capped by the SBBO instead of the NBBO.

8.2 Early Termination

A Complex AIM auction will terminate naturally at the end of the exposure interval. In addition, the auction may terminate early under various scenarios. Refer to the Exchange Rule Book for each Cboe Exchange for a detailed list of early termination scenarios.

9 Complex Solicitation Auction Mechanism (Complex SAM) (C1 Only)

The purpose of Complex SAM auctions is to facilitate the crossing of large size solicited orders. The information below will detail only the significant differences for Complex SAM relative to Complex AIM. Unless mentioned below, all other requirements for Complex AIM will also be applied Complex SAM.

- Complex SAM auctions must have 500 contracts or greater on the smallest leg of the complex order or it will be rejected.
- Customer Priority on the COB and Simple Book will always be enforced for Complex SAM allocations regardless of whether Customer Priority is enabled for the class.
- If better priced responses or a Non-Customer complex order is entered, the Agency side will be filled against the better priced responses and orders only if the entire quantity can be price improved.
- If an equal or better priced Priority Customer complex order is entered, the Agency side will be filled against the Priority Customer order only if it can fill the entire agency order by itself or when combined with equal or better priced responses and complex orders on the book.

9.1 Response Orders

Response orders to Complex SAM auctions follow the same guidelines described for Complex AIM above.

9.2 Early Termination

A Complex AIM auction will terminate naturally at the end of the exposure interval. In addition, the auction may terminate early under various scenarios. Refer to the Exchange Rule Book for each Cboe Exchange for a detailed list of early termination scenarios.

10 Complex Qualified Contingent Cross (Complex QCC) (C1 and EDGX only)

This section will describe the Complex Qualified Contingent Cross (Complex QCC) functionality offered on the Cboe Options Exchange. Members must choose between trading the stock leg off exchange or sending the stock leg in the complex instrument definition for the Cboe Options Exchange to execute. For additional detail relating to the Complex QCCs where the stock leg is included in the complex instrument definition see section 11.6 below.

The information below will detail the important differences for Complex QCC relative to QCC. Unless mentioned below, all other behaviors for QCC (described in the [US Options Auction Process Specification](#)) should be assumed to also be applied Complex QCC.

- The smallest component options leg must be at least 1,000 contracts
- Price protections, including Drill Through, will not apply to Complex QCCs.
- Complex QCCs will not be restricted by other auction types going on at the same time in the Complex or Simple Book.
- Trade messages resulting from Complex QCCs will not be displayed on the Auction Feed but will be displayed on the Depth, Top, and OPRA feeds.
- Complex QCCs will either be immediately executed or canceled on entry.
- Complex QCCs will never interact with resting liquidity on the complex or simple books.
- All component legs must be executed at or inside the SNBBO for each leg.

10.1 Complex QCC Examples

Example 1 – Complex QCC Minimum Size Requirement

Complex QCC Minimum Size: Complex Instrument (CI0001):	1,000 Buy 3 : Sell 2
Complex QCC Order1: Complex QCC Order2:	Agency- Buy 499 @ 10.00 Contra – Sell 499 @ 10.00 Agency- Buy 500 @ 10.00 Contra – Sell 500 @ 10.00
Result:	Complex QCC Order1 does not meet minimum size requirement (smallest leg x quantity) and is rejected. Complex QCC Order2 meets minimum size requirement and is accepted.

US Options
Complex Book Process (Version 1.2.11)

Example 2 – *Complex QCCs must be executed at or inside SNBBO*

Complex Instrument (CI0001): SNBBO: SBBO:	Buy 1 : Sell 1 1.00 x 1.50 .95 x 1.75
Complex QCC Order1: Complex QCC Order2: Complex QCC Order3: Complex QCC Order4:	Agency- Buy 1000 @ .99 Contra – Sell 1000 @ .99 Agency- Buy 1000 @ 1.51 Contra – Sell 1000 @ 1.51 Agency- Buy 1000 @ 1.00 Contra – Sell 1000 @ 1.00 Agency- Buy 1000 @ 1.50 Contra – Sell 1000 @ 1.50
Result:	Complex QCC Order1 and Complex QCC Order2 are both rejected since they are outside of the SNBBO. Complex QCC Order3 and QCC Order4 are accepted and trade at their respective prices.

11 Complex Orders with Stock Legs (C1 only)

Cboe Options Exchange will support Complex instruments that contain a stock leg. The stock portion will be sent to an external execution venue (Cowen Execution Services or “Cowen”) for execution.

11.1 Instrument Creation

The system will support instruments with up to 11 option legs plus 1 stock leg. Actual shares (reduced to lowest terms) is entered on the order for the stock leg (e.g. 100 shares is 100 shares) and it is not entered in round lot quantities. The Options to Stock Ratio cannot be more than 8:100 (based on 100 shares deliverable) or the instrument will be rejected. The system will only accept a complex with stock strategy where the option legs all have the same deliverable amount. Customers can send Buy, Sell, Sell Short or Sell Short Exempt on the Stock Leg portion of the complex order.

Any complex instrument sent with a Buy stock leg will be considered a Debit strategy regardless of how many buy or sell options legs the instrument contains. Any complex instrument sent with a Sell stock leg will be considered a Credit strategy regardless of how many buy or sell options legs the instrument contains. The system will create the reverse of the instrument in order to store the instrument from the Buyer’s perspective.

The system will validate that all complex instruments with a stock leg have at least one option leg with an opposite delta position relative to the stock leg. Below are examples of instruments that would be accepted and instruments that would be rejected by the system:

Stock Leg	Option Legs	Result
Buy	Sell Call	Accepted
Buy	Buy Put	Accepted
Sell	Buy Call	Accepted
Sell	Sell Put	Accepted
Buy	Buy Call	Rejected
Buy	Sell Put	Rejected
Sell	Sell Call	Rejected
Sell	Buy Put	Rejected
Buy	Buy Call Buy Call Sell Call	Accepted
Sell	Buy Put Buy Put Sell Call Buy Call	Accepted

11.2 COA for Complex Orders with Stock Legs

US Options
Complex Book Process (Version 1.2.11)

In general, COA auctions will support instruments with stock legs and will follow the same rules specified for options only strategies. Stock legs will always be priced at or inside NBBO and will always adhere to any trading restrictions in effect such as Reg SHO and LULD.

Rejects on Sell Short orders or system issues with Cowen could cause part or all of agency side not to be entirely filled. In the event that something like that occurs, the rejected stock quantity will result in a corresponding reduction of the total order quantity.

11.3 Early Termination

The auction may terminate early under various scenarios especially for those involving LULD and Reg SHO conditions on the stock leg. Refer to the Exchange Rule Book for each Cboe Exchange for a detailed list of early termination scenarios.

11.4 AIM and SAM for Complex orders with Stock Legs

In general, Complex AIM/SAM auctions will support instruments with stock legs and will follow the same rules specified for options only Complex AIM/SAM strategies. Stock legs will always be priced at or inside NBBO and will always adhere to any trading restrictions in effect such as Reg SHO and LULD.

Rejects on Sell Short orders or system issues with Cowen could cause part or all of agency side not to be entirely filled. In the event that something like that occurs, the rejected stock quantity will result in a corresponding reduction of the total order quantity.

11.5 QCC for Complex orders with Stock Legs

In general, Complex QCC auctions will support instruments with stock legs and will follow the same rules specified for options only Complex QCC auctions. Stock legs will always be priced at or inside NBBO and will always adhere to any trading restrictions in effect such as Reg SHO and LULD.

Rejects on Sell Short orders or system issues with Cowen could cause part or all of agency side not to be entirely filled. In the event that something like that occurs, the rejected stock quantity will result in a corresponding reduction of the total order quantity.

11.6 Pricing

The Net Limit Price of the complex order package can be entered with up to 4 decimals. The equity component of the Net Price represents the cost of 1 share. With the exception of QCCs, stock legs will always be priced at or inside NBBO and will always adhere to any trading restrictions in effect such as Reg SHO and LULD.

Stock legs will be priced in 4 decimals on the tape print.

Regardless of Drill Through protections, it will be permissible to trade stock legs up to \$0.0010 outside of the NBBO (not LULD bands) if necessary to avoid residual amounts.

11.7 Printing and Clearing Stock Legs

Cboe Options will use Cowen Execution Services (“Cowen”) for printing and clearing the stock legs. A two-sided cross of the stock leg at a price determined by the ME is submitted to Cowen. Cowen can reject the cross if they deem it to be at an impermissible price based on their own view of the market data (i.e. Reg SHO violation). Options Members must have agreements with Cowen in place and will clear using one of two methods:

- Members with valid equity MPID - Will clear through Cowen via ACT which will report trade to DTCC. Cboe will pass MPID to Cowen on cross.
- Members without a valid equity MPID – Will clear via correspondent clearing arrangements. Cboe will pass a placeholder MPID to Cowen who will then clear this side of the trade according to pre-determined arrangements.

The placeholder MPID will be stored as a port setting. A MPID can also be specified at the order level using the *EquityPartyID* field. MPIDs specified at the order level will override an MPID stored as a port setting.

The Floor will act as a backup for Cowen in the event they are having system issues. The Trade Desk will have the ability to manually enable the re-routing of all Complex with Stock orders to the Floor.

12 Floor Trading Support (C1 Only)

12.1 Routing Complex Orders to PAR

Complex orders can be routed to a PAR terminal on the Trading Floor.

12.2 Cash Spreads

PAR accepts complex orders with a total cash limit price based on the notional value of the order. C1 will accept cash limit prices up to \$999,999,999. Debit or Credit will be indicated using the same methodology, positive (debit) or negative (credit) used for standard limit prices. The electronic book will not handle orders with cash limit prices. Trade prints and Clearing Records will be converted to price and shares and will not be reported using notional value.

12.3 Combo Trade Condition Code

Complex Orders may be marked as Combo Orders using the *ComboOrder* field in FIX or BOE. To qualify for the CMBO exemption the complex order must meet the following criteria:

- Complex Order must be identified as “Combo” on the order message.
- Underlying symbol must be SPX or SPXW.
- Order must be directed to PAR and cannot be Electronic.
- Complex Instrument can have be entered for any number of legs (up to max) but must have at least one Combo pair as defined below:
 - One Buy Call Leg and One Sell Put Leg (or opposite)
 - Both legs must have the same Strike and Expiration.
- Any order marked CMBO that does not meet all of the above criteria will be rejected.

13 Opening Process

The Exchange's complex order book Opening Process offers customers the ability to queue orders or submit Complex Instrument Creation ("CIC") requests during pre-market and during an intra-day halt period. Instruments with a stock leg will not open until all of the individual option leg series have opened on the simple book, and the first trade and LULD bands have been published for the underlying equity leg by the primary listing market. Complex Orders with Stock legs will COA immediately following the Opening process if marketable.

13.1 Queuing Period

The pre-market Queuing Period will begin accepting limit or market complex orders and CIC requests at 2:00 AM ET for both the Global Trading Hours ("GTH") and the Regular Trading Hours ("RTH") sessions.

Complex instruments can also be halted intraday whenever the underlying product for a component leg is halted. Complex orders sent while a complex instrument is halted will also be queued up for a Re-Opening Auction.

During Queuing Periods, the exchange disseminates expected opening price and size information using Auction Update messages over the [Options Complex Multicast PITCH](#) feed at an interval of once every five seconds starting at 2:00 AM ET for the GTH session and at 8:30 AM ET for the RTH session.

13.2 Complex Instrument Opening Process

Following the receipt of the opening trigger for opening Single Leg series of a class, the exchange will wait for all component legs of the complex instrument to open before beginning the Opening Process. Additional details of the opening process for the individual component legs can be found in the [US Options Opening Process Specification](#). If there are no complex orders that can cross, the exchange will open the order book for the complex instrument immediately. However, if there are complex orders that can cross the system will determine the equilibrium price at which the greatest number of complex orders can trade and all such orders will be executed in standard priority (see '[Opening Price Calculation](#)' below).

If the equilibrium price is at or inside the SNBBO, the system will open the complex instrument at the equilibrium price. If the equilibrium price is outside the SNBBO, the system will continue to send out Auction Update messages. After an exchange-determined period of time, the system will release the complex orders to the complex order book in time priority.

Matched Trade Prevention ("MTP") is not in-effect during the matching phase of the complex series opening.

Complex books do not leg into component single leg books during the opening process. Instead, SNBBO collars ensure complex instrument opening prices are consistent with component single leg prices.

13.3 Opening Price Calculation

If there are complex orders on the book at the completion of the Queuing Period during an Opening or Re-Opening that can cross, then the system will determine the Opening Price using a Volume Maximizing Imbalance Minimizing (“VMIM”) algorithm, which computes the greatest number of complex contracts can trade. Where multiple price levels would result in the same number of contracts traded, the price with the lowest resulting absolute imbalance is selected as the opening price. The following examples illustrate the VMIM algorithm application to opening of Complex Instruments.

Example 1: *Equilibrium Price Calculation*

Equilibrium price is \$1.96 since most contracts (400) can be done at this price.

CumBid	BidQty	Price	AskQty	CumAsk	Match	Imb
0	0	mkt (bid)				
0		2.00	100	8,500	0	(8,500)
0		1.99	1,000	8,400	0	(8,400)
100	100	1.98	3,000	7,400	100	(7,300)
200	100	1.97	4,000	4,400	200	(4,200)
700	500	1.96	100	400	400	300
1,700	1,000	1.95	100	300	300	1,400
2,200	500	1.94	100	200	200	2,000
3,300	1,100	1.93	100	100	100	3,200
4,500	1,200	1.92		0	0	4,500
5,000	500	1.91		0	0	5,000
5,100	100	1.90		0	0	5,100
		mkt (ask)	0	0		

Example 2: *Finding the Imbalance Minimizing Price*

If more than one price will result in the same amount of contracts being executed, a price will be chosen where the Buy or Sell Imbalance is the smallest.

CumBid	BidQty	Price	AskQty	CumAsk	Match	Imb
0	0	mkt (bid)				
0		2.00	100	8,500	0	(8,500)
0		1.99	1,000	8,400	0	(8,400)
0		1.98	3,000	7,400	0	(7,400)
400	400	1.97	4,000	4,400	400	(4,000)
400		1.96	100	400	400	0
1,400	1,000	1.95	100	300	300	1,100
1,900	500	1.94	100	200	200	1,700
3,000	1,100	1.93	100	100	100	2,900
3,000		1.92		0	0	3,000
3,000		1.91		0	0	3,000
3,000		1.90		0	0	3,000
		mkt (ask)	0	0		

In the above example, both the \$1.97 and \$1.96 price levels will result in 400 contracts being executed. Since there is a 4,000 contract Sell Imbalance at the \$1.97 price level and a zero imbalance at the \$1.96 price level, the system would choose \$1.96 as the opening price

US Options
Complex Book Process (Version 1.2.11)

Example 3: *Volume Based Tie Breaker (“VBTB”)*

If more than one equilibrium price would result in the same maximum number of contracts executed and have the same “smallest” imbalance, the system will choose the price closest to the Volume Based Tie Breaker (“VBTB”). Where the VBTB would be the midpoint of the SNBBO for the given series.

For this example, assume the SNBBO is \$1.97 x \$1.98 Midpoint = \$1.975. The \$1.97, \$1.96, and \$1.95 price levels will all result in 100 contracts being executed with a zero imbalance. Since \$1.97 is closest to the VBTB of \$1.975, the system would choose \$1.97 as the opening price.

CumBid	BidQty	Price	AskQty	CumAsk	Match	Imb
100	100	mkt (bid)				
100		2.00	100	4,200	100	(4,100)
100		1.99	1,000	4,100	100	(4,000)
100		1.98	3,000	3,100	100	(3,000)
100		1.97		100	100	0
100		1.96		100	100	0
100		1.95		100	100	0
600	500	1.94		100	100	500
1,700	1,100	1.93		100	100	1,600
2,900	1,200	1.92		100	100	2,800
3,400	500	1.91		100	100	3,300
3,500	100	1.90		100	100	3,400
		mkt (ask)	100	100		

Example 4: *Midpoint of Imbalance Minimizing Prices*

If more than one equilibrium price would result in the same maximum number of contracts executed, have the same “smallest” imbalance, and there is no VBTB available the system will choose the midpoint of the highest and lowest potential opening price levels.

If the potential opening price levels are \$1.97, \$1.96, and \$1.95 with all price levels resulting in 100 contracts being executed with a zero imbalance. Since the midpoint of the highest and lowest potential opening prices of \$1.97 and \$1.95 would be \$1.96, the system would choose \$1.96 as the opening price.

If the midpoint of the potential opening prices would result in an invalid price, the system will round down to the nearest permissible increment.

If the potential opening price levels are \$1.96 and \$1.95. The midpoint of the \$1.96 and \$1.95 price levels is \$1.955, the system would round up and choose \$1.96 as the opening price.

14 Risk Controls

14.1 Risk Management

All existing [Risk Management](#) controls will apply to all complex orders and executions for customers that have applicable symbol or firm-level limits set.

- For *Rate Based* and *Absolute Notional Value* Checks, the system will count the notional value of all individual trades executed as part of a complex order execution.
- For *Rate Based* and *Absolute Volume* Checks, the system will count the volume of all individual trades executed as part of a complex order execution.
- For *Rate Based* and *Absolute Count* Checks, the system will count each individual trade executed as part of a complex order execution separately.
- For *Rate Based* and *Absolute Percentage of Quote* Checks, the system will count the percentage executed on the complex order, not on each individual leg.

14.2 Price Validations

14.2.1 Minimum Price Checks

The exchange will reject any limit orders that would result in individual leg prints being priced below \$0.01 if executed at that limit price. For example, a complex instrument with a 1:3 ratio containing all buys must have a net limit price of at least \$0.04.

The exchange will reject any limit orders where the limit price of the order is less than an exchange determined buffer value for Calendar, Vertical, Diagonal, Butterfly and Box Spreads.

For Roll Spread orders in all product classes the buffer value is -\$999,999.99.

For Calendar Spreads on VIX, SPX, and SPXW the buffer value is -\$50.00.

The current default buffer value applied for all other spread types and products is zero.

14.2.2 Maximum Price Checks

The exchange will reject any limit orders where the limit price of the order is greater than the intrinsic value of a Call or Put Vertical, Butterfly, or Box spread plus an exchange determined buffer value. The current buffer value applied for this price check is 1% of intrinsic value with a minimum \$0.03 and maximum \$0.50.

14.2.3 Fat Finger Protection

The Fat Finger Protection for complex orders will be based on the net price of the entire order relative to the SNBBO. Fat Finger Protection will be available for all complex orders.

US Options
Complex Book Process (Version 1.2.11)

Complex orders will have the exchange default Fat Finger settings applied if they are not set by the customer. The current exchange default settings for both EDGX and C2 Options are show in the following table as a function of limit price range (absolute value):

Abs. Value Limit Price Range	Fat Finger %Default	Fat Finger Dollar-Based Limit Default
\$0.00 – \$1.99	(none)	\$0.50
\$2.00 – \$5.00	(none)	\$0.75
\$5.01 – \$10.00	(none)	\$1.00
\$10.01 – \$20.00	(none)	\$1.50
\$20.01 – \$50.00	(none)	\$2.00
\$50.01 – \$100.00	(none)	\$3.00
\$100.01 & Above	4%	Not Valid

Customers will have the ability to set more or less restrictive settings than the exchange’s default settings.

14.2.4 Maximum Size Checks

The exchange will prevent complex orders from executing or being placed on the complex book if the size of the complex order exceeds the complex order size protection designated by the customer. If the maximum size of complex orders is not designated by the customer, the Exchange will reject orders with a size greater than 999,999. The size of a complex order is calculated as order quantity times largest ratio on a leg of a complex order. Maximum size protection will be available for all complex orders.

14.2.5 Market Order/Limit Order Drill-Through

Default Drill-Through Protections will be applied to all complex limit and market orders that will cap the price of the order relative to the SNBBO at the time of order entry. Exchange defaults are 3% through the contra-side of the SNBBO. The price cap level will be no larger than \$0.10 through the contra-side SNBBO and no smaller than \$0.02 through the contra-side SNBBO. An order that does not execute in full that is placed on the COB at a capped price due to Drill-Through Protections will rest in the complex book for two seconds.

Optional Drill-Through Protections can also be set on an individual order that will allow customers to set more or less restrictive Drill-Through Protections by using *DrillThruProtection (FIX 6253)* field on the `New Order Multileg` message.

14.3 Match Trade Prevention (“MTP”)

MTP will be supported for complex orders when interacting with orders on the complex book and when legging in to the individual series books.

The exchange will support the following limited set of MTP Modifiers for Complex-to-Complex and Complex legging transactions MTP enforcement:

US Options
Complex Book Process (Version 1.2.11)

- Cancel Newest (N)
- Cancel Oldest (O)
- Cancel Both (B)

Complex-to-Complex orders will be prevented from trading with each other only if the specified MTP Identifiers (Firm, EFID, Port Owner) are the same. For example, if one order specified “Firm” and one order specified “EFID”, the orders would be allowed to trade.

A Complex order that legs into the individual series books will always be cancelled (rather than the simple order) regardless of the MTP Modifier, if the MTP Identifier on any individual series book order matches the MTP Identifier on the Complex Order.

15 Market Data

15.1 OPRA

Trade prints will be broken out into the individual leg components when reported to OPRA. The following Message Category/Type will be used for reporting complex order trades to OPRA.

Msg Category	Msg Type	Value	Description
a	L	SPRD	Transaction represents a trade in two options in the same class (a buy and a sell in the same class). Prefix appears solely for information; process as a regular transaction.

15.2 PITCH

15.2.1 Complex Multicast PITCH

The Complex Multicast PITCH feed will be used to disseminate real-time depth of book complex quotation and execution information in addition to Complex Instrument Definition information directly from the exchange.

Updated quotations will be sent using the `Add Order` message which will display the net price of a complex order resting on the complex order book for each Complex Instrument ID.

Executions will be sent using the `Order Executed` message which will be sent when a complex order on the complex order book is executed in whole or in part. The `Trade` message provides information about executions of Complex Order Auctions on the complex order book. Trade messages do not alter the view of the complex order book.

Complex instruments will be published using the `Complex Instrument Definition` message each time a new complex instrument is created.

Additional details can be found within the [Complex Multicast PITCH Specification](#).

15.2.2 Complex Multicast Top

The Complex Multicast TOP feed will be used to receive real-time top of book quotations, last trade price and size, and cumulative volume data in addition to complex instrument definition information, related to complex orders, direct from the exchange's platform.

The quotations received via the Complex Multicast TOP feed provide an aggregated size and do not indicate the size or number of individual complex orders at the best bid or ask.

Complex instruments will be published using the `Complex Instrument Definition` message each time a new complex instrument is created.

`Auction Update` and `Auction Summary` messages will be used to disseminate indicative prices prior to the Opening Auction as well as to report the size of any executions that occur in the Opening Auction.

`Market Update` messages reflect real-time events that update the current state of the market using `Single Side Update` messages or `Two Side Update` messages. `Single Side Update` messages provide an updated price and size for a single side of a Complex Instrument ID while `Two Side Update` messages provide an updated price and size for both sides of a Complex Instrument ID.

`Top Trade` messages provide information about executions of Complex Orders which are necessary to calculate execution-based data but do not alter the complex order book. A `Top Trade` message will be sent for every execution. One or more `Single Side Update` or `Two Side Update` messages will follow a `TOP Trade` message to reflect the updated complex order book.

`Trading Status` messages are used to indicate the current status of a complex instrument. A `Trading Status` message will be sent whenever a complex instrument's status changes.

Additional details can be found within the [Complex Multicast Top Specification](#).

15.2.3 Complex Auction Multicast PITCH

The Complex Auction Multicast PITCH feed will be used to receive real-time auction updates and execution information in addition to complex instrument definition information, related to Complex Order Auctions, direct from the exchange's platform. The Complex Auction Multicast PITCH feed does not include information about any Opening Auctions.

Complex instruments will be published using the `Complex Instrument Definition` message each time a new complex instrument is created.

`Auction Notification` messages are used to disseminate order details of each COA. Auctions will end after a defined period of time known as the exposure period.

`Auction Trade` messages are used to disseminate executions resulting from a COA.

Additional details can be found within the [Complex Auction Multicast PITCH Specification](#).

16 Cross Product Spread Symbol List (C1 Only)

The following cross product spreads are found on Matching Engine Unit 35. With the exception of SPX:SPWX spreads, these spreads are only eligible to route to the floor.

DIA:DJX = 1:1	OEF:SPX = 20:1	SPX:XSP = 1:10
EEM:MXEF = 25:1	OEF:SPXW = 20:1	SPXW:SPY = 0:0
EEM:MXEFF = 25:1	OEF:XEO = 10:1	SPXW:XEO = 1:2
EFA:MXEA = 30:1	OEF:XSP = 2:1	SPXW:XSP = 1:10
EFA:MXEAF = 30:1	OEX:SPX = 2:1	SPY:XSP = 1:1
IWB:RUI = 10:1	OEX:SPXW = 2:1	VIX:VXX = 1:1
IWD:RLV = 10:1	OEX:XEO = 1:1	VIX:VXZ = 1:1
IWF:RLG = 10:1	OEX:XSP = 1:5	VIXW:VXX = 1:1
IWM:RUT = 10:1	SPX:SPXW = 0:0	VIXW:VXZ = 1:2
IWM:RUTW = 10:1	SPX:SPY = 1:10	VXX:VXZ = 1:1
OEF:OEX = 10:1	SPX:XEO = 1:2	XEO:XSP = 1:5

17 References

17.1 Order Entry

For more information regarding Options complex order entry, please refer to the appropriate specification:

- [U.S. Options BOE Specification](#)
- [U.S. Options FIX Specification](#)

17.2 Market Data

For more information regarding Options complex market data messaging, please refer to the appropriate market data specification:

- [U.S. Options Complex Auction Multicast PITCH Specification](#)
- [U.S. Options Complex Multicast TOP Specification](#)
- [U.S. Options Complex Multicast PITCH Specification](#)

18 Support

Please e-mail questions or comments regarding this document to tradedesk@cboe.com.

US Options
Complex Book Process (Version 1.2.11)

Revision History

Document Version	Date	Description
1.0.0	08/21/17	Initial draft version.
1.1.0	09/01/17	Added support for C2.
1.1.1	10/18/17	Cboe branding/logo changes. Removed Fat Finger Max % limits.
1.1.2	01/20/18	Removed unnecessary language concerning number of legs to be eligible for COA. Renamed Origin Code to Order Capacity for consistency with other specifications.
1.1.3	03/22/18	Removed old EDGX Options Fat Finger defaults.
1.1.4	05/03/18	Removed reference to Post Only <i>RoutingInst</i> (9303) for C2 as this feature will not be offered on day 1. Various grammatical corrections, formatting updates, and wording clarifications.
1.1.5	07/09/18	Added additional CIC Request Example for a spread spanning multiple OSI Roots.
1.1.6	07/17/18	Clarified Non-Marketable COA Response order behavior.
1.2.0	11/16/18	Updated for C1 migration to Bats Tech.
1.2.1	11/30/18	Corrected "Complex Options Auction" to "Complex Order Auction".
1.2.2	06/14/19	Updated ineligible leg in scenarios cross product spreads. Removed references to Market Snapshot messages which were sunset 02/28/2019. Added notes indicating Complex AIM and QCC will be available on EDGX, effective with C1 Feature Pack 8.
1.2.3	06/28/19	Added note indicating EDGX will support Complex Auctions with support for underlying stock legs, effective with C1 Feature Pack 9.
1.2.4	07/01/19	Added details about types of instruments created with stock legs in Complex Orders with Stock Legs section.
1.2.5	07/10/19	Updated effective date for C-AIM on EDGX to TBD.
1.2.6	07/17/19	Added detail to Order Capacities section that on C1 orders in SPX and SPXW with a capacity of "M" (Market Maker) or "N" (Away Market Maker) may not rest on the complex book during RTH.
1.2.7	08/09/19	Added note indicating support for C-AIM on EDGX will be effective 08/22/19.
1.2.8	08/30/19	Added section listing Cross Product Spreads on Matching Engine 35 for C1.
1.2.9	10/03/19	Added ratios to Cross Product Spread Symbol List.
1.2.10	10/14/19	Updated Minimum Price Checks for Roll Spreads (all markets) and Calendar Spreads on C1.
1.2.11	10/21/19	COA timer updated from 50 ms to 100 ms.