



# US Options Opening Process

Version 2.0.0

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## 1 Overview

Cboe Options Exchanges offer customers the ability to queue orders during the pre-market and regulatory halt periods (“Queuing Period”), after which the Opening Process applicable to each Options Exchange matches crossable interest at a designated Opening Price and transitions to normal trading.

The process by which exchanges transition single leg books from a Queuing Period, whether pre-open or regulatory halt, to normal trading is exchange-specific. BZX, EDGX and C2 Options exchanges use a Midpoint Uncross Opening Process where the opening price at which series open and queued orders are uncrossed is determined by opening markets at away exchanges. The Cboe Options Exchange (“C1”) uses a Price Forming Opening Process where the opening prices is determined through a matched contracts maximizing and imbalance minimizing process that is collared by external markets for series for which external markets exist.

A distinct Opening Process applies to Complex instruments on the EDGX, C2 and C1 Options Exchanges. Complex instruments open/re-open in a process that is dependent on the state of the constituent Single Leg Books. Specifically, Complex instruments open/re-open when all constituent Single Leg books transition to the open state and the Complex book opening price is within the synthetic best bid / best offer range formed from the Single Leg book markets. See the ‘US Option Complex Book Process’ for more detail on the Opening Process used by Complex Instruments.

Both the Midpoint Uncross and Price Forming Opening Processes used for opening Single Leg books are described in this document.

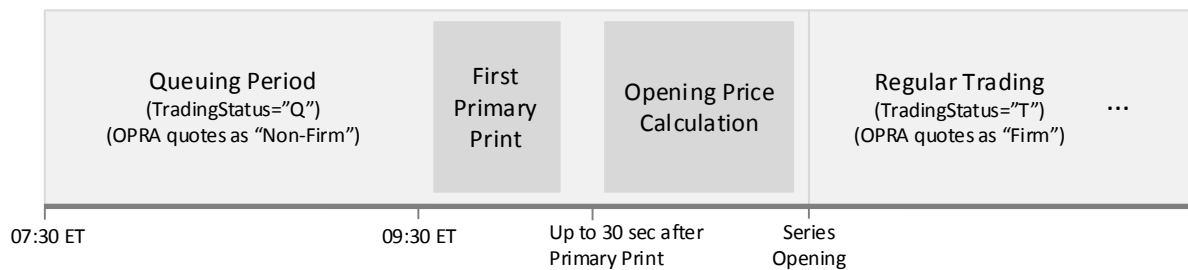
## 2 Midpoint Uncross Opening Process (BZX, C2, and EDGX)

BZX, EDGX and C2 Options Exchanges use a Midpoint Uncross Opening Process to open single leg books at the start of trading, and to re-open after the intraday receipt of an underlying Regulatory Halt from the underlying primary exchange puts a series back into a Queuing Period until unhalted by the primary exchange.

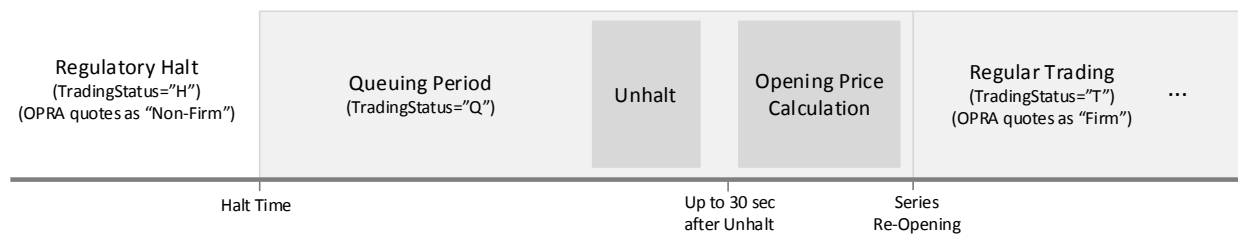
### 2.1 Queuing Period

For both the start of trading and regulatory halts, a Queuing Period precedes the open/re-open. Figure 1 and Figure 2 below illustrate the Opening Process for both start of trading and regulatory halts:

**Figure 1 - Start of day Midpoint Uncross opening**



**Figure 2 - Regulatory Halt Midpoint Uncross re-opening**



During the Queuing Period, Limit on Open ("LOO"), Market on Open ("MOO"), and non-IOC Limit Orders are accepted into single leg pre-open books for queuing. IOC orders submitted during a Queuing Period are rejected. Queued orders may be cancelled or modified at any time during the Queuing Period up to the point of the Opening Price calculation.

During the Queuing Period, the book may appear crossed as observed on the PITCH data feed. All quotes submitted to OPRA during the Queuing Period will be marked as "Non-Firm".

### 2.2 Opening Triggers

For start of trading openings the Queuing Period begins at a scheduled time (7:30 AM EST). The trigger to open a series at the start of trading is the first observation of an underlying print of at least one round lot in size on the primary exchange after a designated time (9:30 AM EST).

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For regulatory halts, the Queuing Period begins at the observation time of an underlying halt issued by the primary exchange. On receipt of an underlying halt, all associated single leg series and their dependent complex series transition to the Queuing state (Queuing Period). Series remain in the Queuing state until the observation of the opening trigger, which in the case of regulatory halts is when a regulatory halt has been lifted by the primary exchange.

### 2.3 Opening Price Determination

After the opening trigger is observed, the Opening Price is computed, after which the book is uncrossed at the Opening Price and Regular Trading commences.

The Opening Price is the midpoint of the NBBO (rounded down to the nearest full penny for half-cent midpoints). If the one or both sides of the NBBO has not been observed, there is no valid Opening Price and the series. The system will remain in the Queuing State until a valid NBBO is observed.

At the Exchange discretion, in the event that a valid NBBO has not been observed for an excessive amount of time, the Opening Price may be assigned the last regular way trade, which may include the previous day's close.

### 2.4 Market Width Check

Prior to uncrossing a book at a computed Opening Price, the width of the prevailing NBBO is checked against maximum width values provisioned as a function of the NBB as shown in Table 3 below:

**Table 1** - Midpoint uncross maximum width vs NBB

National Best Bid (NBB)	Max Width
Below \$2.00	\$0.50
\$2.00 to \$5.00	\$0.80
Above \$5.00 to \$10.00	\$1.00
Above \$10.00 to \$20.00	\$1.60
Above \$20.00 to \$50.00	\$2.00
Above \$50.00 to \$100.00	\$3.00
Above \$100.00	\$4.00

If the NBBO width exceeds the Max Width per Table 1 above, the series stays in the Queuing state until the NBBO width falls back within the Max Width.

At the Exchange discretion, in the event that the width of the NBBO remains above the Max Width for an excessive amount of time and markets are orderly, the max width enforcement may be disabled.

## **2.5 Opening Uncross**

After the opening trigger is observed, a valid Opening Price is computed and the NBBO check passes (or is disabled) the book is uncrossed at the Opening Price prior to transition to Regular Trading.

If there are no orders crossable at the Opening Price, orders in the Queued book are introduced into the continuous book in timestamp order and normal order handling according to order type, routing instruction, and time-in-force instructions identified on the order.

If there exists crossable orders at the Opening Price, orders that are priced equal to or more aggressively than the Opening Price will be matched at the Opening Price based on either time priority for BZX Options, customer priority/pro rata allocation for EDGX Options, or size pro rata allocation for C2 Options.

LOO and MOO order quantities not filled in the Opening Uncross are cancelled back. Other order quantities not filled in the Opening Uncross match will be rolled into the Regular Trading book in time priority and handled according to the order type, routing instruction and time-in-force instructions identified on the order.

## **2.6 Risk Limits During the Opening**

During the Opening Process for both start of trading and regulatory halts re-opening, Risk Limits are in effect. However, within the context of a series opening, executions in the matching phase that cause a Risk Limit to be exceeded will not be stopped. In other words, Risk Limit trips will not prevent a series from opening. As a result Risk Limits can be exceeded as a result of a series opening. Immediately after the series opening in which the Risk Limit was tripped (exceeded), associated live orders are cancelled, from both simple and complex series books still in the Queuing state and those that have transitioned to Regular Trading.

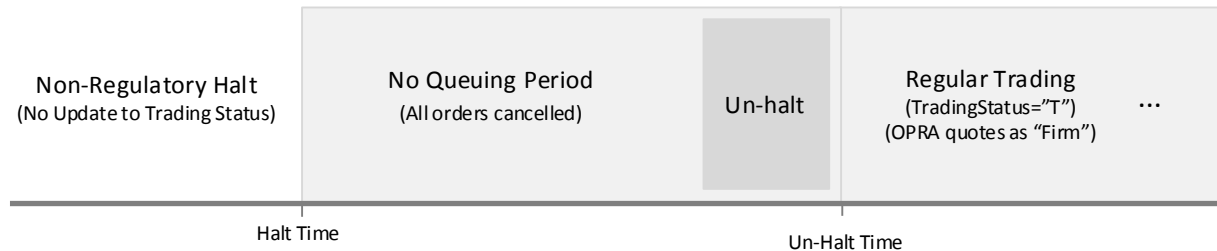
New orders received after the Risk Limit is tripped and before a risk reset operation is effected through FIX/BOE are rejected.

Mass Cancel functionality exists in the pre-open and regulatory halt queuing periods, the same in Regular Trading.

## 2.7 Non-Regulatory Halt Re-Opening

Figure 3 below illustrates the timeline associated with a non-regulatory halt. In the event a non-regulatory halt is issued by the Cboe Exchange (BZX, EDGX or C2), all open orders are cancelled immediately. As a result, open orders at the time of a non-regulatory halt will not be eligible to be rolled to continuous trading post halt. All order received after the occurrence of a non-regulatory halt and before the re-open will be rejected.

**Figure 3 - Non-Regulatory Halt**



The following enumerate exchange actions in various non-regulatory halt scenarios:

1. If a non-regulatory halt is issued during Regular Trading, affected series will transition directly to Regular Trading following the non-regulatory halt being lifted.
2. If a non-regulatory halt is issued while a series is in the Queuing Period prior to the start of Regular Trading, and the opening trigger does not occur prior to the lifting of the non-regulatory halt, affected series will be returned to the Queuing state following the non-regulatory halt being lifted.
3. If a non-regulatory halt is issued while a series is in the Queuing Period prior to the start of Regular Trading, and the opening trigger occurs prior to the lifting of the non-regulatory halt, affected series will transition directly to Regular Trading following the non-regulatory halt being lifted.
4. If a non-regulatory halt is issued after the occurrence of the opening trigger, but before the series has successfully transitioned to Regular Trading, affected series will transition directly to Regular Trading following the non-regulatory halt being lifted.
5. If the non-regulatory halt is issued while a series is in a Queuing Period at the start of trading and a regulatory halt is received prior to the non-regulatory halt being lifted, affected series will be return to the Queuing Period after both the non-regulatory and regulatory halts are lifted.
6. If the non-regulatory halt is issued while a series is in a Queuing Period at the start of trading and a regulatory halt is received and lifted prior to the non-regulatory halt being lifted, affected series will transition directly to Regular Trading following the non-regulatory halt being lifted.

### 3 Price Forming Opening Process (C1 Only)

A price forming Opening Process is used on the Cboe Options Exchange (“C1”) to open proprietary and multilist option series both at the beginning of trading sessions and to re-open after regulatory halts.

A select number of proprietary classes trade in an extended hours session referred to as Global Trading Hours (“GTH”). Classes that trade GTH also trade Regular Trading Hours (“RTH”). Queuing for the RTH session for series in these classes starts while the GTH session is active, and as a result, there exists a continuous trading book (GTH) while the RTH book is in a queuing state. These classes referred to as GTH Prop Classes, leverage the presence of the continuous book for placement of collars on the RTH Opening.

The C1 price forming Opening Process applies to the following four distinct categories of classes traded on C1:

**Table 2 - C1 options class categories**

Option class category	Description
Multilist classes	Classes for which away markets and an ABBO exists. Start of trading open at the beginning of Regular Trading Hours (“RTH”).
No-GTH Prop classes	Proprietary classes that do not trade in Global Trading Hours (“GTH”). Start of trading open at the beginning of RTH. There is no continuous book coincident with the pre-open Queuing book.
GTH Prop Classes	Proprietary classes that trade GTH and are not constituent series of a Volatility Derivative expiration Special Opening Quote (“SOQ”). Start of trading open at the beginning of GTH. Continuous book transitions into RTH book at the RTH open.
SOQ Constituent Series	A subset of GTH Prop Classes that on specific dates are constituent series of a Volatility Derivative expiration Special Opening Quote (“SOQ”).

For all class categories, the following applies:

- Matched Trade Prevention (“MTP”) is not in-effect during the matching phase of crossed-book openings.
- Risk limits are in-effect during the Opening Process. However, risk limit trips during the matching phase of crossed-book series openings will not interrupt the opening of that series.
- Opening triggers, specific to each category, must be observed in order to initiate the opening process (defined in respective sections below).
- The Volume Maximizing Imbalance Minimizing (“VMIM”) algorithm is used to determine the opening price for crossed books, with category specific collars and other constraints (defined in respective sections below).
- For a period of time during the queuing period in all class categories, Auction Update messages are disseminated on PITCH, TOP and Opening Process Data Feeds that provide expected



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opening price, size and imbalance information (see ‘VMIM Algorithm’ and ‘Auction Update Message’ section below for more detail on Auction Update message fields).

- For openings for which a continuous book is present coincident with the queuing book (e.g., GTH Proprietary and SOQ Constituent Series), a cut-off time exists after which existing Limit on Open (“LOO”) and (“Market on Open”) orders cannot be modified or cancelled, and only Late Limit on Open (“LLOO”) orders are accepted. See the Opening Process detail for ‘GTH Proprietary Opening’ and ‘SOQ Constituent Series Opening’ for more detail.

### 3.1 Volume Maximizing Imbalance Minimizing (“VMIM”) Algorithm

The opening price for a series, as well as several prices disseminated in Auction Update messages during the Queuing Period, are computed using the Volume Maximizing Imbalance Minimizing (“VMIM”) algorithm. This section describes the VMIM algorithm irrespective of collars that are applied and the inputs (i.e., queuing book only or combined queuing book and continuous book where a continuous book exists). In each of the sections describing the opening for each class category, further details is presented on the use of the VMIM algorithm for that class.

**Example 1 – Equilibrium price calculation example**

In the following example the price at which the most shares are matched is 1.96 (400 contracts) and as a result the equilibrium price is 1.96. Since there is only a single price that maximizes the match shares, that price is selected as the equilibrium price.

CumBid	BidQty	Price	AskQty	CumAsk	Match	Imb
0	0	<b>mkt (bid)</b>				
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)
<b>700</b>	<b>500</b>	<b>1.96</b>	<b>100</b>	<b>400</b>	<b>400</b>	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
		<b>mkt (ask)</b>	0	0		

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**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. In this example, both the \$1.97 and \$1.96 price levels 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 will select \$1.96 as the equilibrium price.

CumBid	BidQty	Price	AskQty	CumAsk	Match	Imb
0	0	<b>mkt (bid)</b>				
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)
<b>400</b>		<b>1.96</b>	<b>100</b>	<b>400</b>	<b>400</b>	<b>0</b>
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
		<b>mkt (ask)</b>	0	0		

**Example 3 – Volume-based tie breaker**

If more than one equilibrium price would result in the same maximum number of contracts executed and have the same minimum absolute imbalance, the system will select the price closest to the Volume Based Tie Breaker (“VBTB”). The definition of the VBTB will be noted in each of the class categories Opening Process described below.

For this example, assume the VBTB = \$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	<b>mkt (bid)</b>				
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)
<b>100</b>		<b>1.97</b>		<b>100</b>	<b>100</b>	<b>0</b>
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
		<b>mkt (ask)</b>	100	100		

## 3.2 Opening Information Dissemination

### 3.2.1 Queuing Period and Opening Information Dissemination Start Times

Table 3 below presents the start of the Queuing Period and the time at which Auction Update message dissemination begins by option class category. The start of the Queuing Period is the time at which the system begins accepting orders for queuing.

**Table 3 - Queuing Period start times by option class category**

Option Class Category	Queuing Period Start Time	Start of Auction Update Dissemination
Multilist	02:00 AM EST	02:00 AM EST
No-GTH Proprietary	02:00 AM EST	02:00 AM EST
GTH Proprietary (GTH)	GTH: 02:00 AM EST RTH: 02:00 AM EST	GTH: 02:00 AM EST RTH: 08:30 AM EST
Constituent Series	GTH: 02:00 AM EST RTH: 02:00 AM EST	GTH: 02:00 AM EST RTH: 08:30 AM EST

### 3.2.2 Queuing Period Expected Opening Information

During a portion of the Queuing Period (defined in each class category section below) Auction Update messages are disseminated on TOP, PITCH and Opening Process data feeds with information regarding expected opening price, size and imbalances. Table 4 below presents fields of the Auction Update message:

**Table 4 - Auction Update message fields**

Field	Description
Auction-Only Price	Uncollared VMIM price computed on the queuing book only (i.e., MOO, LOO and non-IOC Limit orders).
Reference Price	Collared VMIM price computed on the queuing book only (i.e., MOO, LOO and non-IOC Limit orders). If the Auction-Only Price falls within the prevailing Opening Collar, the Auction-Only Price and the Reference Price will be identical
Buy Contracts	Cumulative Buy contracts at the Reference Price and above (i.e., contracts to buy at prices higher than the Reference Price) and Buy Market on Open Orders.
Sell Contracts	Cumulative Sell contracts at the Reference Price and below (i.e., contracts to sell at prices lower than the Reference Price) and Sell Market on Open Orders.
Indicative Price	Collared VMIM price computed on the combined queuing book and the continuous book. For opening scenarios that do not include a continuous book trading coincident with the queuing period book (Multilist and No-GTH Prop), the Indicative Price and the Reference Price are identical.
Opening Condition	Indication of the state of the opening process. "Would open" indicates that width checks and collars will not prevent opening. "Need quote to Open" indicates that the width check failed and the opening will not occur until the relevant market width narrows. "Need more buyers" and "Need more sellers" indicates and imbalance condition caused by either unfilled market orders or a VMIM price that falls outside of the prevailing collar.

### 3.2.3 Opening Price and Size

At the conclusion of a successful series opening an Auction Summary message is disseminated on TOP, PITCH and Opening Process data feeds with summary trade information. The fields include the Auction Type, Price, and Contracts executed in the related Opening.

### 3.3 Maximum Width Checks

Maximum Composite Width (“MCW”) checks are applied to all option class category openings. Width checks prevent a given series from opening if the prevailing market for the series is too wide.

The MCW is determined as an exchange published function of the Composite Width Reference Price (“CWRP”) for the series, the details of which will be published in subsequent exchange notices.

A series will not open if the Composite Width (“CW”) exceeds the MCW. The system will periodically retry series openings until the width check succeeds. If the CW exceeds the MCW, an Auction Update message is disseminated with an Opening Condition value of “Q”, indicating “Need quote to open”.

Table 5 below defines the CWRP and CW values for each option class category. In the following table, MM-BB/BO refers to the Market Maker best bid and best offer in the local queuing book respectively. ABB/ABO refers to the best bid and offer at an away exchange respectively. Finally, CB-BB/BO refers to the best bid and best offer in the local continuous book respectively.

**Table 5 - Maximum Width Check by option class category**

Option Class Category	CWRP	CW
Multilist	Higher of MM-BB and ABB	Difference between 1) Higher of MM-BB and ABB, and 2) Lower of MM-BO and ABO
No-GTH Proprietary	MM-BB	Difference between MM-BB and MM-BO
GTH Proprietary (GTH)	CB-BB	Difference between CB-BB and CB-BO
Constituent Series	CB-BB	Difference between CB-BB and CB-BO

In the event that the CWRP is unavailable, the minimum price increment for the series is used for CWRP in the determination of MCW.

### 3.4 Opening Collars

Opening collars are applied to ensure that the Opening Price falls within a reasonable distance from the Opening Collar Midpoint Price (“OCMP”). The Opening Collar Width (“OCW”) is determined as an exchange published function of the Opening Collar Reference Price (“OCRP”). The upper (lower) collar price is computed by adding (subtracting) half of the Collar Width to (from) the OCMP.

Table 6 below defines the Opening Collar parameters for each option class category. The “OCW” value referenced in the Opening Collar Prices calculations is a function of the OCRP, the details of which will be published in subsequent exchange notices.

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**Table 6 - Opening Collar parameters by option class category**

Option Class Category	OCRP	OCMP	Opening Collar Prices
Multilist	Higher of MM-BB and ABB	Midpoint between 1) Higher of MM-BB and ABB, and 2) Lower of MM-BO and ABO	Upper: Lower of (OCMP+1/2 OCW) and ABO Lower: Higher of (OCMP-1/2 OCW) and ABB
No-GTH Proprietary	MM-BB	Midpoint of MM-BB/BO	Upper: OCMP + 1/2 OCW Lower: OCMP - 1/2 OCW
GTH Proprietary (GTH)	GTH: MM-BB RTH: CB-BB	GTH: Mid of MM-BB/BO RTH: Mid of CB-BB/BO	Upper: OCMP + 1/2 OCW Lower: OCMP - 1/2 OCW
Constituent Series	GTH: MM-BB RTH: CB-BB	GTH: Mid of MM-BB/BO RTH: Mid of CB-BB/BO	Upper: OCMP + 1/2 OCW Lower: OCMP - 1/2 OCW

In the event that the OCRP is unavailable, the minimum price increment for the series is used for OCRP in the determination of OCW.

If at the time of an Auction Update message in the queuing period, the uncollared Indicative Price violates a collar price, the Indicative Prices is set to the violated collar price and:

- If the uncollared Indicative Price is lower than the lower collar price, an Opening Condition value of “B” (Need more buyers) is indicated.
- If the equilibrium price is higher than the upper collar, an Opening Condition value of “S” (Need more sellers) is indicated.

Series are allowed to open if the uncollared Indicative Price violates a collar price except as noted below for a Constituent Series opening. In this case, the series opens at the collar price. In the event of a collared opening, best efforts are made to fill any unfilled contracts marketable against the opening price at the series opening price before further handling (i.e., routing away, cancelling back or resting at limit price).

### 3.5 Unfilled Market Orders

Unfilled market order quantity will not prevent series from opening except as noted below for a Constituent Series opening. During the queuing period, if the Indicative Price VMIM calculation results in unfilled market order quantity, an Opening Condition value of “B” (Need more buyers) or “S” (Need more sellers) will be set in the associated Auction Update message to signal the imbalance.

Note that when the Opening Condition value of “B” or “S” is observed, it could be a result of a collared opening or unfilled market order quantity. In either event, the values indicate a general imbalance state.

### 3.6 Opening Triggers

For each option class category, Opening Triggers are used by the system to determine at what point the system will attempt to transition from the Queuing Period to the Trading State. Table 7 below defines the Opening Trigger for each option class category:

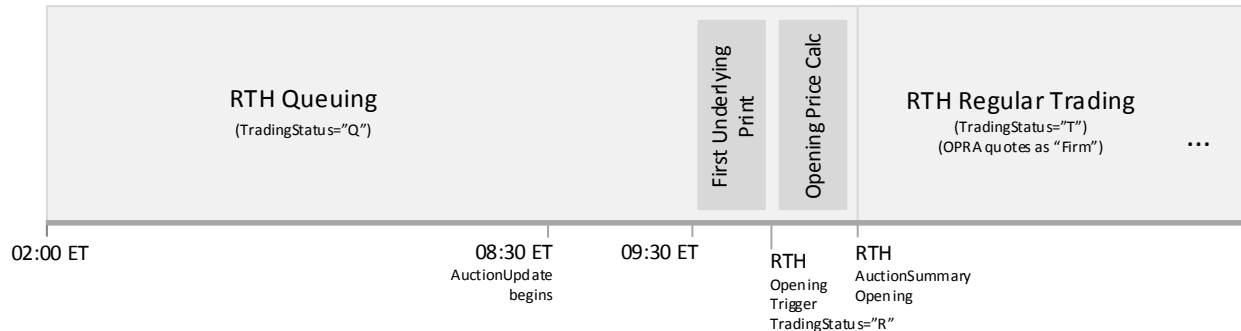
**Table 7 - Opening trigger by option class category**

Option Class Category	Opening Trigger
Multilist	Observation of first print in the underlying from any away exchange after 09:30 AM EST. Note the print is not restricted to the primary exchange for the underlying.
No-GTH Proprietary	Observation of the first underlying index after 09:30 AM EST
GTH Proprietary (GTH)	Observation of the first underlying index after 03:00 AM EST for the GTH session, and 09:30 AM EST for the RTH session.
Constituent Series	Observation of the first underlying index after 03:00 AM EST for the GTH session, and 09:30 AM EST for the RTH session.

### 3.7 Multilist Opening

Figure 4 below illustrates Multilist class category Opening Process on the C1 Exchange:

**Figure 4 - C1 Multilist Opening Process**



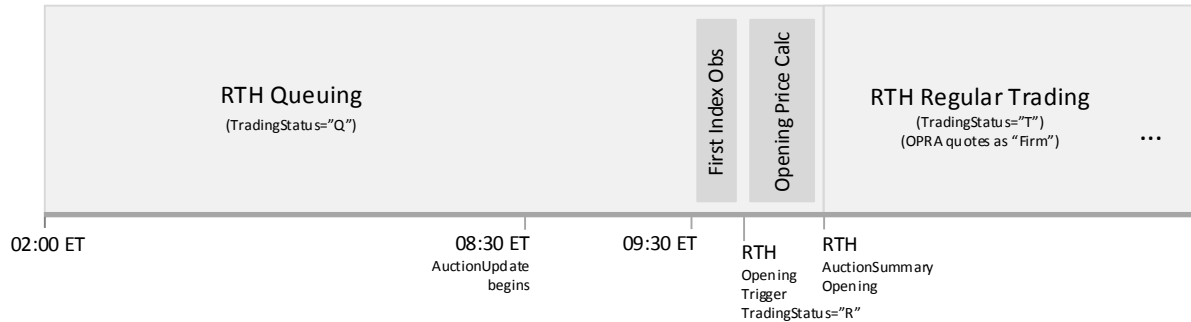
If there are no contracts that can cross after the receipt of the Opening Trigger, the series opens without a trade. Otherwise, the series will open at the Indicative Price, whether or not the Indicative Price falls within the prevailing collar or has been clamped to a violated collar price. In the case of a collared opening, it is possible for contracts marketable against the opening price to roll to the continuous book. In this case, best efforts are made to fill any such contracts locally at the opening price before normal handling, which may include routing away, cancelling back unfilled LOO/MOO contracts, or posting to the book at the limit price.

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### 3.8 No-GTH Proprietary Opening

Figure 5 below illustrates No-GTH Proprietary class category Opening Process on the C1 Exchange:

**Figure 5 - C1 No-GTH Proprietary opening process**

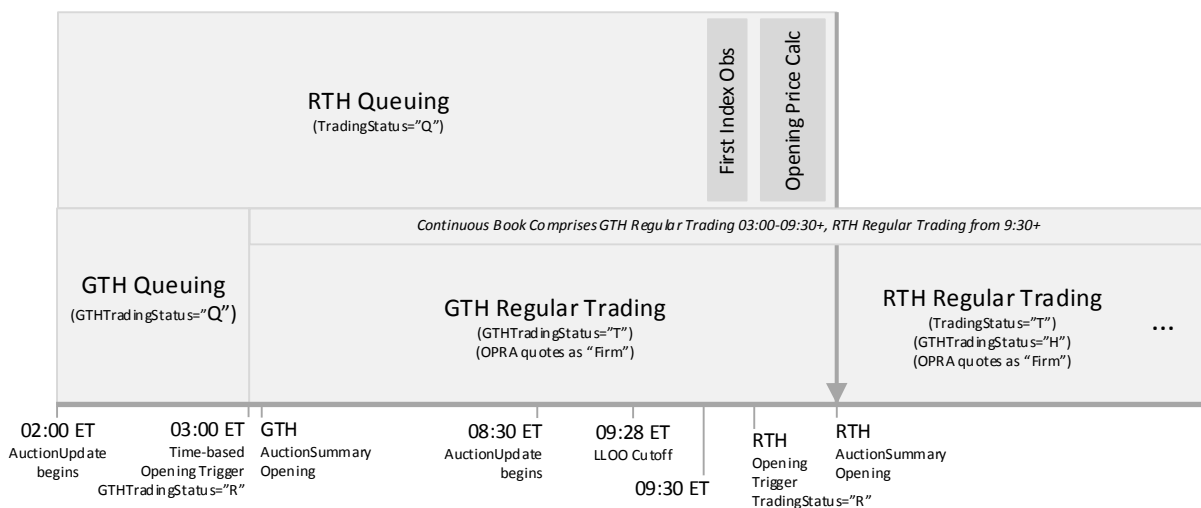


If there are no contracts that can cross after the receipt of the Opening Trigger, the series opens without a trade. Otherwise, the series will open at the Indicative Price, whether or not the Indicative Price falls within the prevailing collar or has been clamped to a violated collar price. In the case of a collared opening, it is possible for contracts marketable against the opening price to roll to the continuous book. In this case, best efforts are made to fill any such contracts locally at the opening price before normal handling, which may include cancelling back unfilled LOO/MOO contracts or posting to the book at the original limit price.

### 3.9 GTH Proprietary Opening

Figure 6 below illustrates GTH Proprietary class category Opening Process on the C1 Exchange.

**Figure 6 - C1 GTH Proprietary opening process**



### **3.9.1 RTH Cutoff Time and Late Limit On Open (“LLOO”) Orders**

To ensure convergence of the queuing book and the continuous book, the RTH session opening for GTH Proprietary series incorporates a cutoff time at 09:28 AM EST after which existing orders in the queuing book (LOO, MOO and non-IOC Limit orders) cannot be modified or cancelled.

After the cutoff time, only Late Limit on Open (“LLOO”) orders are accepted. LLOO orders are submitted as a Limit order using *TimeInForce*(59)=2 (At the Open) and *ExecInst*(18)、“r” (Late). An RTH only, Limit Order received after 9:28 AM ET will be automatically converted into a LLOO order for the Opening Process. The system compares the LLOO order limit price to the instantaneous continuous book midpoint (“CB-mid”). If the LLOO order limit price is more aggressive than the CB-mid, the LLOO is displayed at the CB-mid, otherwise it is posted at its limit price. As the CB-mid changes, the display price of LLOO orders pegged to the CB-mid will slide to be more aggressive but will never slide in the less aggressive direction. This design, used on BZX equities for Cboe listed securities, enables responses to “Need more buyers”/“Need more sellers” opening conditions while preventing abnormal equilibrium price swings in the final moments of the opening process, and to ensure continuity between the opening price and trading in the continuous book.

### **3.9.2 Opening Process**

#### **3.9.2.1 GTH Opening Process**

If there are no contracts that can cross after the receipt of the Opening Trigger for the GTH session opening, the series opens without a trade. Otherwise, the series will open at the Indicative Price, whether or not the Indicative Price falls within the prevailing collar or has been clamped to a violated collar price. In the case of a collared opening, it is possible for contracts marketable against the opening price to roll to the continuous book. In this case, best efforts are made to fill any such contracts locally at the opening price before normal handling, which may include canceling back unfilled LOO/MOO contracts or posting to the book at the original limit price.

#### **3.9.2.2 RTH Opening Process**

The RTH Opening process brings together the continuous book (end of the GTH session) and the queuing book to determine the opening price (per the definition of Indicative Price). If there are no contracts that can cross after the receipt of the opening trigger for the RTH session opening, the series opens without a trade. Otherwise, the series will open at the Indicative Price, whether or not the Indicative Price falls within the prevailing collar or has been clamped to a violated collar price. In the case of a collared opening, it is possible for contracts marketable against the opening price to roll to the continuous book. In this case, best efforts are made to fill any such contracts locally at the opening price before normal handling, which may include canceling back unfilled LOO/MOO contracts or posting to the book at the original limit price.



### 3.10 Constituent Series Opening

On a Volatility Derivative Expiration date, a subset of series of a specific class undergo a variant of the RTH Proprietary opening process known as the “Constituent Series Opening” to create a Special Opening Quote (“SOQ”) for the Volatility index value on which the expiring derivatives settle. For example, on a date in which there exists SPX options with 30 days to expiration, all SPX options with that 30 days to expiration (i.e., Constituent Series) use the Constituent Series Opening.

All Constituent Series of an SOQ are Proprietary products that trade both GTH and RTH sessions. The Constituent Series Opening Process is identical to that presented in the above ‘GTH Proprietary’ with regard to the GTH opening. Subtle but important differences are isolated to the RTH Opening, where the opening prices for Constituent Series are inputs to the Volatility Settlement calculation. The following summarizes the differences:

- A distinct set of Maximum Composite Width (“MCW”) parameters are used for Constituent Series openings that are generally tighter than those used on non-Constituent Series.
- A distinct set of collar width parameters are used for establishing collars for Constituent series that are generally tighter than those used for non-Constituent Series.
- Unlike all other openings, Constituent Series will not open with unfilled market order contracts. Like other openings, the Auction Update message field Opening Condition = “B”/”S” is used to signal unfilled market contracts. Unlike other openings, this condition prevents Constituent Series from opening.
- Like all other openings, The Auction Update message field Opening Condition = “B”/”S” is used to signal when the Indicative Price is collared (i.e., the uncollared Indicative Price computed as the VMIM price on the combined continuous and queuing book falls outside of the prevailing collars). Unlike other openings, this condition prevents Constituent Series from opening.

US Options  
Opening Process (Version 2.0.0)

**Revision History**

Version	Date	Description
2.0.0	16-Nov-18	Version 1.x retired in favor of new format and to include support for Cboe Options Exchange.