

# MDP 3.0 - MBP and MBOFD Market Recovery

This page describes the market data recovery process for Market by Price (MBP) and Market by Order Full Depth (MBOFD) order books. This method:

- should be used for large-scale data recovery (e.g. major outage or late join)
- synchronizes client order books with the current state maintained by CME Group

The Market Recovery Feed:

- loops the Market Data Snapshot Full Refresh (tag 35-MsgType=W) message.
  - at the beginning of the week, a Snapshot message is generated each time book/trade activity occurs on an instrument
    - no Snapshot message is sent for an instrument with no book activity
  - more than one instrument can be updated in a packet
  - instruments expired during the trading session will stay on the market recovery feed until the end of the day.
- supports primary (A) and backup (B) feeds
  - Feed A - disseminates market data Snapshot messages for all books having activity since beginning of the week
  - Feed B - acts as a backup in the event that Feed A becomes inoperable



CME Group strongly recommends that the Market Recovery feeds be used for recovery purposes only. Once the client system has retrieved the recovery data, the client system should stop listening to the Market Recovery feeds.



Market Recovery support is required for client systems that utilize MDP 3.0.

This topic includes:

- [Market Recovery Feed Messaging](#)
  - [MBP Recovery Feed Messaging](#)
  - [MBOFD Recovery Feed Messaging](#)
    - [Market Recovery Price Interleaving \(MBOFD\)](#)
- [Market Recovery Processing \(MBP & MBOFD\)](#)
  - [Market Recovery Processing Workflow](#)
  - [Market Recovery Feed Processing Examples](#)
    - [Example 1 – Standard Recovery](#)
    - [Example 2 - Same Transaction Time for Instrument](#)
    - [Example 3 - Different Transaction Time for Instrument](#)
    - [Example 4 - New Market Recovery Snapshot Message Added](#)

## Market Recovery Feed Messaging

This section describes the messaging and templates for MBP and MBOFD Market Recovery feeds.

### MBP Recovery Feed Messaging

The MBP Market Recovery feed:

- loops Snapshot messages
- implements template SnapshotFullRefresh for recovery processing

Template SnapshotFullRefresh contains:

- Top of Book MBP Quotes – Bids and Offers
- Top of Book Implied Quotes – Bids and Offers
- Last Trade
- Opening Price
- Session High and Low Trade Prices
- Session High Bid and Session Low Offer
- Fixing Price
- Settlement Price
- Cleared Trade Volume
- Open Interest
- Electronic Volume
- Threshold Limits



For MBP books, client systems have the option to concurrently recover instrument books via [MBP Natural Refresh](#) logic.

# MBOFD Recovery Feed Messaging

The MBOFD Market Recovery feed:

- loops Snapshot messages
- implements template SnapshotFullRefresh and template SnapshotFullRefreshOrderBook for recovery processing

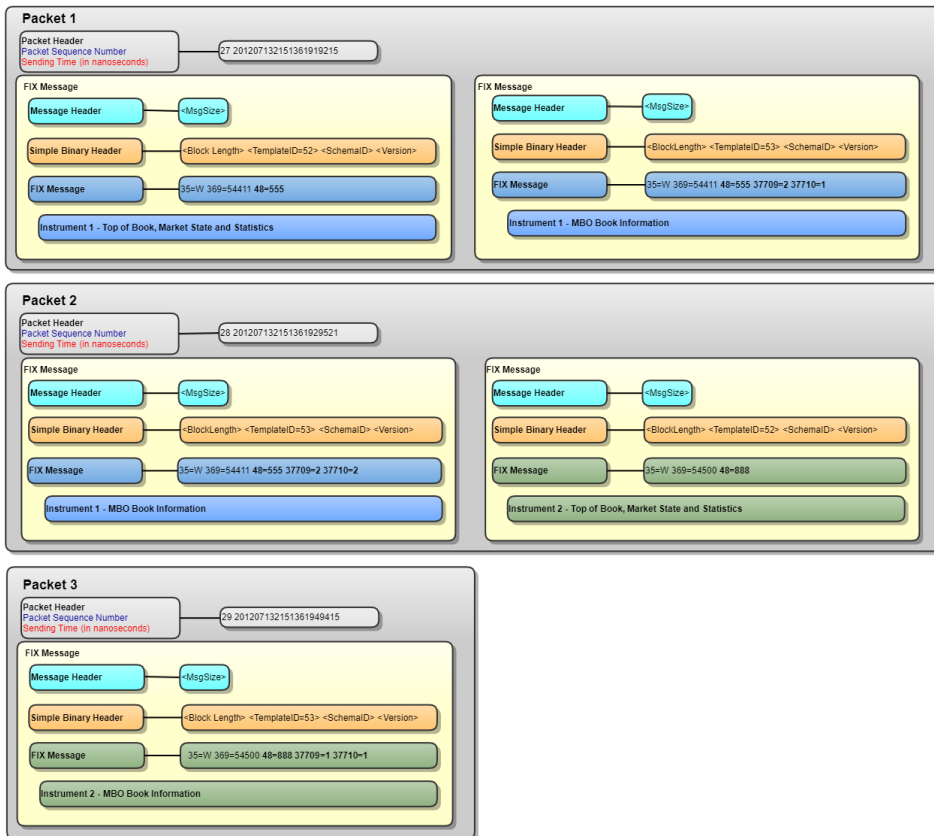
In addition to template SnapshotFullRefresh, template SnapshotFullRefreshOrderBook contains recovery data in the following order:

- MBP information
- market state
- statistics
- MBOFD book information

The MBOFD Market Recovery feed also supports:

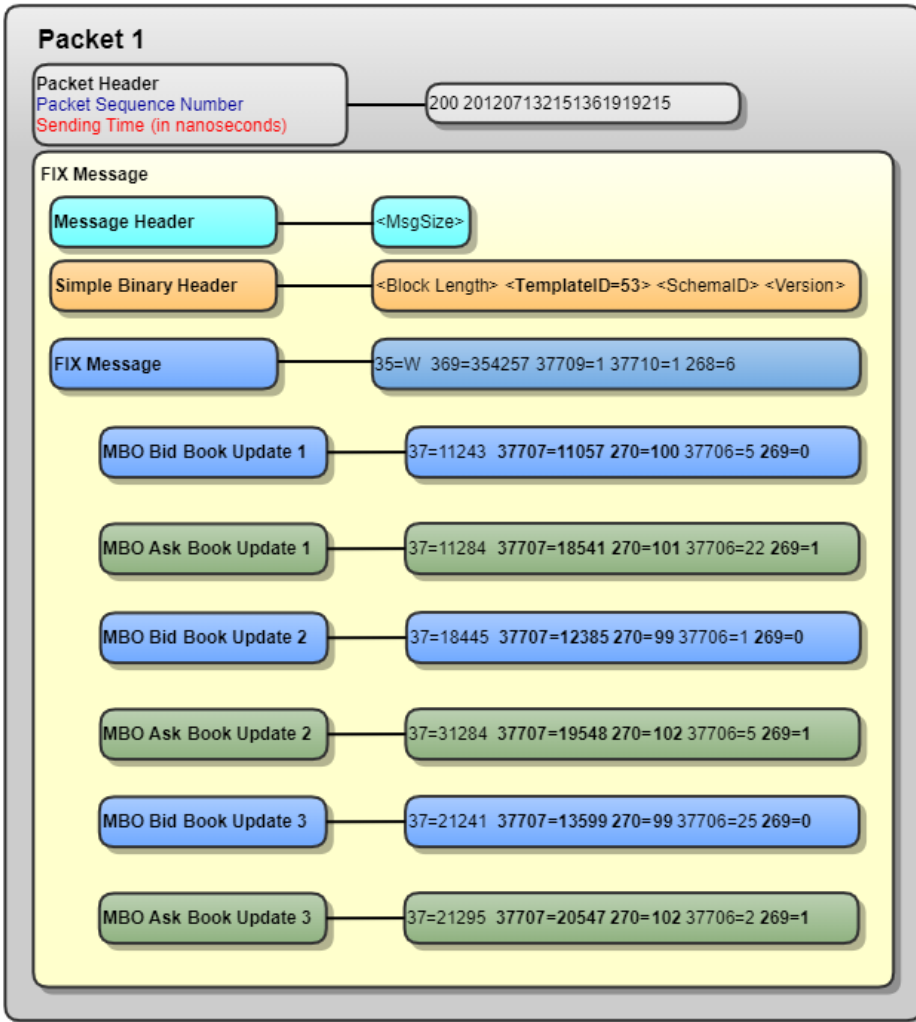
- recovery chunk tag 37709-NoChunks and tag 37710- CurrentChunk
  - allows client systems to determine the number of packets required to recover an MBOFD book.
  - tag 37709-NoChunks - total number of packets that constitute a single instrument order book
  - tag 37710-CurrentChunk - current chunk in the sequence

The example below shows two different instruments updated in an MBOFD Market Recovery feed.



## Market Recovery Price Interleaving (MBOFD)

To optimize recovery time for the highest priority orders, the Snapshot message alternates bid and ask orders from highest to lowest priority (tag 37707-MDOrderPriority).



## Market Recovery Processing (MBP & MBOFD)

When packets are missed on both UDP Incremental feeds, packet loss is indicated by a gap in message packet sequence numbers.

- the tag 369-LastMsgSeqNumProcessed value on the Snapshot message corresponds to the packet sequence number on the Incremental feed
- tag 60-TransactTime communicates the start transaction time of the last event for the instrument

Market Recovery Feed - Snapshot (tag 35-MessageType=W) Message		Incremental Feed
369-LastMsgSeqNumProcessed	corresponds to	packet sequence number
tag 60-TransactTime		tag 60-TransactTime



The order of each Snapshot message iteration is not guaranteed; client systems must process one full iteration of a Market Recovery Snapshot message starting at sequence number 1 to ensure full recovery.

When this large-scale market recovery method is used, client systems must subscribe to the Instrument Definition feed to determine if any new instruments have been defined. A client application can determine if recovery is necessary using the tag 779-LastUpdateTime timestamp on the Market Recovery feed to detect if instrument data has changed.

## Market Recovery Processing Workflow

This section describes the process to follow for large-scale recovery concurrently processing the Incremental feed and Snapshot messages from the Market Recovery feed. Once a book is recovered, client systems can resume normal processing for that instrument even if other books are still being recovered. Client systems will not recover any missed statistics on the Market Recovery feed.

Recovery processing steps are as follows:

1. Identify channel(s) in which the client system is out of sync.
2. Listen to the Incremental feed and queue real-time data for the affected channel(s), and optionally begin MBP natural refresh.
3. Listen to the Market Recovery feed for the affected channel(s).
4. For a given instrument, compare the Market Recovery Snapshot message tag 369-LastMsgSeqNumProcessed to the Incremental feed Market Data Incremental Refresh (35=X) message packet sequence number.
  - If the SecurityID appears in both the Incremental feed and Market Recovery feed updates during the comparison, then compare the Market Recovery feed tag 60-TransactTime to the Incremental feed tag 60-TransactTime. The instrument with the unequal 60-TransactTime must be recovered via the next market recovery cycle or optional concurrent natural refresh processing.
  - Drop all cached Incremental feed updates with a packet sequence number < 369-LastMsgSeqNumProcessed.
5. Once all instruments are recovered via market recovery or natural refresh, start normal processing and disconnect from the market recovery feed.

## Market Recovery Feed Processing Examples

The following section provides examples for Market Recovery feed processing.

### Example 1 – Standard Recovery

The following example shows a standard recovery scenario using the following workflow:

1. Identify the channel that is out of sync.
2. Connect to the Incremental feed and begin queuing data.
3. Connect to the Market Recovery feed. In this example, the first Market Recovery Snapshot message sequence number = 4.
4. Compare the Market Recovery Snapshot message tag 369-LastMsgSeqNumProcessed to the Incremental feed packet sequence number. In this example, the Incremental feed sequence number compared is 104.
  - If the instrument (tag 48-SecurityID) appears in both the Incremental and Market Recovery updates during the comparison, then compare the Market Recovery feed tag 60-TransactTime to the Incremental feed tag 60-TransactTime.
  - In this example, the tag 60-TransactTime comparison is not required due to different instruments between the feeds.
  - For Market Recovery Snapshot message processing, drop all cached Incremental feed updates with a packet sequence number < tag 369-LastMsgSeqNumProcessed from the Market Recovery feed.
  - Begin normal processing for recovered instrument 13205.
  - Recover subsequent instruments via the Market Recovery feed (8087, etc).
  - Additionally, as tag 369-LastMsgSeqNumProcessed increases in subsequent Market Recovery feed updates, continue to drop cached market data where the packet sequence number < tag 369-LastMsgSeqNumProcessed from the Market Recovery feed.
5. Disconnect from the Market Recovery feed once processing is complete for all instruments.

Incremental Feed				Market Recovery Feed				
Incremental Packet Sequence Number	Tag 35- Msg Type	Tag 48- SecurityID(s)	Tag 60- TransactTime(s)	Snapshot Packet Sequence Number	Tag 369- LastMsgSeq NumProcessed	Tag 60- TransactTime	Tag 48- SecurityID	Tag 911- TotNum Reports
100 - drop	X	13205	20191120-18:36: 41.000000000					
101 - drop	X	5522	20191120-18:36: 41.000278478					
		904	20191120-18:36: 41.000293451					
102 - drop	X	904	20191120-18:36: 41.000320480					
103 - drop	X	1741	20191120-18:36: 41.000353097					
104 - recover instrument 13205 information via Market Recovery Snapshot message and begin normal processing	X	7720	20191120-18:36: 41.000368253	4 – Connect to Market Recovery Feed	104	20191120-18:36: 41.000000000	13205	10
105 – apply update to 13205 information gathered in the Snapshot	X	13205	20191120-18:36: 41.000383610	5 – Next instrument to be processed	108	20191120-18:32: 22.080423217	8087	10
106	X	5522	20191120-18:36: 41.000412613	Next Market Recovery Iteration				
107	X	12121	20191120-18:36: 41.000423217	1	112		1741	10

....				....				
------	--	--	--	------	--	--	--	--

## Example 2 - Same Transaction Time for Instrument

In the following example, the instrument (tag 48-SecurityID=15212) appears in both the Incremental and Market Recovery feed updates when comparing tag 369-LastMsgSeqNumProcessed. Therefore, client systems must compare the Market Recovery feed tag 60-TransactTime to the Incremental feed tag 60-TransactTime. In this example the tag 60-TransactTime values match and the instrument can be recovered.

Incremental Feed				Market Recovery Feed				
Incremental Packet Sequence Number	Tag 35- MsgType	Tag 48- SecurityID (s)	Tag 60-TransactTime (s)	Snapshot Packet Sequence Number	Tag 369- LastMsgSeq NumProcessed	Tag 60-TransactTime	Tag 48- Security ID	Tag 911- TotNumRepts
100 - drop	X	13205	20191120-18:36:41.000000000					
101 - drop	X	5522	20191120-18:36:41.000278478					
		904	20191120-18:36:41.000293451					
102 - drop	X	904	20191120-18:36:41.000320480					
103 - drop	X	15212	20191120-18:36:41.000368253					
104 - recover instrument 15212 information via Market Recovery Snapshot message and begin normal processing	X	15212	20191120-18:36:41.000368253  TransactTime matches with Snapshot message	4 - Connect to Market Recovery Feed	104	20191120-18:36:41.000368253  TransactTime matches with Incremental message	15212	10

## Example 3 - Different Transaction Time for Instrument

In the following example, the instrument (tag 48-SecurityID=13205) appears in both the Incremental and Market Recovery feed updates when comparing tag 369-LastMsgSeqNumProcessed, however the tag 60-TransactTime values do not match. Therefore, client systems must process the next Market Recovery feed iteration for the instrument.

Incremental Feed				Market Recovery Feed				
Incremental Packet Sequence Number	Tag 35- MsgType	Tag 48- SecurityID (s)	Tag 60-TransactTime(s)	Snapshot Packet Sequence Number	Tag 369- LastMsgSeq NumProcessed	Tag 60-TransactTime	Tag 48- Security ID	Tag 911- TotNumRepts
100 - drop	X	13205	20191120-18:36:41.000000000					
101 - drop	X	5522	20191120-18:36:41.000278478					
		904	20191120-18:36:41.000293451					
102 - drop	X	904	20191120-18:36:41.000320480					
103 - drop	X	13205	20191120-18:36:41.000353097					
104	X	13205	20191120-18:36:41.000353097	4 - Connect to Market Recovery Feed	104	20191120-18:36:40.103368841  TransactTime does not match with Incremental message, must process next loop to recover 13205	13205	10
105	X	13205	20191120-18:36:41.000353097	4 - Next instrument to be processed	107	20191120-18:36:22.000423217	8087	10
106	X	5522	20191120-18:36:41.000412613	Next Market Recovery Iteration				
107	X	12121	20191120-18:36:41.000423217	1	110		1741	10
....				....				
170	X	13205	20191120-18:36:43.121427232  TransactTime matches with Snapshot message, recover instrument 13205	4	170	20191120-18:36:43.121427232  TransactTime matches with Incremental message, recover instrument 13205	13205	10

## Example 4 - New Market Recovery Snapshot Message Added

In the following example there is activity for an instrument (tag 48-SecurityID) that adds a new Market Recovery Snapshot message to the Market Recovery feed. Therefore, to ensure all new instruments are recovered, client systems must process an additional Market Recovery iteration starting from the Snapshot message with a packet sequence number = 1. Client systems can determine if a new Snapshot message has been added by comparing tag 911-TotNumReports with the previous iteration. The order of each Snapshot message iteration is not guaranteed, therefore the newly created Snapshot message may be placed mid-loop in the next iteration.

Incremental Feed				Market Recovery Feed				
Incremental Packet Sequence Number	Tag 35-MessageType	Tag 48-SecurityID(s)	Tag 60-Transact Time(s)	Snapshot Packet Sequence Number	Tag 369-LastMsgSeq NumProcessed	Tag 60-Transact Time	Tag 48-SecurityID	Tag 911-TotNumReports
105 - drop	X	12171 – New instrument activity generates a Market Recovery Snapshot message	2019112 0-18:36:41.000383610	4 - Recovery in process	107	2019112 0-18:36:41.000013217	8087	10
106 - drop	X	5522	2019112 0-18:36:41.000412613	Next Market Recovery Iteration				
107 - drop	X	13205	2019112 0-18:36:41.000423217	1	110	2019112 0-18:36:3097	1741	11 – incremented to reflect new Snapshot message for instrument 12171
....				....				
170 – begin normal processing for instrument 12171 from Market Recovery Snapshot due to the Incremental update for packet sequence number < to 369-LastMsgSeqNumProcessed	X	904	2019112 0-18:36:41.001223443	3 – new Snapshot placed mid-iteration	170 – recovery instrument via Snapshot	2019112 0-18:36:41.000383610	12171	11
171 – apply update to 12171 information gathered in the Snapshot	X	12171		....				
....								