



Unified Market Data Feed
FIX/FAST Functionality
Version 1.2.2 DRAFT – January 14th 2010

Trading Systems Department

Document | BM&FBOVESPA Unified Market Data Feed Functionality

Contacts

To request copies of this document, please contact:

Centro de Controle BM&FBOVESPA (BM&FBOVESPA Control Center)

+55 11 2565-5333 (São Paulo)

centrodecontrole@bmf.com.br

Or e-mail:

servicos@bmfbovespa.com.br

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Change log

Date	Version	Description	Author
January 14th, 2010	1.2.2.5	- Included SettlPriceType to incremental and snapshot messages - Included (9 and U) as new values to TradeCondition field	RNKH/TAT
January 13th, 2010	1.2.2.4	- RLC to FIX mapping revised - Included Trading Statistics Reset Flag - Included NewsSource to News message - Included DayCumQty to incremental and snapshot messages	RNKH/TAT
January 8th, 2010	1.2.2.3	- Including best description for index related messages	RNKH/TAT
December 30th, 2009	1.2.2.2	- Texts and links revised - Bovespa RLC revised	JML/RNKH/TAT
December 17th, 2009	1.2.2.1	- TCP Replay revised - Added information on the cash equities index channel	DRSF/JML/RNKH
October 23th, 2009	1.2.1	- Texts and links revised	RNKH/JML
September 29th, 2009	1.2.0	- Added price banding information - Tag 207 is now required in the instrument identification block - Added section 11.3 – clarification on instrument state in the snapshot message - Added state mappings from RLC	RNKH/JML
April 6th, 2009	1.0.0	- First version	RNKH/JML

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1 Preface

1.1 Introduction

BM&FBOVESPA provides a trading interface based on the Financial Information eXchange ("FIX") Protocol. FIX is a technical specification for electronic communication of trade-related messages. It is an open standard managed by members of FIX Protocol Limited (<http://www.fixprotocol.org/>).

This document outlines a new BM&FBOVESPA Market Data FIX specification contemplating the use of FIX 5.0/FAST protocol and the integration of Equities, Derivatives and FX, consolidating the market data feed of the exchange's both trading platforms, MEGABOLSA (for equities) and GTS (for derivatives and FIX). It also introduces the change in the transport protocol to deliver the data, from TCP unicast to UDP multicast.

The new feed format also leverages the distribution of CME Group's GLOBEX platform market data distribution due to its reduced latency requirements.

It is assumed that the reader of this document has knowledge of the basic functioning of the FIX protocol.

1.2 Abbreviations

Abbreviation	Description
BVMF	Bolsa de Valores, Mercadorias & Futuros, or BM&FBOVESPA.
CBOT	Chicago Board of Trade
CCB	Centro de Controle BM&FBOVESPA – BM&FBOVESPA Control Center.
CFI Code	Classification of Financial Instruments Code.
CME	Chicago Mercantile Exchange
CMEG	CME Group – the holding that encompasses the CME, CBOT, NYMEX and other exchanges.
FAST	FIX Adapted for STreaming – a specification for data compression to reduce bandwidth usage, especially for market data feeds.
FIX	Financial Information Exchange Protocol
GTS	Global Trading System, BM&FBOVESPA's trading platform for derivatives and FX.
IP	Internet Protocol
SSL	Secure Socket Layer
TCP	Transport Control Protocol
UDP	User Datagram protocol

1.3 Glossary

Term	Definition
BM&FBOVESPA	Securities, Commodities and Futures Exchange, based in São Paulo, Brazil. For more information, visit http://www.bmfbovespa.com.br .
Broker	A broker is an individual or firm who acts as an intermediary between a buyer and seller, usually charging a commission.
Brokerage	Used interchangeably with broker when referring to a firm rather than an individual. Also called brokerage house or brokerage firm.

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Term	Definition
Counterparty	Party to a trade.
DMA	Direct Market Access – functionality that allows end-customers, such as hedge funds or investment banks, to directly access the exchange electronically without the need to go over physical broker firm infrastructure.
FIX Gateway	Service that provides connectivity to third-party clients and brokerages using the FIX protocol.
GLOBEX	CME Group's electronic trading platform.
Instrument	Financial capital in a readily tradable form.
Market Data	A collective term for quotes, last sales, volume statistics and other information used by the market to evaluate trading opportunities.
Matching	The process by which two counter-parties that have engaged in a trade compare the settlement details of the trade provided by both. Matching is done to verify all aspects of a trade and ensure that all parties agree on the terms of the transaction.
IP Multicast	Method of forwarding IP datagrams to a group of interested receivers.
MEGABOLSA	BM&FBOVESPA's trading platform for equities.
Security	A stock, bond or contract that has been authorized for trading on, and by, a registered exchange. Each exchange has different criteria to determine a security's eligibility for listing.
Vendor	Institution that sells services to its clients. In the context of this document, a vendor is an institution that sells access to market data feeds and order management interfaces to an Exchange.

2 Trading Hours

2.1 Trading Session Hours

For a list of equities trading hours and sessions, please visit:

<http://www.bovespa.com.br/BovespaEV/MarketCalendar.asp>

For a list of derivatives and FX trading hours and sessions, please visit:

<http://www.bmf.com.br/portal/pages/boletim2/HorariosNegociacao2.asp?slocation=derivativos#>

For a list of GLOBEX products trading hours and sessions, please visit:

http://www.cmegroup.com/trading_hours/

2.2 Exchange Holidays

For a list of exchange holidays for the equities segment, please visit:

http://www.bovespa.com.br/BovespaEV/horarioneg_i.htm

For a list of exchange holidays for the derivatives and FX segments, please visit:

http://www.bmf.com.br/portal/pages/boletim2/bd_manual/calendario_vencimentos.asp

For a list of CME Group's exchange holidays, please visit:

<http://www.cmegroup.com/tools-information/holiday-calendar/>

3 FAST Introduction

FIX Adapted for STreaming (FAST) encoding has been developed as part of the FIX Market Data Optimization Working Group. FAST is designed to optimize electronic exchange of financial data, particularly for high volume, low latency data dissemination. This document describes implementation of FAST in receiving and processing BVMF's FIX/FAST-encoded electronic market data feed.

The implementation of BVMF's market data feed is based on the FAST 1.1 specification, available at: <http://www.fixprotocol.org/documents/3066/FAST%20Specification%201%20x%201.pdf>

FAST is a data compression algorithm that significantly reduces bandwidth requirements and latency between sender and receiver. FAST works especially well at improving performance during periods of peak message rates. FAST extends the base FIX specification and assumes the use of FIX message formats and data structures.

It compresses data by removing redundant data and doing binary encoding. It does not use general-purpose, data compressing methods like Lempel-Ziv or arithmetic coding; instead, carefully crafted templates are used for describing the structure of the messages. High levels of data compression with low processing overhead and latency can be attained by using FAST.

It is not required that the decoding of a FAST message results in a FIX message; you can streamline your market data feed processing by creating directly data structures suited to your program, if your FAST decoder implementation supports it.

3.1 Implementing FAST Overview

This section provides a brief overview on FAST implementation and basic concepts of FAST and the encoding/decoding process. Customer development teams should refer to the FAST specification for in-depth understanding of such process. **BVMF does not provide support for any FAST decoders including the reference code.**

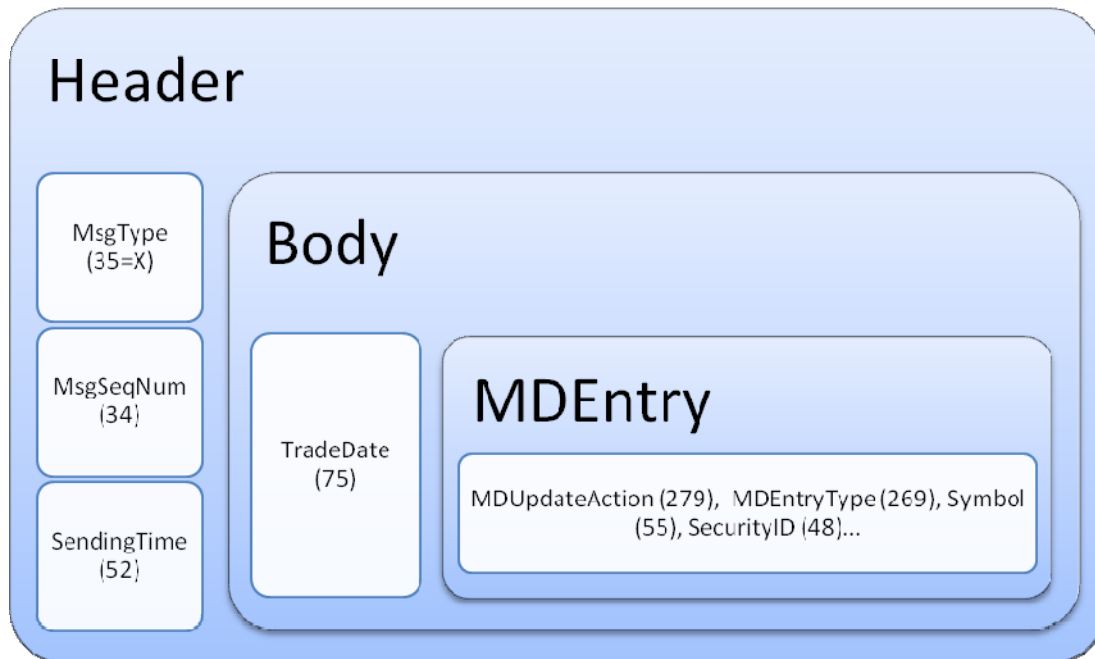
3.1.1 Templates

Every FIX message can be described by one or more FAST templates. Each template describes what fields from the original FIX message are included, and their types and transfer encodings. The templates are kept in a single XML file that obeys the "FAST v1.1 Template Definition Schema", included in the FAST 1.1 specification.

3.1.2 Message Structure

Take as example the FIX message "Market Data Incremental Refresh" (tag 35=X). It is composed by three elements:

- Header;
- Body;
- Trailer (that is not encoded in FAST).



FAST encoding makes no distinction between Header, Body and Trailer. The template for the message "X" simply lists the fields, as follows:

```

<!-- Template 12 for message MarketDataIncrementalRefresh44h (X) -->
<template name="MarketDataIncrementalRefresh_12" id="12">
  <!-- == Header == -->
  <string name="MsgType" id="35">
    <constant value="X" />
  </string>
  <!-- SeqNum -->
  <uint64 name="MsgSeqNum" id="34" />
  <!-- UtcTimeStamp -->
  <uint64 name="SendingTime" id="52" />
  <!-- == Body == -->
  <!-- LocalMktDate -->
  <uint32 name="TradeDate" id="75" presence="optional">
    <copy />
  </uint32>
  <sequence name="MDEntries">
    <length name="NoMDEntries" id="268" />
    <!-- Char -->
    <string name="MDUpdateAction" id="279">
      <default value="0" />
    </string>
    ...
  </sequence>
</template>

```

3.1.3 Data Types

The following data types are recognized by FAST:

- String – ASCII (7-bit) strings (no special characters allowed);
- Unicode strings – Internationalized (Unicode) strings, encoded using UTF-8;
- Byte vectors;
- Decimal numbers;
- Signed integers (both 32 and 64 bits);
- Unsigned integers (both 32 and 64 bits).

Fragments of template definitions of fields:

- Ascii String
`<string name="Symbol" id="55" />`
- Unicode String
`<string name="Text" id="58" charset="unicode" presence="optional" />`
- Byte Vector
`<byteVector name="Text" id="58" presence="optional">
 <length name="TextLength" id="59" />
</byteVector>`
- Decimal number
`<decimal name="MDEntryPx" id="270" presence="optional"/>`
- Signed Integer (64 bits)
`<int64 name="MarketDepth" id="264" />`
- Unsigned Integer (64 bits)
`<uInt64 name="MarketDepth" id="264" />`
- Signed Integer (32 bits)
`<int32 name="MarketDepth" id="264" />`
- Unsigned Integer (32 bits)
`<uInt32 name="MarketDepth" id="264" />`

FIX has more types, but almost all of them can be easily mapped to FAST data types (like Price → Decimal). The exception is the *UTCTimeStamp* type, that's mapped to an unsigned, 64-bit integer in a non-standard¹ way – just remove all separators of the *UTCTimeStamp* value (the value must have the milliseconds part) and convert the resultant decimal string to a number. For instance, if the field

¹ BVMF uses the same FAST encoding of a FIX *UTCTimeStamp* as the CME Group, and does not follow the tentative FAST 1.2 specification.

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SendingTime (52) has the value 20081007-09:12:08.008 (format YYYYMMDD-HH:MM:SS.sss), encode it to the integer "20081007091208008":

```
<uInt64 name="SendingTime" id="52" />
```

Decimal numbers are represented as a pair of integers "mantissa" and "exponent". For instance, the value 23.45 is 2345×10^{-2} and it is represented as "2345" and "-2".

3.1.4 Stop Bit Encoding

All fields in FAST are variable-length fields, even the integer ones. Instead of using a length indicator (like ASN.1, DER Encoding) or a separator byte (like FIX), the 8th bit of each byte (for strings and numbers) indicates if this is the last byte of the field.

Optional fields are encoded slightly differently from mandatory fields, to take into account the special value NULL (missing); the details can be found in the FAST specification document. We will show only the encoding of mandatory fields.

- **Encoding an ASCII (7-bit) string**

"BM&FBovespa" = ASCII 42 4D 26 46 42 6F 76 65 73 70 61

The 8th bit of the last byte (61 hex, 0110 0001 binary) must be set to indicate that it's the last byte, so the last byte must be encoded as 1100 0001 binary = C1 hex. The FAST encoding will be:

42 4D 26 46 42 6F 76 65 73 70 C1

- **Encoding an unsigned integer**

Integers are encoded using 7 bits per byte; the 8th bit of the last byte must be set.

123456 = binary 111 1000100 1000000

The FAST encoding will be:

0000111 01000100 11000000

i.e.,

07 44 C0

- **Encoding a byte vector or an Unicode (UTF-8) string**

Byte vectors (that represent the FIX DATA type) and Unicode strings are encoded using a length indicator (encoded as an integer in stop-bit encoding) and then the data. For instance, "ação" (stock in Portuguese) is represented in UTF-8 as the following 6-byte array:

61 C3 A7 C3 A3 6F

The stop-bit encoding of the integer value 6 is binary 86, so the resulting encoding will be:

86 61 C3 A7 C3 A3 6F

3.1.5 Data Redundancy Removal

Redundant data in FAST is removed by noting that:

- If you have a template, no metadata information need to be sent (like tags numbers and field separators);
- Optional fields are usually absent;

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- Some fields have constant or default values, and could be omitted;
- In repeating groups, some fields can have repeated or similar values.

3.1.6 Templates and Implicit Tagging

The FAST template says exactly what fields must be encoded by FAST, and what the order of the fields is. So the tags are not encoded. If the original FIX message contains fields that are not specified in the template, they are simply ignored when encoding, and will not be decoded as well.

3.1.7 Presence Map (PMAP)

It is a bit vector that helps the decoder to find if data is present or it is implied (omitted). It occurs at the beginning of each FAST message and at the beginning of every sequence/group.

3.1.8 Template IDs

Every FAST message has a *template ID* as the first integer field and it will be used by the decoder to choose what template will be used to decode it. You can have several templates for the same FIX message (*MsgType=X*, for instance), but referring to different versions of the message layout. For instance, if BVMF needs to add a field "Symbol (55)" to the message X, a new template will be generated (with a new template ID) that maps to the new version of the message X including the new field.

Example (taken from the FAST template file):

```
<!-- Template 11 for message MarketDataSnapshotFullRefresh (w) -->
<template name="MarketDataSnapshotFullRefresh_11" id="11">
  <string name="MsgType" id="35">
    <constant value="W" />
  </string>
  ...

```

3.1.9 The Dictionary Context

It is a set of values that must be kept in memory for correct operation of the decoder. FAST compares the current value of a field to the prior value of that field, and determines how it will be encoded (according to the "field operator", a directive that is associated to that field).

The BVMF encoding process always resets the dictionary for each message, and uses only the "global dictionary". See FAST Specification Version 1.1 for more details:

<http://www.fixprotocol.org/documents/3066/FAST%20Specification%201%20x%201.pdf>

3.1.10 Field Operators

A field within a FAST template will usually have one of the following Field Operators:

- **(None)** – The field will be encoded directly as *is*.

```
<uInt64 name="MsgSeqNum" id="34" />
```

- **Constant** – The field will always contain a predetermined value. For instance, to encode a *MarketDataIncrementalRefresh* message (tag 35=X), the value of tag 35 is constant and always X, so it can be omitted. (The messages are distinguished by their template IDs.)

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```
<string name="MsgType" id="35">  
  <constant value="X" />  
</string>
```

- **Default** – The field is omitted from the message if it is equal to the default value. For instance, the field *SecurityExchange* (tag 207) is usually “XBMF” and can be omitted if the value is exactly “XBMF”.

```
<string name="SecurityExchange" id="207">  
  <default value="XBMF">  
    <!-- Possible values: -->  
    <!-- XBMF : BVMF_DERIVATIVES_FX -->  
    <!-- XBSP : BVMF_EQUITIES -->  
    <!-- XCME : CME -->  
    <!-- XCBT : CBOT -->  
  </default>  
</string>
```

- **Copy** – Omit the field if it was already used with that exact value (usually in a previous repeating group). For instance, if the field *Currency* (tag 15) occurs several times in the same FIX message with the value “BRL”, the first occurrence of that field is sent and the other occurrences are copies, so they don’t need to be encoded.

```
<decimal name="MDEntryPx" id="270" presence="optional">  
  <copy />  
</decimal>
```

- **Delta** (for numbers) – Encode the difference between the previous value and the current value. It can save some bytes because smaller numbers are encoded with lesser bytes.

```
<decimal name="MDEntryPx" id="270" presence="optional">  
  <delta />  
</decimal>
```

- **Delta** (for strings) – Encode the “string difference” between the previous value and the current value. For instance, to encode two fields *SecurityID*, one with the value “BMFBR123456” and the other with the value “BMFBR789012” (both start with “BMFBR”), encode the binary value “-5” and the string value “789012”.

```
<string name="SecurityID" id="48" presence="optional">  
  <delta />  
</string>
```

- **Increment** – If the difference between the current value and the previous value is exactly 1 (one), the field can be omitted.

```
<int64 name="NumberOfOrders" id="346" presence="optional">  
  <increment />  
</int64>
```

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- **Tail** – Encode just the “tail” difference. It’s like “delta” but the strings must have exactly the same length. For instance, to encode the *SecurityID* fields given above (“BMFBR123456” and “BMFBR789012”), encode just “789012”.

```
<string name="SecurityID" id="48" presence="optional">
  <tail />
</string>
```

3.1.11 Sequence Numbers and Groups

In FAST, a “group” is an unordered set of fields (a FAST “group” is roughly equivalent to the FIX “component” type). For instance, you can define a “group” that groups the fields of a single instrument together.

A “sequence” is a length and an ordered set of FAST groups (a FAST “sequence” is a FIX “repeating group”). For instance, you can define a “sequence” that lists *MDEntries* (market data incremental refresh blocks). You can specify directly the fields, dispensing the FAST “group”.

The terminology is somewhat confusing; just remember, “FAST Sequence” = “FIX Repeating Group”.

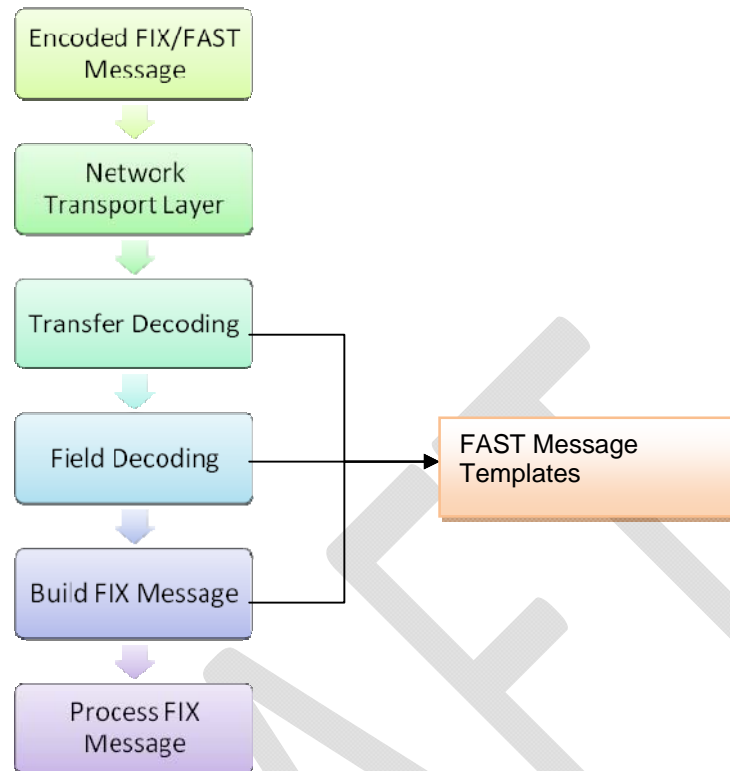
The repeating group “*NoMDEntries*” from FIX (message “W”, *MarketDataSnapshotFullRefresh*) is represented in FAST as:

```
<sequence name="MDEntries">
  <length name="NoMDEntries" id="268" />
  <string name="MDEntryType" id="269">
    <default value="0" />
  </string>
  <decimal name="MDEntryPx" id="270" presence="optional">
    <copy />
  </decimal>
  ...
</sequence>
```

3.1.12 The FAST Decoding Process

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- 1) The FAST Encoder translates the original FIX message into a FAST message.
- 2) Such message is transmitted (via UDP, for instance), and received by the client system. If the message needed to be split in pieces, the client must join them to get a complete message.
- 3) Transfer decoding:
 - a. Identify template (get the template ID and find the matching template)
 - b. Extract binary encoded bits
 - c. Map bits to fields per template field
- 4) Field decoding: apply operators (like <copy> or <delta>) to determine values per template field.
- 5) Build FIX Message
- 6) Process FIX message.

3.1.13 Transfer Decoding

Transfer decoding is the initial step that converts data from the FAST binary format.

3.1.14 Field Decoding

Field decoding reconstruct data values according to the template definitions.

3.1.15 Decoder State Reset for Every Message

BVMF resets the encoder state for each message sent, so the client decoder must reset the decoder state as well. The reason is because the client can join the market data dissemination at any time and it cannot be dependent on data in a previous message.

3.1.16 Template Implementation Considerations

The following items must be taken into account whenever implementing template functionality:

- Client systems should use the defined sizes and types for each tag in the FIX Message Specification as a guide for storing data, not just only the FAST template.
- If the structure of the underlying FIX message is changed somewhat, a new template will be generated, with a new ID. BVMF will release a new version of the template file.

Note: Template changes should be handled by client systems without any changes to their decoder.

3.2 Reference Source Code for FAST Decoding

BVMF makes available reference source code for client system's developers who wish to decode BVMF's market data stream.

The source code comes with absolutely no warranties and is not intended for production use. The decoder is implemented in C++ and can be compiled by MSVC++ (Windows platform) and gcc/g++ (Unix/GNU platform).

They can be found at the URL:

<ftp://ftp.bmf.com.br/FIXFAST/FASTDecoder.zip>

4 Legacy Electronic Market Data Feeds

Currently there are 3 separate electronic market data feeds available from BVMF. All 3 feeds will remain available after FIX/FAST is rolled out for facilitating the migration process. However, support for these feeds will cease at a later date, to be established by the exchange.

4.1 BELL (FIX 4.4 over TCP)

This feed carries the derivatives and FX segments' market data. It is based on the FIX 4.4 protocol and is transmitted via TCP unicast using a subscription mechanism.

The feed specification is available at:

http://www.bmf.com.br/portal/pages/gts/arquivos/BMF_FIX_v3.0.7_ing.zip

This feed also provides the market data for CME Group's CME Futures and CBOT Futures. It is expected that new FIX/FAST feed will leverage the broadcast of other CME Group's products due to smaller bandwidth requirements, such as CME and CBOT options, COMEX and NYMEX.

4.2 RLC/MMTP over TCP

This feed carries the equities segment market data. It is based on the RLC protocol using the TCP unicast mechanism as transport, in a push data model (no subscription). The RLC messages are compressed using the ZLIB algorithm before being sent to the market, reducing the necessary bandwidth.

The feed specification is available at:

http://www.bovespa.com.br/novosinal/Manual_Production_NewVersion.pdf

4.3 SDM over TCP

This feed carries the derivatives clearing house market data. It is a proprietary protocol using the TCP unicast mechanism as transport, in a push data model (no subscription).

5 System Architecture

The market data systems at BVMF will be changed to cater for the unified FIX FAST feed, albeit keeping the current feed live to provide a smoother migration. These components will be platform-specific (MEGABOLSA, GTS and GLOBEX), although their output will be the same from the client system standpoint.

Migration will be phased, with each platform having a specific schedule of deployment.

There are two focal points the new market data architecture: the concept of a “market data channel” – which defines how the feed is logically distributed according to a set of instruments and level of information of the book; and the “FIX FAST engagement rules” – which define the transport of the information and how the client system should synchronize the data that is provided in the market data channels.

5.1 Market Data Channel

A channel is a logical group of multicast IP addresses, UDP ports and a TCP IP connection for replay purposes. Every channel provides market data of a list of instruments that have common characteristics, as determined by the exchange.

A channel is broken up into 3 UDP streams and one replay connection, as listed below:

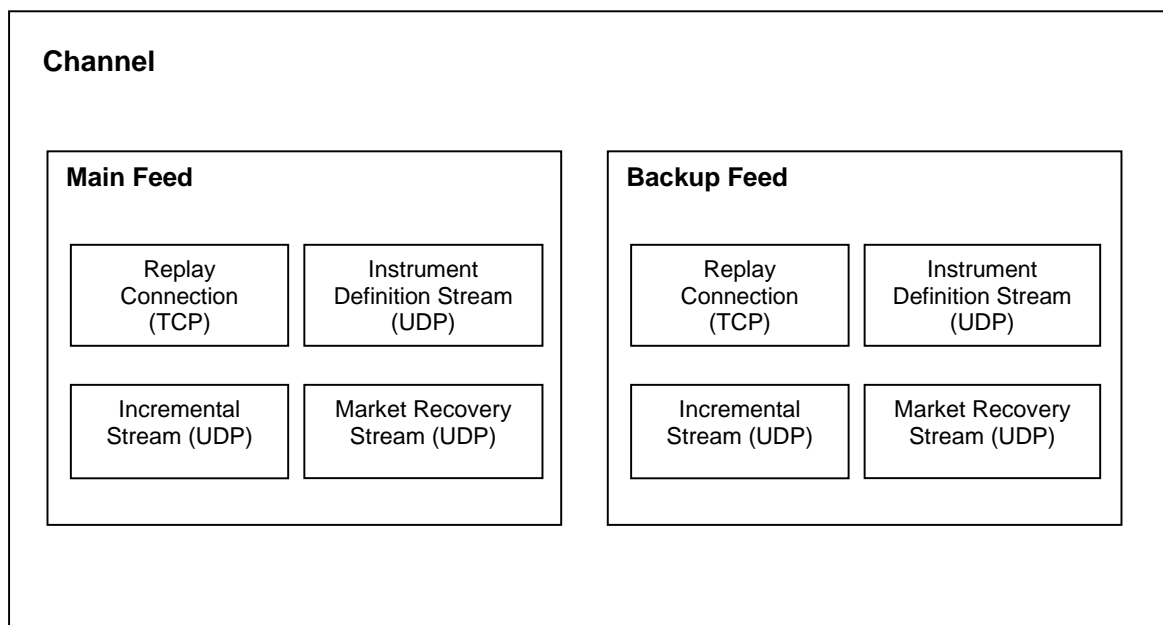


Figure 5.1: Channel overview.

For contingency purposes, BVMF provides a backup feed that is generated at its contingency site.

The backup feed contains the exact same data that is sent over the primary feed, however with different connectivity information (different UDP multicast addresses and TCP addresses).

BVMF strongly suggest that customers sign up to receive both feeds.

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5.1.1 Incremental Stream

Used to disseminate BVMF incremental market data and other real time data such as news, instrument updates, instrument status using FAST encrypted FIX messages. Please note that a single FIX/FAST message can contain multiple updates for multiple instruments.

If no data is sent through the incremental stream for more than 10 seconds, BVMF will issue a heartbeat message for maintaining connectivity. If client systems do not receive this message within 30 seconds, the incremental stream should be considered not functional and the book state should be considered inconsistent.

5.1.2 Market Recovery Stream

Market recovery is used to disseminate BVMF market data snapshot message for all instruments belonging to that channel. The snapshot for a book is transmitted in only one message in one or more chunks of data, despite order depth books are transmitted and may not fit into the maximum UDP packet size. The market data snapshot messages are replayed at a specific rate and should be used as the primary source for initial book synchronization.

Note: Once the books are synchronized and the client starts using only the incremental stream, the client should unjoin the stream as it would take up unnecessary bandwidth.

5.1.3 Instrument Definition Stream

The instrument definition stream is used to relay the list of all instruments belonging to that channel. The list is replayed at a specific rate and starts over once the last instrument definition message is received. There may be more than one instrument in each message.

5.1.4 Replay Connection (TCP)

The Replay Connection functionality allows a client to request messages that were already sent through the incremental stream. These messages will be returned to the client over a TCP connection (a FIX 4.4 session). The same connection is used for both the request and the retransmission.

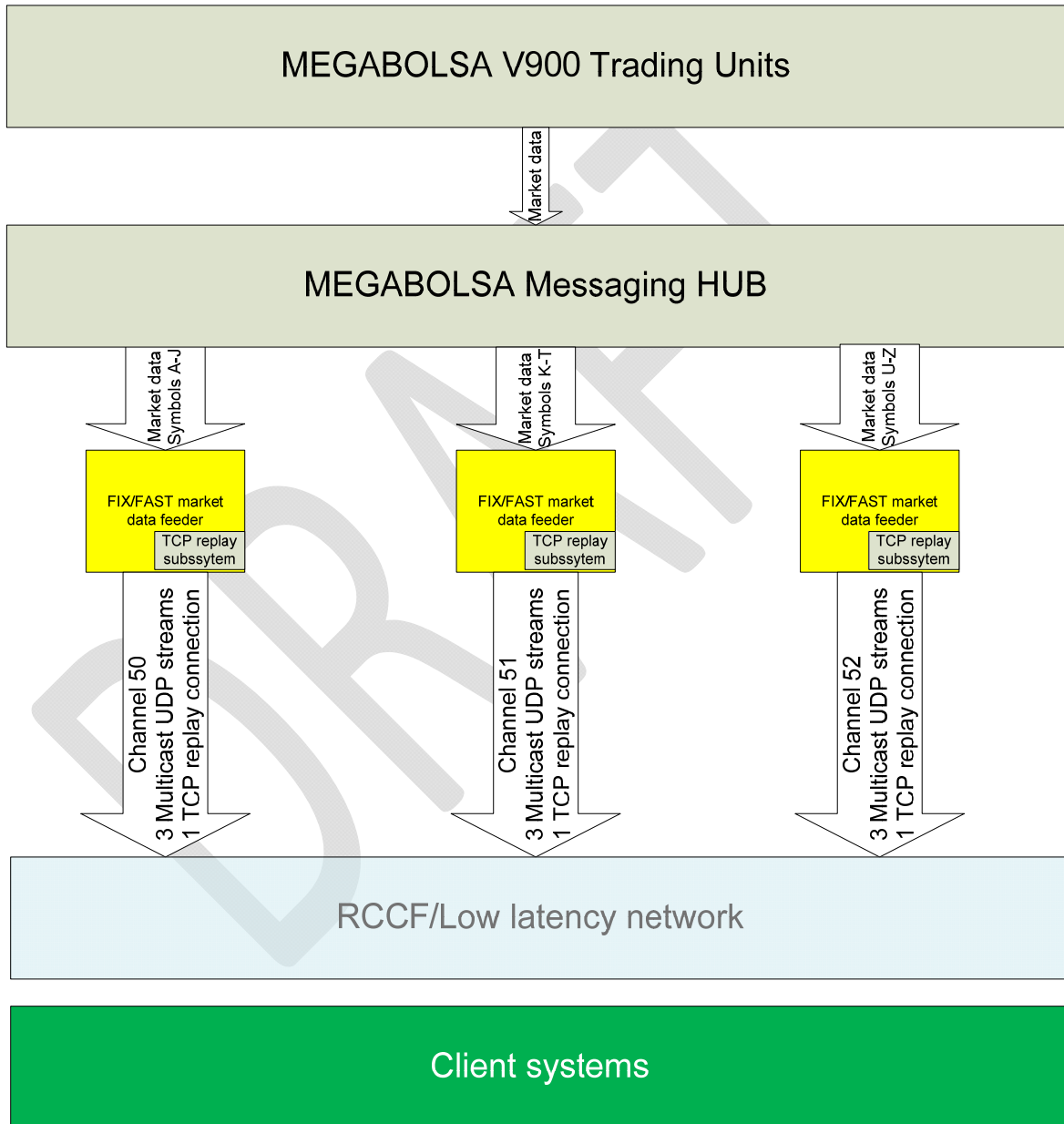
The request specifies a range of messages to be retransmitted. The client system must use an *ApplicationMessageRequest* message (tag 35=BW) to request the lost messages in the incremental stream (UDP channel). For each request, BM&FBovespa should send an Application Message Request Acknowledgment (tag 35=BX) to report whether the request was accepted or not. After sending a positive acknowledgment, BM&FBovespa should start resending the available requested messages wrapped in one or more Application Raw Data Reporting messages (tag 35=URDR). To indicate the end of the retransmission, for each *ApplID* (UDP channel) in the request, BM&FBovespa sends an *ApplicationMessageReport* (tag 35=BY) message.

This method of recovery should only be used if few messages were lost. For late joiners to the market, or if the lost exceeded 2000 messages, the market recovery stream should be used.

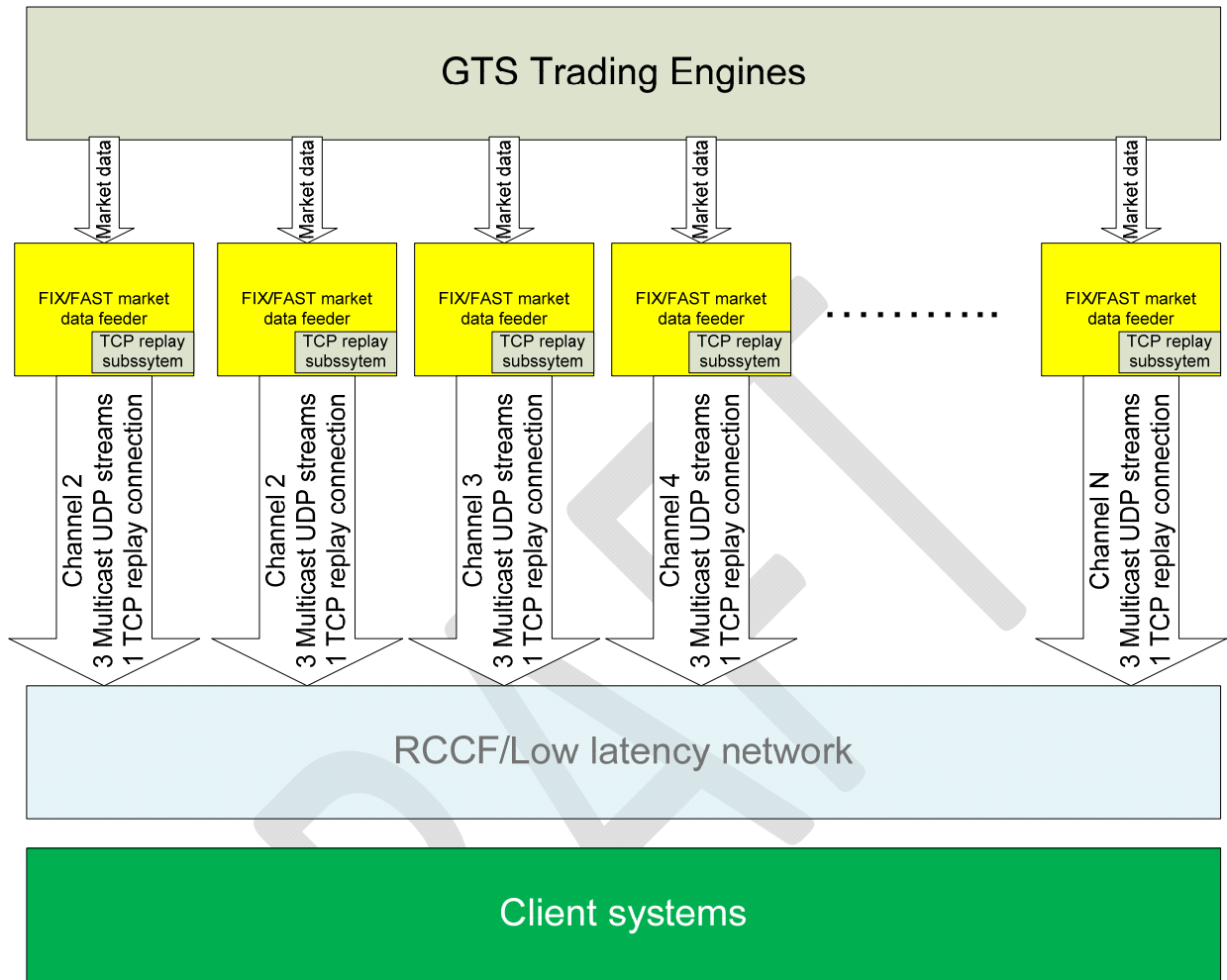
5.1.5 BVMF Market Data Distribution Diagrams

The following diagrams illustrate the market data distribution components involved in the feeds for MEGABOLSA, GTS and GLOBEX, respectively.

MEGABOLSA market data distribution architecture



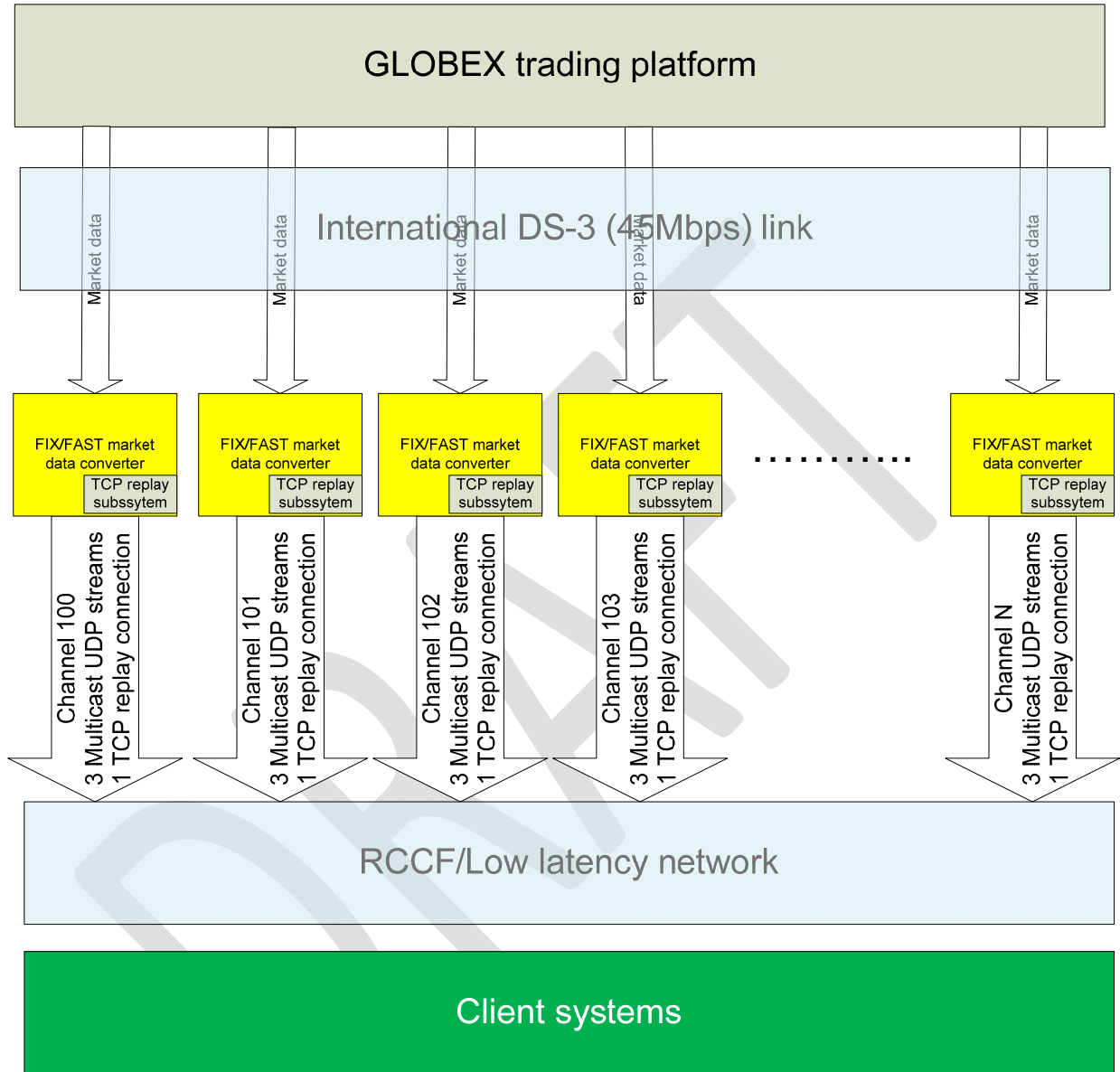
GTS market data distribution architecture



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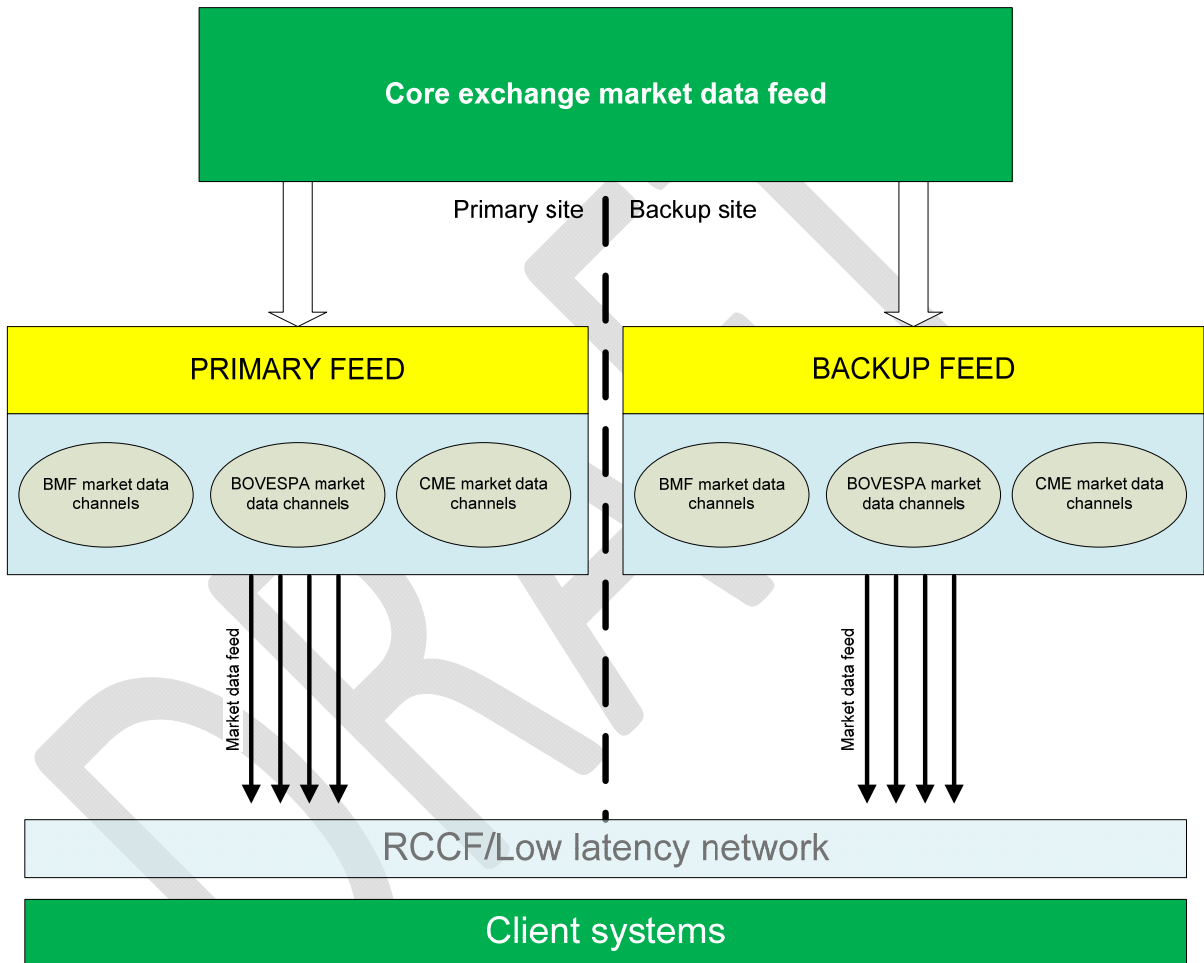
GLOBEX market data distribution architecture



5.2 Market Data Contingency Feed

BVMF will provide customers the ability to receive a contingency feed from the backup site, to strengthen stability and provide for disaster recovery. Customers that wish to receive the backup feed should contact the exchange's Market Relations Department at the e-mail sinal.bovespa@bovespa.com.br and request the backup feed.

The following diagram illustrates the primary and backup feeds distribution.



BVMF suggests customers to sign up for both feeds, to increase stability. In case of disaster, only the backup feed will be available.

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5.3 FIX/FAST Engagement Rules

This section contains an overview of engagement architecture for receiving the FIX/FAST market data feed.

5.3.1 FIX/FAST Templates

FIX/FAST templates provide the rules for a FAST decoder to be able to properly decode market data messages. FAST-encoded messages can only be interpreted correctly by using such templates.

The templates are all listed within a single XML file. The templates are subject to change by BVMF as the system evolves and new functionality is added. When a change is done, BVMF will notify market participants in advance for appropriate development and/or testing efforts.

Please contact the BVMF CCB (Centro de Controle BM&FBOVESPA – or BM&FBOVESPA's Control Center) on how to get the latest template information.

In addition, template files are available at the BVMF public FTP site, at the following address:

For Certification:

<ftp://ftp.bmf.com.br/FIXFAST/templates/Certification/templates.xml>

For Production:

<ftp://ftp.bmf.com.br/FIXFAST/templates/Production/templates.xml>
<http://www.bmfbovespa.com.br/pt-br/servicos/download/TemplateXML.zip>

The production templates are scheduled to be updated every Sunday night, so client systems could schedule to synchronize the latest templates at the start of week.

Note: The SCP (Session Control Protocol) is not used by BVMF to exchange template files.

5.3.2 Network Configuration

BVMF will provide clients with the necessary network configuration in order to receive all market data channels.

See the documents: *UMDF Market Data Channels - CERT* and *UMDF Market Data Channels - PROD*, or contact the BVMF CCB for the list of certification and production multicast streams and TCP replay connection information.

Please note that FIX/FAST multicast data is available through the RCB (Rede de Comunicação BVMF, or BVMF Communications Network) and RCCF.

**FIX/FAST Multicast Data is available
through the RCB (low latency network)
and RCCF**

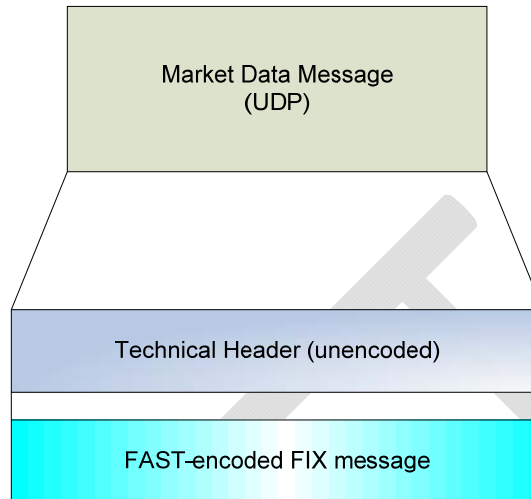
5.3.3 Technical Message Header

The FIX/FAST encoded Market Data is transmitted over a network from UDP layer in chunks that is no larger than 1500 bytes including the header.

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Each message contains a technical header, which consists of a group of fields that are not coded, before the FAST-encoded market data message.



The purpose of the UDP technical message header is:

- To allow the client system to detect sequence number gaps *before* decoding the message, and;
- Allow for breaking-up of large messages and recomposition (e.g. market data snapshots of order depth-books may be very deep – over 100 entries for each side, bid and ask).

Before each received FIX/FAST message from both UDP feed, there is the following sequence of bytes defining a header:

MsgSeqNum	NoChunks	CurrentChunk	MsgLength	FAST message
4 bytes	2 bytes	2 bytes	2 bytes	MsgLength bytes

All attributes defined in the header is in “*big endian*” convention, where bits and bytes are in network byte order, where high order bits precede low order bits, and high order bytes precede low order bytes.

MsgSeqNum – this attribute contains the same value as in the Tag *34-MsgSeqNum*.

NoChunks – total number of chunks that constitutes a single FIX/FAST Message identified by *MsgSeqNum* in the channel at the current trading session.

CurrentChunk – the current position of the chunk of data that constitutes a single FIX/FAST Message identified by *MsgSeqNum* in the channel at the current trading session.

MsgLength – The length of the following sequence of bytes that constitutes a chunk of data.

Client systems need to assembly all chunks of data with same *MsgSeqNum* in the correct order to have a valid FIX /FAST encoded data before sending to the FIX/FAST decoding procedure.

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5.3.4 Instrument List Processing

The instrument definition stream replays the list of instruments of a specific channel at an exchange-defined rate. In order to correctly process the entire list of instruments for that channel, client systems must join the instrument definition stream and start decoding messages looking for the *SecurityList* message (tag 35=y) which contains tag 34-*MsgSeqNum* equal to 1.

From this point on, the instrument database on the client side may be populated. Each *SecurityList* message (tag 35=y) will contain the count of instruments of that channel in tag 393-*TotNoRelatedSym*. The last message in the loop will contain tag 893-*LastFragment* set to 'Y'.

Note that a *SecurityList* message may contain more than one instrument definition. Deleted or expired instruments are not sent over the instrument definition stream. For deletion of instruments, please process the *SecurityList* (tag 35=y) message sent over the incremental stream.

The following diagram illustrates correct client system processing of the instrument definition stream:

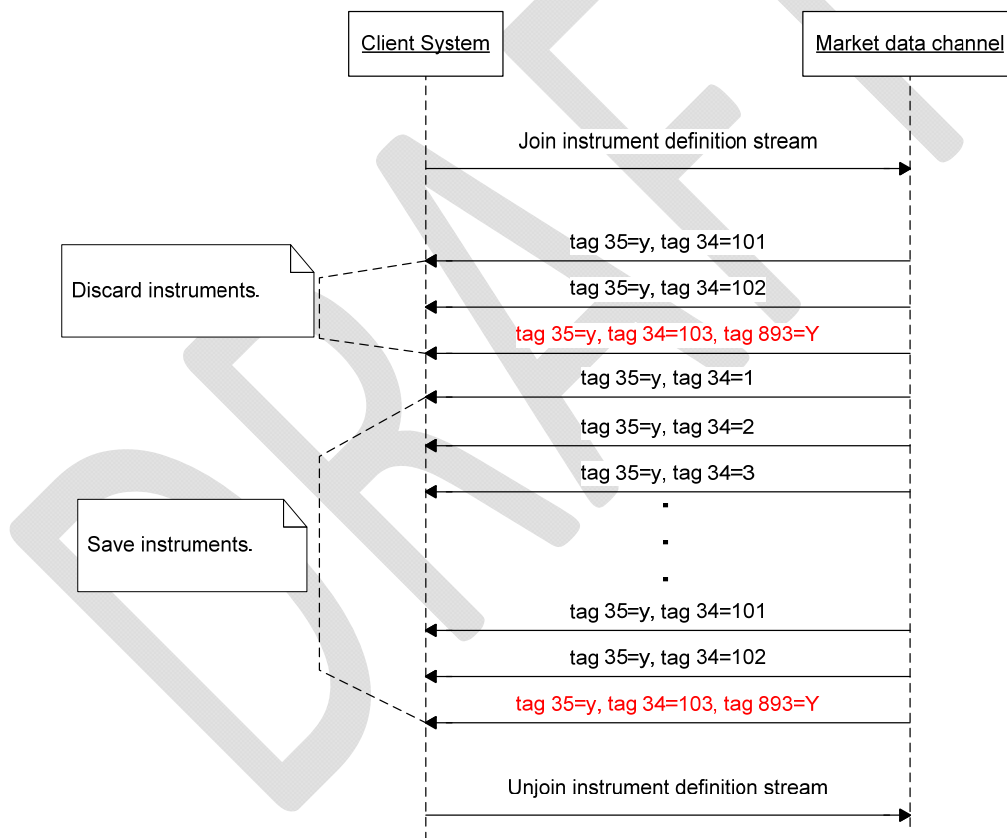


Figure 1.5 - Start of day instrument list processing.

BVMF will start issuing instrument definition messages in the instrument definition stream using the following schedule:

Trading platform	Segment	Sunday	Daily (Mon-Fri)
------------------	---------	--------	-----------------

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MEGABOLSA	Equities	-	02:00 – 20:30
GTS	Derivatives/FX	15:00 UTC	02:00 – 20:30
GLOBEX	CME	15:00 UTC	02:00 – 20:30

5.3.5 Initial Market Data Synchronization Procedure

For a startup, follow the process below to ensure that all necessary market data is received:

1. Contact the BVMF CCB or visit the BVMF FTP server to get the latest configuration parameters and template files;
2. Join the multicast address/UDP port of the security definition stream until all instruments have been received (monitor the tag *393-TotNoRelatedSym*);
3. **Unjoin** the security definition stream, to avoid consuming unnecessary bandwidth;
4. Join the multicast address/UDP port of the incremental stream and start receiving the market data incremental messages. **Queue** them;
5. Join the multicast address/UDP port of the market recovery stream until all snapshot messages have been received: monitor the tag *34-MsgSeqNum* whose value is cyclical and the tag *911-TotNumReports* = total number of snapshots in the current loop. Client systems could receive and queue snapshots until total number of snapshots received and stored is equal to the value of field *TotNumReports field (tag 911)* of the **last** snapshot message received and the older incremental data queued is the next sequence of the lowest value of *LastMsgSeqNumProcessed field (tag 369)* of all snapshots stored;
6. Start **dequeuing** the incremental stream messages applying over related snapshots until consuming all the queued messages: discard queued messages from the incremental stream until tag *34-MsgSeqNum* in the incremental message has the same value as tag *369-LastMsgSeqNumProcessed* in the snapshot for each instrument in the channel. The discarded messages contain information that was already included in the related snapshot message;
7. **Unjoin** the market recovery stream, to avoid consuming unnecessary bandwidth;
8. Start normal processing with incremental messages.

Note: the number of snapshots sent in the market recovery stream in one loop could be less than the number of instruments assigned to the related channel. Client systems must handle instruments with no snapshots as have empties books and empties statistical data before applying incremental data.

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The following diagram illustrates the graphical representation of the steps listed above.

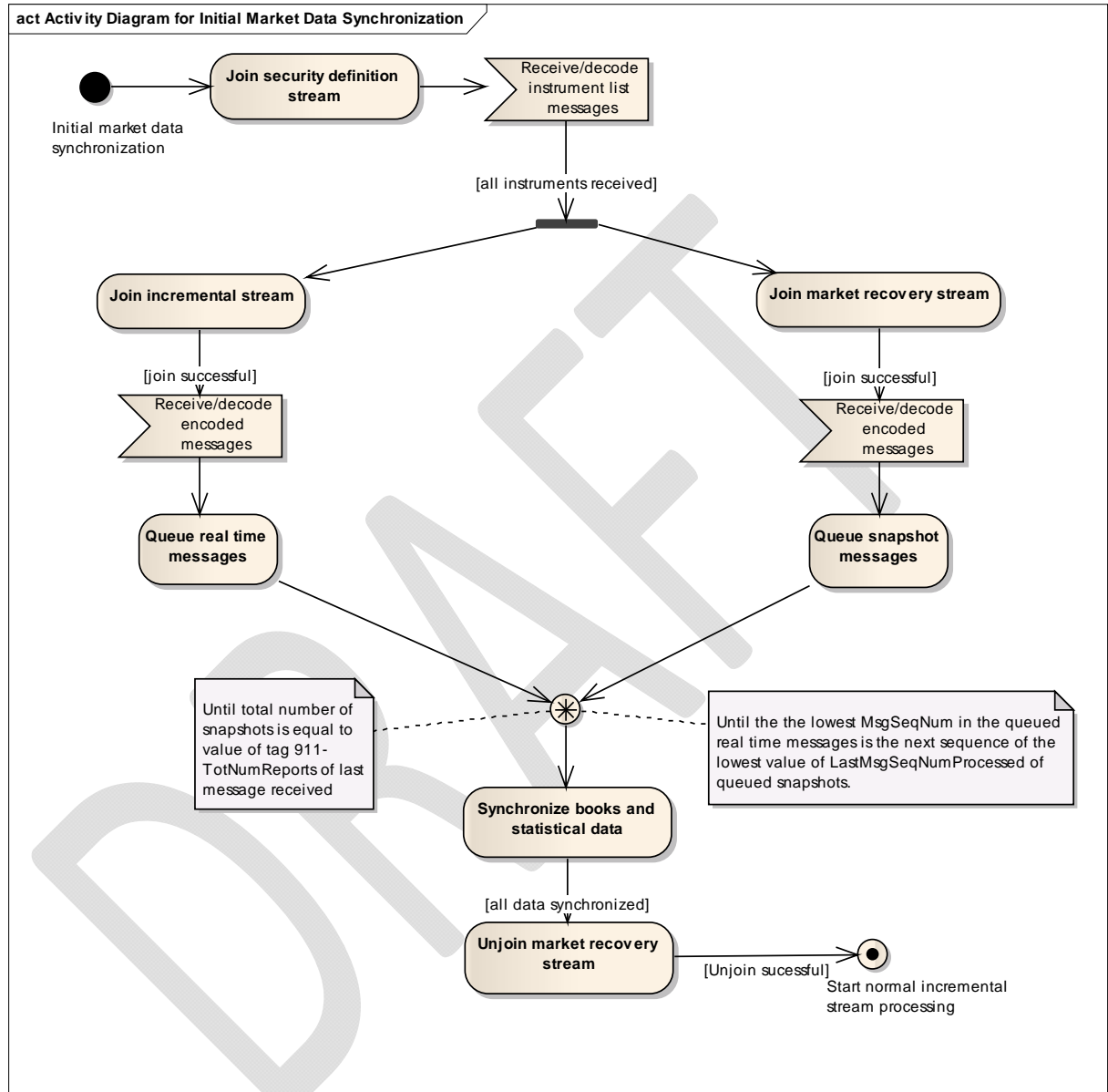


Figure 5.6 - Procedures for initial book synchronization.

BVMF will start issuing instrument definition messages in the instrument definition stream using the following schedule:

Trading platform	Segment	Sunday	Daily (Mon-Fri)
MEGABOLSA	Equities	-	02:00 – 20:30
GTS	Derivatives/FX	-	02:00 – 20:30
GLOBEX	CME	15:00 UTC	02:00 – 20:30

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5.3.6 Start of Day Heartbeats

In order to provide clients with connectivity testing before the actual streams are activated, BVMF will issue Heartbeat (tag 35=0) messages every 10 seconds. If client systems do not receive 3 heartbeats in a row it should consider that the multicast is not active. Note that heartbeat message is applicable to all three UDP multicast streams.

5.3.7 Stream Reset Message

Client systems should be able to handle the market data reset message, which is sent by BVMF in the incremental stream of any market data channel.

This message is issued in case of a component failure in the exchange market data system, or regular start-up. This message will be sent individually for each site, i.e. if the failure occurs in the primary site, only that channel in the primary site is affected, likewise for the backup site.

The stream reset is the *Sequence Reset* message (tag 35=4) with *NewSeqNo* field (tag 36) = 0 (set new sequence number).

Upon receipt of this message, client systems should:

- Consider that the application sequence number has been reset, and should be started from the value in *NewSeqNo* field;
- Resynchronize their order books according to the market recovery stream, as if it were a start of day synchronization.

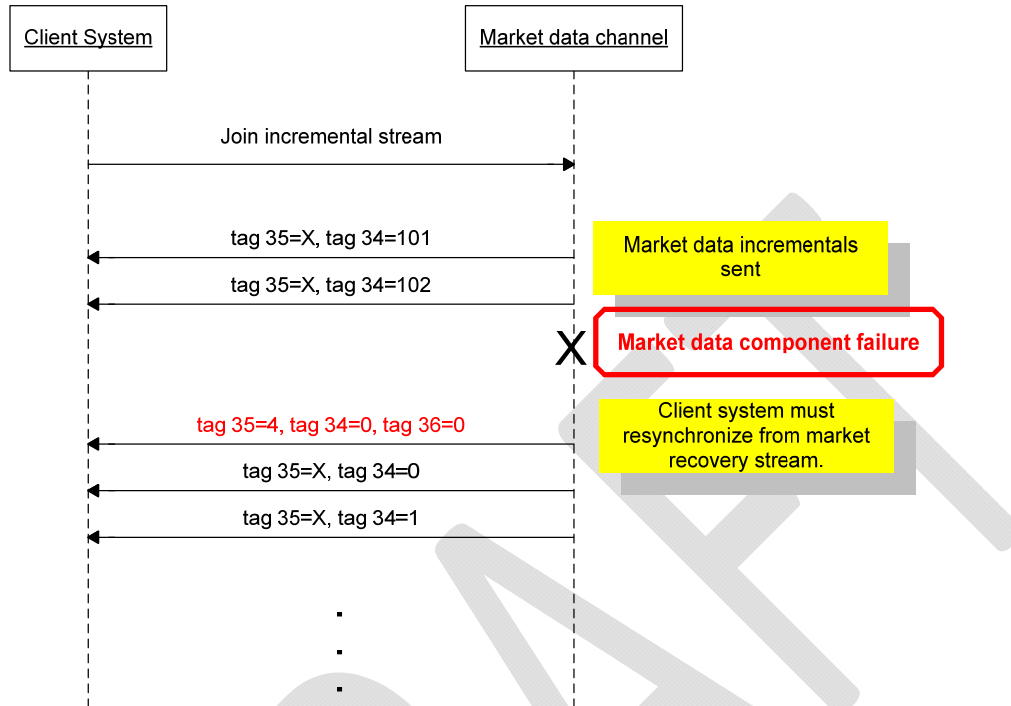
The Sequence Reset message resetting the market data stream is also sent at the startup of the market data component, regardless of failure or regular startup.

Historical TCP replay is not available for messages prior to a Sequence Reset message in that channel.

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The following diagram illustrates an example of the Stream Reset procedures:



5.3.8 Instrument Book Reset

The exchange may ask client systems to invalidate the order book for specific instruments on a channel, without invalidating all instruments of that channel. This request is done via a market data incremental message which is sent over the incremental stream.

In this case, BVMF will issue a market data incremental message with an entry type 'J' (tag 269-*MDEntryType*). Client systems should assume that the exchange is invalidating market data for that instrument and the order book is no longer valid. The *RptSeq* field (tag 83) is also reset for the subsequent messages/repeating groups for the related instrument.

Upon receipt of this message with entry type J, client systems should:

- Invalidate the order book for that instrument;
- Rejoin the market recovery stream for re-synchronizing that instrument book only.

Note: Client systems **DO NOT** have to resynchronize ALL instruments of that channel when receiving Instrument Book Reset entry type ("J").

6 Recovery

BVMF offers some options for recovering missed messages or synchronizing client systems to the latest state: [Historical Data Replay](#) and [Market Recovery](#).

Message loss is detected using the message sequence number present in the message header and tag *34-MsgSeqNum* in the decoded incremental FIX message. This attribute is an incrementing number. If a gap is detected between messages in tag *34-MsgSeqNum*, this indicates a group of messages have been missed. It should be assumed at this point that all books maintained in the client system may no longer have the correct, latest state maintained by BVMF. Client systems must resynchronize all books to the latest state maintained by BVMF. During this synchronization process, all books are initially assumed to be in an incorrect state and are recovered during the synchronization process.

6.1 Market Recovery Overview

This recovery method should be used for **large-scale** data recovery (i.e. major outage or late joiners) to synchronize client systems to the latest state maintained by BVMF. Client systems can use the Market Recovery stream on each channel to determine the state of each book in affected channels. Each Market Recovery stream constantly loops and sends the Market Data Snapshot Full Refresh (*tag 35=W*) message. The Market Recovery feed is known to be valid as of a sequence number on the Incremental Market Data feed, which is found in tag *369-LastMsgSeqNumProcessed*. This sequence number (*tag 369-LastMsgSeqNumProcessed*) is found on each Market Data Snapshot Full Refresh (*tag 35=W*) message. Client systems will recover the most recent statistics on the Market Recovery stream. Any intermediary statistics (for example trades) will not be recovered.

Some considerations:

1. Client systems should queue real-time data until all snapshot data is retrieved from a given channel. After this, the queued data should then be applied as necessary, where all queued incremental message with tag *34-MsgSeqNum* less or equal than the value of tag *369-LastMsgSeqNumProcessed* of processed snapshot should be discarded.
2. BVMF strongly recommends that the Market Recovery streams be used for recovery purposes only. Once client systems have retrieved recovery data, client systems **should stop** listening to the Market Recovery streams.

Recommended procedure for recovering:

1. Identify channel(s) in which the client system is out of synch;
2. Listen to and queue all the messages from incremental stream;
3. Join the multicast address/UDP port of the market recovery stream until all snapshot messages have been received: monitor the tag *34-MsgSeqNum* whose value is cyclical and the tag *911-TotNumReports* = total number of snapshots in the current loop. Client systems could receive and queue snapshots until total number of snapshots received and stored is equal to the value of field *TotNumReports* (*tag 911*) of the last snapshot message received and the older incremental data queued is the next sequence of the lowest value of *LastMsgSeqNumProcessed* (*tag 369*) of all snapshots stored;

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4. Start **dequeuing** the incremental stream messages applying over related snapshots until consuming all the queued messages: discard queued messages from the incremental stream until tag *34-MsgSeqNum* in the incremental message has the same value as tag *369-LastMsgSeqNumProcessed* in the snapshot for each instrument in the channel. The discarded messages contain information that was already included in the related snapshot message;
5. Unjoin the market recovery stream, to avoid consuming unnecessary bandwidth;
6. Start normal processing with incremental messages.

6.2 Historical Data Replay Overview

Historical Data Replay service allows client to request a replay of a set of messages already published on the Incremental stream, using a regular FIX 4.4 session over TCP connection. The request specifies messages to be replayed based on the *MsgSeqNum* range and uses a FIX message of type Application Message Request (tag 35=BW) adapted to the FIX 4.4 specification in order to be used in the standard FIX session layer. All messages requested are FIX/FAST encoded and embedded in one or more Application Raw Data Reporting messages (tag 35=URDR), the *96-RawData* field is used to transport the FAST encoded data. See the message specification for more details.

The following message types are expected from this connection:

- The *Application Message Request Acknowledgment* (tag 35=BX) message is sent to confirm the receiving of the Application Message Request (tag 35=BW) message. The *AppIRespType* field (tag 1348) contains the type of acknowledgment being sent. The requested messages are resent only when the value of this tag is "0" (Request accepted) or "1" (Request partially accepted), for the later not all of the messages are resent, in this case the client application must iterate through all the *NoAppIIDs* (tag 1351) instances to check the presence and value of the *AppIRespError* field, which has the reason for the error related to a specific *RefAppIID* (tag 1355). The other values (greater than 1) for *AppIRespType* indicate Negative acknowledgment and the client application should verify and treat the error (see the message specification for more details).
- The *Application Raw Data Reporting* (tag 35=URDR) message is a BVMF user defined message created to encapsulate and make feasible the transportation of the FAST encoded messages (binary data) over a regular FIX 4.4 session using a TCP connection. The *RawData* field (tag 96) contains one or more FAST encoded messages. The *NoAppISeqNums* field (tag 10054) is the repeating group that contains the list of the message sequence numbers and related offset/length to retrieve each message in the *RawData* field (tag 96). The *AppILastSeqNum* field (tag 1350) can be used to detect gaps (i.e., a sequence reset during the trading session). See the message specification for more details.
- The *Application Message Report* (tag 35=BY) message is used to indicate that the application resend process is complete or was interrupted because of an error. The *AppIReportType* field (tag 1426) reports whether the resending was successfully completed (value=3) or there was an error (value=4). A separate *Application Message Report* message is issued for each channel ID in the request. Thus, in all messages of this type, *NoAppIIDs* field (tag 1351) is always equal to 1. The field *RefAppIID* (tag 1355) identifies the channel ID (incremental stream) being reported. This message might be sent immediately after the *Application Message Request Acknowledgment* (tag 35=BX) message (if an error occurs and messages cannot be resent), or just after the resending of the last *Raw Data Reporting* message for the related channel ID. Client application must always check the presence of the *AppIRespError* field to detect error occurrence and the field's value to know the error reason.

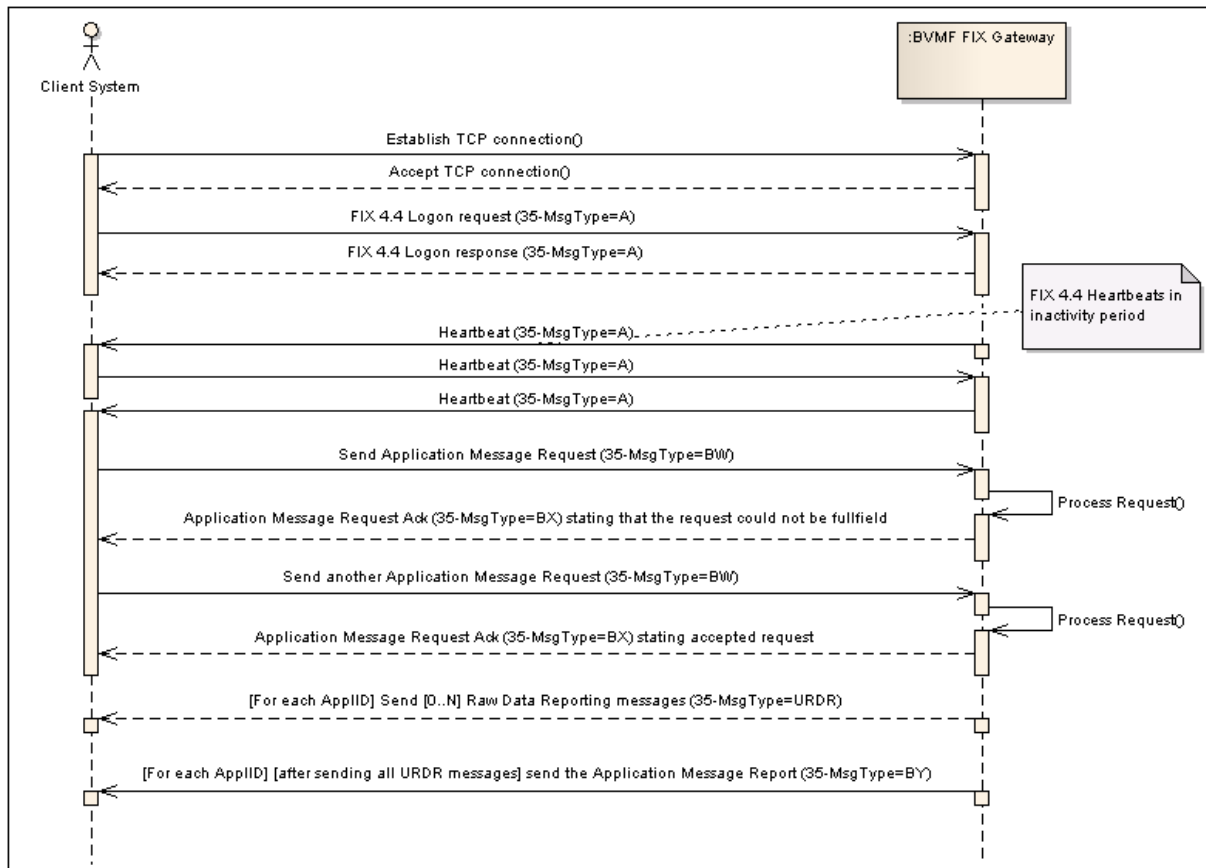
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Some considerations:

1. The replayed messages from the current trading session are available until the next trading session starts. After that, *MsgSeqNum* is reset and the old ones are unavailable.
2. The maximum number of messages that can be requested in one request message is 2000 messages.
3. BVMF strongly recommends that the client application should keep connected to the TCP channel during the whole trading session (establishing a connection for each request is not efficient and is not recommended).
4. This type of connection conforms to FIX Session layer standard defined by FPL, but *Application Message Request* (tag 35=BW), *Application Message Report* (tag 35=BY), *Application Message Request Acknowledgment* (tag 35=BX) and *Application Raw Data Reporting* (tag 35=URDR) messages as described at the BVMF specification must be included as valid to the dictionary of the chosen FIX engine.
5. Concerning the URDR (BVMF Raw Data Reporting) message, The FAST encoded messages appended in the *RawData* (tag 95) field do not contain the header that is sent in the incremental stream for fragmentation/reassembly purposes. After correctly extracting a message from the *RawData* (tag 95) field using *RawDataOffset* (tag 10055) and *RawDataLength* (tag 96), the client application can immediately submit it to the application FIX/FAST decoder routines to obtain the final FIX.5.0SP2 *MarketDataIncrementalRefresh* (tag 35=X), *SecurityList* (tag 35=y), *SecurityStatus* (tag 35=f), *News* (tag 35=B) and *Heartbeat* (tag 35=0) messages.
6. BVMF expects that the adopted FIX engine at the client application side take care of all FIX 4.4 session layer routines (i.e., the sending of heartbeat messages during the periods of inactivity)
7. BVMF recommends to reset the sequence numbers on every logon (client application should send the logon message with field 141=Y).
8. Retransmission from the session level might not be implemented at BVMF side, all Resend Request messages (35=2) might be responded with a Sequence Reset (35=4 with Gap Fill). Thus, the client application should not rely on retransmissions at the session level because this feature might not be available through the TCP replay Gateways.

The following sequence diagram describes an example of the historical data replay process:



There are two strategies that client systems can apply to determine to whether be the moment to use a Historical Data Replay:

6.2.1 Message Level Sequencing

Each datagram received from Incremental stream has the following important information for recovery process in the header: *MsgSeqNum*, *NoChunks* and *CurrentChunk*. Before sending a sequence of bytes to the FAST decoder, the client system needs to assembly a message in correct order using the *CurrentChunk* as index with same *MsgSeqNum*. If any chunk of data is missed, the client system must request, via Historical Data Replay mechanism, the entire message identified by *MsgSeqNum*, receiving all the chunks that constitute the message.

6.2.2 Instrument Level Sequencing

Market Data Incremental Refresh messages (tag 35=X) contain instrument sequence numbers (tag 83-RptSeq), in addition to message sequence numbers (tag 34-MsgSeqNum). Every repeating group instance of a market data entry contains an incrementing sequence number (tag 83-RptSeq) that is associated with the instrument for which data is present in the block. Instrument level sequencing can be used to identify which instruments you have not missed messages for, and apply during the Historical Data Replay mechanism.

Client systems can keep track of the instrument sequence number (tag 83-RptSeq) for every instrument by inspecting incoming data and determining whether there is a gap in the instrument sequence number (tag 83-RptSeq).

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- If there is a gap in the instrument sequence number (tag *83-RptSeq*), it indicates that data was missed for the instrument when message loss occurred.
- If there is no gap, the data can be used immediately, and it also indicates that the book for this instrument still has a correct current state.

It is likely that if only a small number of messages have been missed, there will be data in subsequent messages which are not affected by the missing data. If there are 100 instruments in a channel, for example, and the missed messages contain data for 4 of these instruments, any subsequent messages containing data about the other instruments (not affected by message loss) are still valid.

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7 Market Data Entry Types

This section lists the market data entry types supported in the BVMF feed. Each entry type contains relevant trading information such as order book, trade and statistical data. Note that availability of each of these types is subject to the trading platform functionality:

MDEntryType	Description	Comment
0	Bid	The book on the buy side for the security. The book could be order-depth based or price-depth based depending on channel parameters definition. In order-depth based book, each individual order will appear as a separate book entry, even if it contains the same price as other orders, while in price-depth based book, each book entry corresponds to a price, and may contain more than one order.
1	Offer	The book on the sell side for the security. The book could be order-depth based or price-depth based depending on channel parameters definition. In order-depth based book, each individual order will appear as a separate book entry, even if it contains the same price as other orders, while in price-depth based book, each book entry corresponds to a price, and may contain more than one order.
2	Trade	The completed trades for the security.
3	Index Value	Data related to indexes and ETFs (Exchange Traded Funds).
4	Opening price	The opening price of the security (first trade).
5	Closing price	The closing price of the security (previous day's last trade).
6	Settlement price	The settlement price of the security.
7	Trading session high price	The highest price traded for the security in the trading session.
8	Trading session low price	The lowest price traded for the security in the trading session.
9	Trading session VWAP price	Volume-Weighted Average Price, the ratio of the value traded to total volume traded over the trading session. Calculated using the formula: $P_{VWAP} = \frac{\sum_j Q_j P_j}{\sum_j Q_j}$ Where: P_{VWAP} = Volume Weighted Average Price P_j = price of trade j Q_j = quantity of trade j j = each individual trade that takes place over the defined period of time (excluding cross trades).
B	Trade volume	The total volume traded for that security in the trading session.
C	Open Interest	Total number of contracts in a commodity or options market that are still open; that is, they have not been exercised, close out, or allowed to expire. The term also applies to a particular commodity or, in case of options, to the number of contracts outstanding on a particular underlying security. The level of open interest is reported daily.
J	Empty Book	Indicates that the order book of related instrument is no longer

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MDEntryType	Description	Comment
		valid, so client systems should: <ul style="list-style-type: none">• Invalidate the order book for that instrument;• Rejoin the market recovery stream for re-synchronizing that instrument book only.
c	Security trading state	The trading status and/or phase of the security.
g	Price bands	Contains price banding information.

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8 Intraday Instrument Definition Updates

The definition of instruments may change intraday, i.e. instruments may be added, deleted, or have their characteristics changed at the exchange's market operations discretion. Hence, client systems must be able to handle these events in order to correctly list the tradable instruments to its customers.

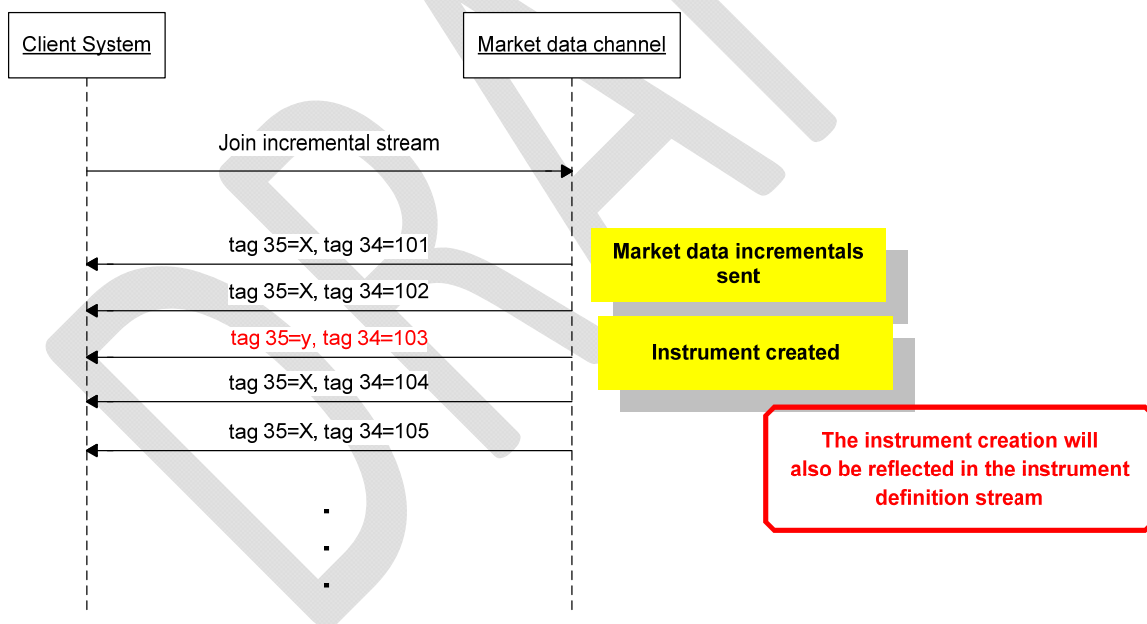
After the start of day procedure to retrieve the list of instruments, any new updates will be sent over the incremental stream of the market data channel. These updates will be available in the TCP replay functionality as well.

Updates to the instrument definitions will also be reflected in the instrument definition stream for late joiners, however client systems that have already constructed their instrument database as per the start of day procedure should rely on the incremental stream updates instead.

The following sections illustrate the three possible types of instrument updates that will be sent over the incremental channel.

8.1 Intraday Instrument Creation

In this case, an instrument is created during the trading session.

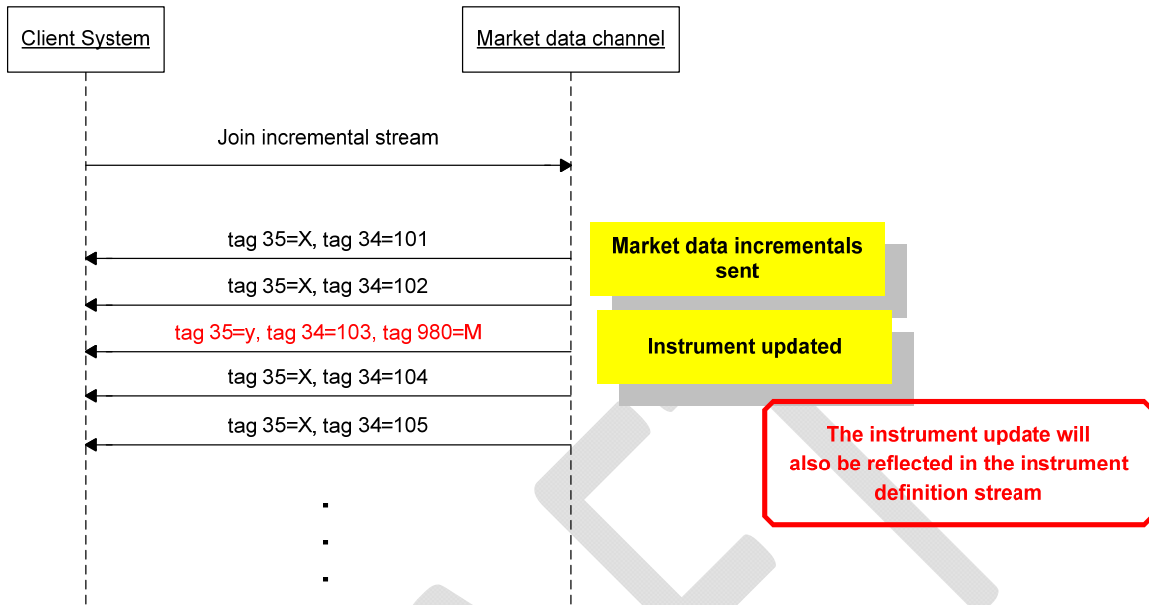


8.2 Intraday Instrument Update

In this case, one of the characteristics of the instrument was changed. BVMF will send all the instrument's characteristics, being the client systems responsibility to update its instrument database.

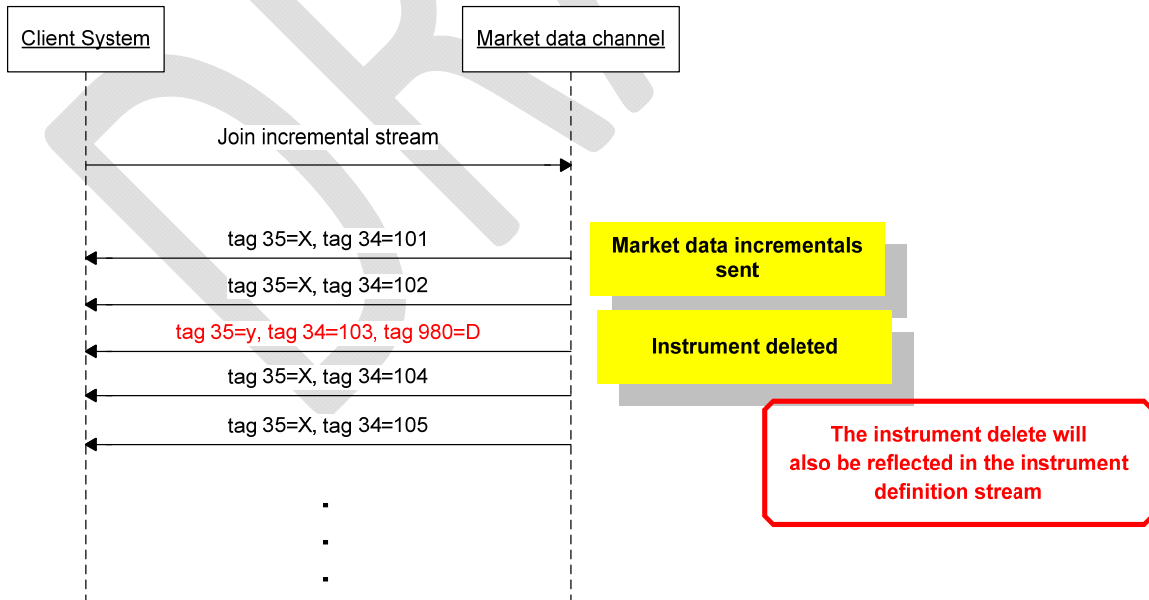
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8.3 Intraday Instrument Deletion

In this case, the instrument was deleted, due to the fact that it is not tradable anymore. Client systems should remove the instrument from its instrument database and invalidate the order book associated to it.



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9 Incremental Book Management

Books received via the FIX 5.0/FAST feed are incremental, i.e. changes to the book are relayed on individual messages providing “deltas” of the previous state of the book.

The actions to be executed by the client system receiving the incremental message are determined by tag 279-*MDUpdateAction*, whose value carries an instruction that can be either add, delete, change, delete from, delete thru or overlay. The items in the order book that are affected by the action stated in tag 279 are stated in tag 290-*MDEntryPositionNo*, which contains a position in the order book.

For bid or offer book entries (order and price depth book), the deletion is based on the entry's position (tag 290-*MDEntryPositionNo*). For example, assume ten bids for a security. Adding a bid with 290-*MDEntryPositionNo* = 4 requires the receiver to shift down other Market Data Entries, i.e. the Market Data Entry in the 4th display position will shift to the 5th, the 5th shifts to the 6th, etc. until the 10th shifts to the 11th. BVMF will not send a modification of all entries in the 4th through 10th positions just to update the 290-*MDEntryPositionNo* field; the receiver of the market data must infer the change.

Similarly, deleting a Market Data Entry in the 7th position causes the 8th Market Data Entry to move into the 7th position, the 9th to shift into the 8th position, etc. BVMF will not issue a change action to modify the position of an entry in the book. Change updates are only sent when a value applicable to a specific tag 290-*MDEntryPositionNo* – such as total quantity or number of orders – changes.

BVMF publishes two types of book depth: order depth and price depth using the same *MDEntryType*: 0 (Bid) and 1 (Offer). To determine which type of book is currently defined in a given channel, see [FIX/FAST Channel Definitions](#) documents or from tag 264-*MarketDepth* in the Market Data Snapshot Full Refresh (tag 35=W) message for each instrument: if it is absent, the book is order-depth based, if present, it is price-depth based and the level is determined by the value of the tag where the value 1 (one) indicates top of book.

Important note: The book could be **order-depth** based or **price-depth** based depending on channel parameters definition. Please see [FIX/FAST Channel Definitions](#) documents to determine which type of book each channel supports.

9.1 Order depth book

Order depth book contains order by order information, where each entry represents an individual order. For example, this is how an order-depth book looks like:

Bid			Offer		
PosNo	Size	Px	Px	Size	PosNo
1	5000	10.58	11.03	7000	1
2	4000	10.58	11.03	2000	2
3	3000	10.57	11.05	1000	3
4	4000	10.54			4

One entry per order: same price on more than one entry.

BVMF provides the full depth of the book for order-depth book, i.e. the client will always receive updates for all the orders that are in the order book, even if it is the last one (worst price).

In general, if a trade occurs, BVMF will send a delete or change data block to update the book. The trade data block itself is not used to update the order book.

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9.1.1 Basic Order Depth Book Update Data Block

The following FIX tags are normally sent for an order-depth book update:

Tag Number	Tag Name	Required for Book Update	Description
279	MDUpdateAction	Y	0 (New), 1 (Change), 2 (Delete), 3 (Delete Thru) or 4 (Delete From). Note that 3 and 4 is only applicable for equity market .
269	MDEntryType	Y	0 (Bid) or 1 (Offer).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of the event.
273	MDEntryTime	Y	Time of the event.
290	MDEntryPositionNo	Y	Position in the book to insert/update/delete/delete from. Always 1 for delete thru (equity market).
270	MDEntryPx	C	Price of order. If <i>MDUpdateAction</i> =2, 3 or 4, this field is absent. Otherwise, this is a required field.
271	MDEntrySize	C	Quantity of order. If <i>MDUpdateAction</i> =2, 3 or 4, this field is absent. Otherwise, this is a required field.
37	OrderID	N	Represents an order. It is unique per broker firm, per instrument, per trading date.
288	MDEntryBuyer	N	Could be present if <i>MDEntryType</i> =0 (Bid). It is the buyer broker firm.
289	MDEntrySeller	N	Could be present if <i>MDEntryType</i> =1 (Offer). It is the seller broker firm.

9.2 Price depth book

Price-depth book contains price by price information, where each entry represents the aggregation of all order quantities at that price. The following table illustrates the price-depth book of the same book described above:

Bid				Offer			
PosNo	NoOrders	Size	Px	Px	Size	NoOrders	PosNo
1	2	9000	10.58	11.03	9000	2	1
2	1	3000	10.57	11.05	1000	1	2
3	1	4000	10.54				3

One entry per price: more than one order per entry.

In addition to the quantity and the price, the price-depth book also makes the number of orders that compose a specific price available. BVMF presets the depth of the book that will be made available per instruments, usually defaulting to 5. Client systems must determine the book-depth for an instrument from tag *264-MarketDepth* in the Market Data Snapshot Full Refresh (tag *35=W*) message.

BVMF sends an add data block if there is a new price level. Client systems should then shift price levels down, and delete any price levels past the defined depth of the book as indicated in tag *264-MarketDepth* in the Market Data Snapshot Full Refresh (tag *35=W*) message.

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The change data block is sent to update characteristics of a price level without changing the price itself, or impacting any other prices on the book (update to the order count or quantity at that price).

9.2.1 Price-depth Bottom Row Handling

For price-depth book only, the recipient of the market data must know how many price levels are being supplied by BVMF. The recipient must delete the bottom price row when the number of price rows is exceeded – BVMF will not send a delete of the bottom row when the number is exceeded. BVMF will send the bottom row again when a higher level row is deleted.

The following example illustrates this behavior:

Bid			
PosNo	NoOrders	Size	Px
1	2	9000	10.58
2	1	3000	10.57
3	1	4000	10.54
4	4	10000	10.53
5	3	8000	10.50

Top row of the book (best bid).

Bottom row of the book.

New buy order is received (BUY 1000 @ 10.60), updating the top of the book (bid):

Market Data Incremental Refresh	
MDEntryPositionNo	1
MDUpdateAction	New
MDEntrySize	1000
MDEntryPx	10.60
NumberOfOrders	1

Bid			
PosNo	NoOrders	Size	Px
1	1	1000	10.60
2	2	9000	10.58
3	1	3000	10.57
4	1	4000	10.54
5	4	10000	10.53
6	3	8000	10.50

New bottom row of the book.

Implicit deletion of the previous bottom row.

The order with price 10.57 is deleted (CANCEL BUY 3000 @ 10.57):

Market Data Incremental Refresh	
MDEntryPositionNo	3
MDUpdateAction	Delete
MDEntryPositionNo	5
MDUpdateAction	New
MDEntrySize	8000
MDEntryPx	10.50
NumberOfOrders	3

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So, the book Will miss the last row until the insert at the last position:

Bid			
PosNo	NoOrders	Size	Px
1	1	1000	10.60
2	2	9000	10.58
3	1	4000	10.54
4	4	10000	10.53

New bottom row will be sent by BM&F:

Market Data Incremental Refresh	
MDEntryPositionNo	5
MDUpdateAction	New
MDEntrySize	8000
MDEntryPx	10.50
NumberOfOrders	3

The book after the event will be:

Bid			
PosNo	NoOrders	Size	Px
1	1	1000	10.60
2	2	9000	10.58
3	1	4000	10.54
4	4	10000	10.53
5	3	8000	10.50

New bottom row will be sent by BM&F.

9.2.2 Basic Price Depth Book Update Data Block

The following FIX tags are normally sent for a price-depth book update:

Tag Number	Tag Name	Required for Book Update	Description
279	MDUpdateAction	Y	0 (New), 1 (Change), 2 (Delete) or 5 (Overlay). Overlay is supported only when <i>MarketDepth</i> = 1 (Top of Book).
269	MDEntryType	Y	0 (Bid) or 1 (Offer).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of the event.
273	MDEntryTime	Y	Time of the event.
290	MDEntryPositionNo	Y	Position point in the book to insert/update/delete.
270	MDEntryPx	N	Price of position point.
271	MDEntrySize	C	Aggregated quantity of position point. If <i>MDUpdateAction</i> =2 (delete), this field is absent. Otherwise, this is a required field.
346	NumberOfOrders	C	Number of orders that composes the position point. If <i>MDUpdateAction</i> =2 (delete), this field is absent. Otherwise, this is a required field.

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9.3 Top of the Book (best bid and best offer)

The best bid and best offer prices are used to indicate aggregation of all order quantities at the best bid price of the current book and aggregation of all order quantities at best offer price of the current book respectively. In addition to the quantity and the price, the price-depth book also makes the number of orders that compose a specific price available.

This information is represented by a price depth book with market depth = 1 (as described at the previous sub-topic: Price depth book), and is largely used at some client systems for comprehensive overview of market data behaviour of several instruments at same time.

9.4 Delete From (equities only)

FIX 5.0/FAST allows for more efficient book management by providing an extension to tag 279-*MDUpdateAction* allowing delete from a position. This functionality is supported in the equity market data feed only.

When an order is entered that causes several executions and sweeps the order book, causing several price levels to be deleted, instead of sending deletions for several price levels, the *MDUpdateAction* "Delete From" (*tag 279 = 4*) is used. It indicates that all positions from the position stated in tag *MDEntryPositionNo* up until position 1 must be deleted. This will cause the market data entry that was in position *MDEntryPositionNo + 1* to be the first position now.

The following example of an order-depth book illustrates this behavior:

Bid			Offer		
PosNo	Size	Px	Px	Size	PosNo
1	5000	10.58	11.03	7000	1
2	4000	10.58	11.03	2000	2
3	3000	10.57	11.05	1000	3
4	4000	10.54			4

A sell order is sent with quantity 12000 and price 10.57, which executes against the 3 existing buy orders in the book. BVMF will send an incremental market data message with the following characteristics:

Market Data Incremental Refresh	
NoMDEntries repeating group instance	
MDUpdateAction	Delete From (4)
MDEntryType	Bid (0)
MDEntryPositionNo	3

The resulting book as displayed by the client system should be:

Bid			Offer		
PosNo	Size	Px	Px	Size	PosNo
1	4000	10.54	11.03	7000	1
2			11.03	2000	2
3			11.05	1000	3

9.5 Delete Thru (equities only)

FIX 5.0/FAST allows for more efficient book management by providing an extension to tag 279-*MDUpdateAction* allowing delete thru a position. This functionality is supported in the equity market data feed only and in this case, the value of *MDEntryPositionNo* field (tag 290) is always 1 (one). Therefore, all entries of related side of the book (Bid or Offer) are deleted.

The following example of an order-depth book illustrates this behavior:

Bid			Offer		
PosNo	Size	Px	Px	Size	PosNo
1	5000	10.58	11.03	7000	1
2	4000	10.58	11.03	2000	2
3	3000	10.57	11.05	1000	3
4	4000	10.54			4

The market supervisor decided to cancel all bid entries, so BVMF will send an incremental market data message with the following characteristics:

Market Data Incremental Refresh	
NoMDEntries	repeating group instance
MDUpdateAction	Delete Thru (3)
MDEntryType	Bid (0)
MDEntryPositionNo	1

The resulting book as displayed by the client system should be:

Bid			Offer		
PosNo	Size	Px	Px	Size	PosNo
1			11.03	7000	1
2			11.03	2000	2
3			11.05	1000	3

9.6 Empty Book

In order to represent an empty book (i.e. no orders on both the bid and ask sides), BVMF will issue a snapshot with no bids nor offers, so empty book entry type (tag 269-*MDEntryType* = J) is not expected to be received from snapshot messages. Client systems should then assume that the book is empty.

When an incremental message received at the incremental stream has an empty book entry type (tag 269-*MDEntryType* = J), it indicates that the order book of related instrument is no longer valid, so client systems should:

- Invalidate the order book for that instrument;
- Rejoin the market recovery stream for re-synchronizing that instrument book only.

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10 Trade and real-time statistical data

There is a number of statistics (market data events) which are related to changes in a book but are not used to update the book. The following type of information fit this category: last best price, trade, high/low trade price, and pre-opening statistics. These events describe the behaviour of the market and allow a user to know when the market is moving in a certain direction and provide historical information on how the market has performed.

10.1 Trade

The trade data block is sent when a trade occurs to provide volume and trade statistics.

When a cross order is accepted in the trading system, the related market data contains a trade, tag 269-*MDEntryType* = 2 (trade) with tag 277-*TradeCondition* containing character 'X'.

If a repeating group with tag 269-*MDEntryType* = 2 (trade) contains tag 277-*TradeCondition* containing character 'R', it informs that this is one of trade that forms the opening trade event that indicates when an instrument is traded for the first time in the trading session in progress.

If a trade contains tag 277-*TradeCondition* containing character 'L', it indicates that the related trade is the last trade of match or opening event.

Here are the FIX tags normally sent for a trade repeating group:

Tag Number	Tag Name	Required for Trade	Description
279	MDUpdateAction	Y	0 (New) or 2 (Delete). Delete indicates a trade cancellation.
269	MDEntryType	Y	2 (Trade).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of the trade event.
273	MDEntryTime	Y	Time of the trade event.
1003	TradeID	N	Contains the unique identifier for this trade, per instrument + trading date, as assigned by the exchange. This attribute is normally present in derivative and FX market.
277	TradeCondition	N	For optional use in reporting Trades. Space delimited list of conditions describing a trade. Possible values: R=Opening Price (applied only for equity market). X=Crossed. L=Last Trade at the Same Price Indicator (applied only for equity market). 9=Trade entered from market surveillance. U = Exchange Last.
270	MDEntryPx	Y	Price of trade.
271	MDEntrySize	C	Quantity of trade. If <i>MDUpdateAction</i> =2 (delete),

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Tag Number	Tag Name	Required for Trade	Description
			this field is absent. Otherwise, this is a required field.
1020	TradeVolume	N	Total traded volume since the beginning of the session. This attribute is normally present in derivative and FX markets.
288	MDEntryBuyer	N	Buying party in a trade. This attribute is normally present in derivative, FX and equity market.
289	MDEntrySeller	N	Selling party in a trade. This attribute is normally present in derivative, FX and equity market.
274	TickDirection	N	Direction of the tick. If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick
425	DayCumQty	N	Total traded quantity of the trading day. Only applicable for equity market.
451	NetChgPrevDay	N	Net change from previous day's closing price versus last traded price. This attribute is normally present in derivative, GLOBEX and equity market.
63	SettlType	N	Indicates order settlement period (for forward market) using the following convention: Dx = FX tenor expression for "days", e.g. "D5", where "x" is any integer > 0.
64	SettlDate	N	Specific date of trade settlement (SettlementDate) in YYYYMMDD format. If present, this field overrides SettlType (63). Only used for some types of trades in forward market. (expressed in local time at place of settlement)

Note 1: The last received repeating group *MDEntryType* (tag 269)=2 (Trade) does not mean it is the last traded price. Please pay attention to the following fields to determine the last traded price: *MDEntryTime* (tag 273) and *TradeID* (tag 1003).

Note 2: When receiving a message with the repeating group whose *MDEntryType* (tag 269) = 2 (Trade) and *TradeCondition* (tag 277) contains **U** (Exchange Last), it means that it is not a "real" trade, but a price information of the last valid trade. Therefore, the related repeating group only inform the price, and not contains other information like trade quantity, buying and selling parties, trade identification, etc.

10.2 Trading Session High/Low/VWAP Price

The high trade price data block is sent for a trade event that has produced the highest trade price for the current session. Likewise, the low trade price data block indicates that a trade event has produced the lowest trade price for a given session. High, low and Volume-Weighted Average Price (VWAP) trade prices are helpful in tracking market trends. They also provide historical information for the current session regarding market behaviour.

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Note: Volume-Weighted Average Price (VWAP) is not available for equity market.

FIX Syntax for Session High/Low/VWAP Trade Price - Market Data Incremental Refresh (tag 35-*MsgType* = X):

Tag Number	Tag Name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New), 2 (Delete).
269	MDEntryType	Y	7 (Session high price), 8 (Session low price) or 9 (Volume-Weighted Average Price).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of the event.
273	MDEntryTime	Y	Time of the event.
270	MDEntryPx	Y	Price of Market Data Entry.

10.3 Opening/Closing/Settlement Price

The price data block is sent to update opening (current trading session), previous day adjustment and settlement price. This data block is useful for obtaining the settlement price and the previous day's adjusted closing price and is sent after the close of the trading session and the opening price (price of first trades in the current session).

Here are the FIX tags normally sent for this type of Market Data Entry repeating group:

Tag Number	Tag Name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New) or 2 (Delete)
269	MDEntryType	Y	4 (opening price), 5 (closing price) or 6 (settlement price).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of the event.
273	MDEntryTime	Y	Time of the event.
270	MDEntryPx	Y	Price of Market Data Entry.
274	TickDirection	N	Direction of the tick. If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick Optional field for <i>MDUpdateAction</i> = Opening Price.

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451	NetChgPrevDay	N	Net change from previous day's closing price versus last traded price. This attribute is normally present in derivative, GLOBEX and equity market. Optional field for <i>MDUpdateAction</i> = Opening Price.
731	SettlPriceType	C	Required only for <i>MDEntryType</i> =6 (Settlement Price). Type of settlement price: 1 = Final 2 = Theoretical/Preview 3 = Updated

10.4 Theoretical Opening Price

The theoretical opening price is embedded (indicated by the presence of the tag *286-OpenCloseSettlFlag*) in the repeating group of type = Opening Price and is calculated and updated based on the orders presented in the book during every auction including the pre-opening / pre-closing auction.

Here are the FIX tags normally sent for this type of Market Data Entry repeating group:

Tag Number	Tag Name	Required for this MDEntry	Description
279	<i>MDUpdateAction</i>	Y	0 (New) or 2 (Delete).
269	<i>MDEntryType</i>	Y	4 (opening price).
83	<i>RptSeq</i>	Y	Sequence number per instrument update.
55	<i>Symbol</i>	Y	Composes the Instrument Identification Block.
48	<i>SecurityID</i>	Y	Composes the Instrument Identification Block.
22	<i>SecurityIDSource</i>	Y	Composes the Instrument Identification Block.
207	<i>SecurityExchange</i>	Y	Composes the Instrument Identification Block.
272	<i>MDEntryDate</i>	Y	Date of the event.
273	<i>MDEntryTime</i>	Y	Time of the event.
270	<i>MDEntryPx</i>	N	Price of Theoretical Opening. It is not presented in the message when <i>MDUpdateAction</i> =2 (Delete).
271	<i>MDEntrySize</i>	N	Quantity of Theoretical Opening. It is not presented in the message when <i>MDUpdateAction</i> =2 (Delete).
286	<i>OpenCloseSettlFlag</i>	Y	Value = 5 – Theoretical Price.

10.5 Open Interest

Open interest (also known as open contracts or open commitments) denotes the total number of contracts in a commodity or options market that are still open; that is, they have not been exercised, close out, or allowed to expire. The term also applies to a particular commodity or, in case of options, to the number of contracts outstanding on a particular underlying security.

Below is the basic template of both market data entry type (**C**):

Tag Number	Tag Name	Required for this MDEntry	Description
279	<i>MDUpdateAction</i>	Y	0 (New).
269	<i>MDEntryType</i>	Y	C (Open Interest).
83	<i>RptSeq</i>	Y	Sequence number per instrument update.

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55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of the event.
273	MDEntryTime	Y	Time of the event.
270	MDEntrySize	Y	Total number of contracts.

10.6 Price Banding Information

Price tunnel information is relayed using the *PriceLimits* component sets for a specific instrument in the *MDEntryType=g* (Price bands):

Tag number	Tag name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New) or 2 (Delete).
269	MDEntryType	Y	g (Price bands).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of the event.
273	MDEntryTime	Y	Time of the event.
6939	PriceBandType	Y	Indicates the type of price banding (tunnel): 0 = oscillation tunnel / intraday limit 1 = rejection tunnel 2 = auction tunnel
1306	PriceLimitType	Y	Describes how the prices are expressed. Possible values: 0 = Price 1= Ticks 2 = Percentage
1148	LowLimitPrice	N	Lower price band
1149	HighLimitPrice	N	Higher price band
1150	TradingReferencePrice	N	Reference price

The operational tunnel is usually does not change intraday. It is also known as “oscillation tunnel” establishing the price limits (lower and higher) of an instrument. Any order submitted with a price below the low limit or above the high limit will be rejected.

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10.7 Index Statistical Data

This group of information is only applicable to indexes channel (indexes and ETFs) for equity market. For this specific channel, only the following entry types are valid: 3 (Index Value), 4 (Opening Price), 5 (Closing Price), 6 (Settlement Price), 7 (Trading Session High Price), 8 (Trading Session Low Price) and 9 (Trading Session Average Price).

Market Data entry type Index Value (3) is used to inform the current value of given index and described as follows:

Tag number	Tag name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New).
269	MDEntryType	Y	3 (Index Value).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of index generation.
273	MDEntryTime	Y	Time of index generation.
270	MDEntryPx	Y	Current value of the index.
274	TickDirection	N	Index change direction: If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick

Market Data entry type Opening Price (4) is used to inform the first value of given index and described as follows:

Tag number	Tag name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New).
269	MDEntryType	Y	4 (Opening Price – first index value of the day).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of first index generation.
273	MDEntryTime	Y	Time of first index generation.
270	MDEntryPx	Y	Day's first index value.

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Market Data entry type Closing Price (5) is used to inform the last value of trading day of given index, including the related consolidated statistical data, described as follows:

Tag number	Tag name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New).
269	MDEntryType	Y	5 (Closing Price – reference index value of the last trading day).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of last index generation.
273	MDEntryTime	Y	Time of last index generation.
270	MDEntryPx	Y	Last trading day's index value.
7687	PercentageVar	N	Index variation in percentage, from start of day.
9343	NoUnchangedSecurities	N	Number of index underlying securities with no variation.
9344	NoNotTradedSecurities	N	Number of index underlying securities that are not quoted.
9989	TotTradedSecurities	N	Number of quoted securities in the index.
9990	CapitalPct	N	Capitalization percentage of active securities in the index.
9993	PrevYearVariation	N	Index variation in percentage, compared to previous year last index.
9996	NoFallingSecurities	N	Number of index underlying securities falling in price.
9997	NoRisingSecurities	N	Number of index underlying securities rising in price.

Market Data entry type Settlement Price (6) is used to inform the settlement price used for related future derivate of given index described as follows:

Tag number	Tag name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New).
269	MDEntryType	Y	6 (Settlement Price – settlement index for futures).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of settlement index generation.
273	MDEntryTime	Y	Time of settlement index generation.
270	MDEntryPx	Y	Settlement index value: Type of Index = 7 .

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When the index surpasses the maximum or minimum value of trading session, the entry types Trading Session High Price and Trading Session Low Price are generated, respectively:

Tag number	Tag name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New).
269	MDEntryType	Y	7 (Trading Session High Price – highest index value) or 8 (Trading Session Low Price – lowest index value).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of highest/lowest index generation.
273	MDEntryTime	Y	Time of highest/lowest index generation.
270	MDEntryPx	Y	Highest/lowest index value.

Periodically, BVMF generates the average value of each index in the current trading session, and it is reflected at the following entry type:

Tag number	Tag name	Required for this MDEntry	Description
279	MDUpdateAction	Y	0 (New).
269	MDEntryType	Y	9 (Trading Session Average Price – average index value).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MDEntryDate	Y	Date of average index publication.
273	MDEntryTime	Y	Time of average index publication.

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10.8 News

The News message is sent over the incremental stream and TCP replay to convey market information of BVMF market surveillance notifications. News message is available to all trade platforms: MEGA, GTS and GLOBEX.

Tag	Tag Name	Required for this MDEntry	Description
[Standard message header]			
42	OrigTime	N	Time of message origination (always expressed in UTC - Universal Time Coordinated, also known as "GMT")
6940	NewsSource	N	Source (Agency) of News.
1474	LanguageCode	N	Indicates the language the news is in. Represented by the two-letter ISO 639-1 standard identification. Absence of this field defaults to "pt" – Portuguese.
148	Headline	Y	The headline of a News message.
146	NoRelatedSym	N	Specifies the number of repeating symbols (instruments) specified.
55	Symbol	N	Composes the Instrument Identification Block.
48	SecurityID	N	Composes the Instrument Identification Block.
22	SecurityIDSource	N	Composes the Instrument Identification Block.
207	SecurityExchange	N	Composes the Instrument Identification Block.
215	NoRoutingIDs	N	Indicates the number of destinations of this message.
→ 216	RoutingType	Y	Indicates the type of <i>RoutingID</i> (217) specified. Values issued by BM&FBOVESPA: 2 = Target List.
→ 217	RoutingID	N	Assigned value used to identify a specific routing destination. Values issued by BM&FBOVESPA: "1" = Vendors "2" = Traders "3" = BM&FBOVESPA RSS feed "4" = BBMNet "5" = GLOBEX
33	NoLinesOfText	Y	Identifies number of lines of text body.
→ 58	Text	Y	Free format text string.
→ 354	EncodedTextLen	N	Length of EncodedText field.
→ 355	EncodedText	N	Encoded (non-ASCII characters) representation of the Text (58) field in the encoded format specified via the MessageEncoding (347) field.
149	URLLink	N	A URL (Uniform Resource Locator) link to additional information (e.g. http://www.bmf.com/news.html)

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11 Group phase/Instrument State Information

BVMF will relay the state of an individual instrument or a group of instrument using two messages:

- **MarketDataSnapshotFullRefresh (35=W)** message in the market recovery stream: used for initial setup of the instrument or instrument group upon client system startup;
- **SecurityStatus (35=f)** message: used to relay instrument state changes intraday.

When the client system starts up, it should consider that all snapshots contain the current state of the individual instrument. Intraday updates may be done on the instrument group level.

Please note: group codes may repeat amongst different exchanges, hence it is advisable that client systems use the key group code (*tag 1151 – SecurityGroup*) + exchange (*tag 207 – SecurityExchange*).

When processing the *SecurityStatus* message (*tag 35=f*), client systems must first look for tag *1151-SecurityGroup*. This tag contains the group identification of a set of instruments. That being the case, all individual instruments of that set will have their status changed to the value of tag *326-SecurityTradingStatus*. The following message example illustrates the change of instrument group “XX” to “trading”, with the trading phase set to “continuous trading”:

MsgType = f (SecurityStatus)		
Tag	Tag Name	Value
1151	SecurityGroup	XX
207	SecurityExchange	Exchange code
625	TradingSessionSubID	S
326	SecurityTradingStatus	17

If tag *1151-SecurityGroup* is not present in the message, then the instrument will be identified by tag *48-SecurityID*:

MsgType = f (SecurityStatus)		
Tag	Tag Name	Value
48	SecurityID	SECURITY_ID
22	SecurityIDSource	8
55	Symbol	SECURITY_SYMBOL
207	SecurityExchange	Exchange code
625	TradingSessionSubID	S
326	SecurityTradingStatus	17

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11.1 Possible Instrument States

BVMF will consolidate the state of its instruments into a new list of possible states, as indicated by the following table:

Tag 326 value
2 = Trading halt
5 = Price indication
16 = Trade dissemination time
17 = Ready to trade
18 = Not available for trading
20 = Unknown or invalid
21 = Pre-Open
24 = Pre-Cross
25 = Cross
26 = No-Cancel

11.2 Trading Phases

A trading phase is an ID to identify the state of a group in terms of trading session.

For example, group XX may be in trading phase *Continuous Trading* ("S"), but instrument ABCD that belongs to group XX is in the "*trading halt*" status – due to market surveillance command. This information is especially useful when client systems want to determine the state of the group altogether, and outlining the individual state of the instrument.

Trading phase information is relayed to client systems using tag 625–*TradingSessionSubID*.

For details on each trading phase, please refer to each market segment section further in this document.

11.3 Trading Statistics Reset

This is a type of flag in the *SecurityStatus* (tag 35=f) message that advice customer systems for a event of a end of day trading statistics reset. Represented by a presence of tag 1174 – *SecurityTradingEvent* with a value = 4 (Change of Trading Session).

On receipt of this message and flag, customer systems are expected to reset the following statistics:

- Trading Session High Price (MDEntryType=7)
- Trading Session Low Price (MDEntryType=8)
- Trading Session VWAP Price (MDEntryType=9)
- Trade Volume (MDEntryType=B and tag 1020)
- Opening Price (MDEntryType=4)

The above statistics will be reset in the market recovery stream on the upon receipt of message *SecurityStatus* (tag 35=f) with *SecurityTradingEvent* field (tag 1174) = 4 (Change of Trading Session).

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11.4 Group Phase and Instrument State in the Snapshot Messages

In the full market data recovery process, the current phase and/or state of given instrument is broadcast in the *MarketDataSnapshotFullRefresh (35=W)* message at the following format:

Tag number	Tag name	Required for this MEntry	Description
279	MDUpdateAction	Y	0 (New).
269	MEntryType	Y	c (SECURITY_TRADING_STATE_PHASE).
83	RptSeq	Y	Sequence number per instrument update.
55	Symbol	Y	Composes the Instrument Identification Block.
48	SecurityID	Y	Composes the Instrument Identification Block.
22	SecurityIDSource	Y	Composes the Instrument Identification Block.
207	SecurityExchange	Y	Composes the Instrument Identification Block.
272	MEntryDate	Y	Date of the event.
273	MEntryTime	Y	Time of the event.
625	TradingSessionSubID	Y	Group phase
326	SecurityTradingStatus	Y	Instrument state

12 Certification Process for FIX/FAST

Client system must certify against the FIX 5.0/FAST feed before being deployed in production. The certification process consists of:

- Establishing connectivity to the certification environment;
- Developing and testing against the certification environment feed;
- Once the client system is deemed ready for certification, the customer must schedule the certification process with BVMF's certification support team (e-mail ctc@bmfbovespa.com.br);
- Customer and BVMF will execute the certification script;
- If the client system correctly executes the certification script, it may proceed into production.

The certification script for the BVMF FIX/FAST feed is available at the following URL:

[TBD]

12.1 Connectivity to the Certification Environment

Client systems have different options of establishing connectivity to the certification environment. They are:

- Dedicated VPN over RCCF: in this case, a separate VPN with low QoS must be acquired by the customer, in order not to impact production data;
- Internet VPN: in this case, the customer must be able to configure a GRE tunnel with the exchange, to allow for multicast traffic to be sent.

For a detailed description of network connectivity options, please refer to the BVMF Network Connectivity Portfolio, available at the following URL:

[TBD]

13 BM&F Market Data Functionality

This section refers to the BM&F segment (derivatives) functionality only, and important technical information for BVMF customers on how to process this data.

13.1 Trade Volume

BVMF sends trade volume information for derivatives instruments as published by the Derivatives Clearing House. Client systems should expect volume information to be sent independently from trades, since the data is updated every 1 minute and not on a tick by tick basis.

13.2 Open Interest

[TBD]

13.3 Complimentary Last Calculation

[TBD]

13.4 Settlement Price

[TBD]

13.5 News Messages

News messages related to the derivatives markets will be sent in all incremental streams of all derivatives market data channels. These messages will be available for retransmission in the TCP replay functionality.

13.6 Trading Phases Supported by the BM&F Segment

13.6.1 Start of Day

Initial phase of the trading day. Allow client systems to prepare for the start of day. No client system intervention is allowed.

13.6.2 Pre-Opening

The timing of this phase is defined for each quotation group.

This is the first phase in which brokers may come in with offers that may only be executed in the following phase. Following parameters defined by BVMF, the system may or may not accept an offer.

The auction that occurs in the trading phase establishes the theoretical opening price. Order entry is allowed, however order cancellation or modification is not.

13.6.3 Continuous Trading

This trading phase encompasses the sending of orders, cancellations and modifications from client systems to the instruments of the instrument group. All regular trading rules are applicable.

13.6.4 End of Consultation

Pause at the end of the trading session. Only market operations actions are allowed. Order entry, cancellation and modification by exchange customers are not allowed.

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13.6.5 Surveillance Intervention

Phase dedicated to BVMF market surveillance to perform administrative action on the instrument group. Order entry is prohibited, cancellation and modification are allowed.

13.6.6 Close of Day

All open orders are cancelled. Order entry, cancellation and modification are not allowed.

13.6.7 Batch

Indicates the end of the trading date: causing the trading date to be incremented as per the exchange calendar. Typically, this applies at end of the calendar day to financial derivatives, and during the day for agricultural products. Order entry, cancellation and modification are not allowed.

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14 Bovespa Market Data Functionality

This section refers to the Bovespa segment (equities) functionality only, and important technical information for BVMF customers on how to process this data.

14.1 Spread Instruments Market Data

When trading spread instruments, client systems should expect two types of orders in the price-depth order book:

- *Calculated quantities*: quantities and prices that are “borrowed” from the legs order books
- *Combined order quantities*: orders that were actually sent for that spread instrument, and did not execute (and hence, available in the order book)

Client systems should not expect that tag 346 – *NumberOfOrders* – is sent to calculated quantities. This tag is sent to combined orders quantities.

14.2 Stock Indexes Market Data

BVMF will make available information on its stock indexes to customers in the Stock Index market data channel (channel 55).

The different stock indexes provided by the exchange can be listed at the exchange website, at:

<http://www.bovespa.com.br/indexi.asp>

Click on “Market” and then “Indices”.

14.2.1 Stock Index List and Index Portfolio

The instrument definition stream of Stock Index market data channel will provide the list of instruments that represent the indices provided by the exchange. Each of the instruments listed will contain the portfolio composition listed as underlying instruments of that index. Each instrument will contain the percentage of participation in the index.

Therefore, consider as an example the index IBOVESPA (BVMF index). Client systems should expect its definition in the Security List message, with all the instruments that compose the index as underlying and their percentage indicated in tag 6919 (*IndexPct*).

Take for example the following IBOVESPA index composition:

Code	Stock	Part. (%)
ALLL11	ALL AMER LAT	1.136
AMBV4	AMBEV	1.047
ARCZ6	ARACRUZ	1.147
BTOW3	B2W VAREJO	0.793
BVMF3	BMFBOVESPA	5.005
BBDC4	BRADESCO	3.741
BRAP4	BRADESPAR	1.060
BBAS3	BRASIL	2.597
BRTP4	BRASIL T PAR	0.275
BRTO4	BRASIL TELEC	0.310
BRKM5	BRASKEM	0.492
PRGA3	BRF FOODS	0.905
CCRO3	CCR RODOVIAS	0.596
CLSC6	CELESC	0.108

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CMIG4	CEMIG	1.405
CESP6	CESP	0.898
CGAS5	COMGAS	0.101
CPLE6	COPEL	0.631
CSAN3	COSAN	0.578
CPFE3	CPFL ENERGIA	0.441
CYRE3	CYRELA REALT	1.632
DURA4	DURATEX	0.565
ELET3	ELETROBRAS	0.874
ELET6	ELETROBRAS	0.781
ELPL6	ELETROPAULO	0.744
EMBR3	EMBRAER	0.557
GFA3	GAFISA	1.112
GGBR4	GERDAU	4.257
GOAU4	GERDAU MET	1.093
GOLL4	GOL	1.102
ITSA4	ITAUSA	2.257
ITUB4	ITAUUNIBANCO	5.742
JBS3	JBS	0.684
KLBN4	KLABIN S/A	0.316
LIGT3	LIGHT S/A	0.195
LAME4	LOJAS AMERIC	1.045
LREN3	LOJAS RENNER	0.931
NATU3	NATURA	0.610
NETC4	NET	0.734
BNCA3	NOSSA CAIXA	0.350
PCAR5	P,ACUCAR-CBD	0.559
PETR3	PETROBRAS	3.186
PETR4	PETROBRAS	16.008
RD3	REDECARD	1.032
RSID3	ROSSI RESID	0.706
S3	SABESP	0.360
SDIA4	SADIA S/A	1.292
CSNA3	SID NACIONAL	3.479
CRUZ3	SOUZA CRUZ	0.608
TAMM4	TAM S/A	0.871
TNLP3	TELEMAR	0.239
TNLP4	TELEMAR	0.718
TMAR5	TELEMAR N L	0.243
TLPP4	TELESP	0.155
TCSL3	TIM PART S/A	0.118
TCSL4	TIM PART S/A	0.761
TRPL4	TRAN PAULIST	0.368
UGPA4	ULTRAPAR	0.409
USIM3	USIMINAS	0.816
USIM5	USIMINAS	3.406
VCPA4	V C P	0.717
VALE3	VALE	3.075
VALE5	VALE	11.240
VIVO4	VIVO	0.789

Client systems should expect a Security List message in the Stock Index market data channel with the following relevant tags:

In the Instrument Identification Block:

SecurityID, Symbol = IBOVESPA

SecurityIDSource = 8

SecurityExchange = XBSP

In the NoUnderlyings repeating group:

First instance:

UnderlyingSymbol, UnderlyingSecurityID = ALLL11

UnderlyingSecurityIDSource = 8

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UnderlyingSecurityExchange = XBSP
IndexPct = 1.136

Second instance:

UnderlyingSymbol, UnderlyingSecurityID = AMBV4
UnderlyingSecurityIDSource = 8
UnderlyingSecurityExchange = XBSP
IndexPct = 1.047

Third instance:

UnderlyingSymbol, UnderlyingSecurityID = ARCZ6
UnderlyingSecurityIDSource = 8
UnderlyingSecurityExchange = XBSP
IndexPct = 1.147

And so on until the last instance, containing security VIVO4.

14.2.2 Stock Index Statistical Data

Stock index statistical data is composed of:

- Opening price
- Trading session high price
- Trading session low price
- Current value
- Average value
- Closing price

Client systems will receive this data every 30 seconds for all indexes, as published by the exchange.

The statistical data is sent in the snapshot message (*tag 35=W*) in the market recovery stream and incremental message (*tag 35=X*) in the incremental stream.

The incremental and snapshot messages are composed of all statistical data for that index, separated by entry type (*tag 269*). Client systems should expect field *MDUpdateAction* (*tag 279*) = 0 (New) for the incremental messages in this channel. A typical message containing index information is as follows:

Field name	Field number = value
<i>MDEntryType</i>	279 = 3 (index value)
<i>MDEntryDate</i>	272=20091217 (date of index generation)
<i>MDEntryTime</i>	273=(time of the index generation)
<i>MDEntryPx</i>	270=68000 (current value of the index)
<i>TotTradedSecurities</i>	9989=(number of quoted securities in the index)
<i>TickDirection</i>	274=(index change direction – up, down or unchanged)
<i>PercentageVar</i>	7687=(index variation in percentage, from start of day)
<i>PrevYearVariation</i>	9993=(index variation in percentage, compared to previous year last index)
<i>CapitalPct</i>	9990=(capitalization percentage of active securities in the index)

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<i>NoFallingSecurities</i>	9996=(number of index underlying securities falling in price)
<i>NoRisingSecurities</i>	9997=(number of index underlying securities rising in price)
<i>NoUnchangedSecurities</i>	9343=(number of index underlying securities with no variation)
<i>NoNotTradedSecurities</i>	9344=(number of index underlying securities that are not quoted)
MDEntryType	279=4 (opening price, first index of the day)
<i>MDEntryDate</i>	272=20091217 (date of first index)
<i>MDEntryTime</i>	273=(time of the first index)
<i>MDEntryPx</i>	270=66000
MDEntryType	279=7 (high price, highest index of the day)
<i>MDEntryDate</i>	272=20091217 (date of highest index)
<i>MDEntryTime</i>	273=(time of the highest index)
<i>MDEntryPx</i>	270=69000
MDEntryType	279=8 (lowest price, lowest index of the day)
<i>MDEntryDate</i>	272=20091217 (date of lowest index)
<i>MDEntryTime</i>	273=(time of the lowest index)
<i>MDEntryPx</i>	270=66000
MDEntryType	279=6 (settlement price, settlement index for futures)
<i>MDEntryDate</i>	272=20091217 (date of settlement index)
<i>MDEntryTime</i>	273=(time of the settlement index)
<i>MDEntryPx</i>	270=69000
MDEntryType	279=9 (average price)
<i>MDEntryDate</i>	272=20091217 (date of average index calculation)
<i>MDEntryTime</i>	273=(time of the average index calculation)
<i>MDEntryPx</i>	270=68654

14.3 News messages

BVMF will broadcast all news related to the Bovespa segment, OTC markets and CBLC (Brazilian Clearing and Depository Corporation), the main products and services of these institutions, plus data on transactions, indices and a range of information on the market and listed companies. Each news message will be published on the incremental stream of all market data channels.

14.4 Trading Phases Supported by the Bovespa Segment

14.4.1 Start of Day

This is the first phase of the day, and applies to all instrument groups. The aim is to allow users' systems to update by processing messages produced automatically by the system (for instance, preparing data for a stock after distribution of dividends). No intervention by brokers is allowed during this phase.

14.4.2 Preparing Quotation Groups

The timing of this phase is defined for each quotation group, and will be used by BOVESPA to audit the situation of the quotation system and for any interventions (canceling offers of a stock or a broker, if necessary). The system is not yet available for intervention by brokers.

14.4.3 Pre-Opening

The timing of this phase is defined for each quotation group.

This is the first phase in which brokers may come in with offers that may only be executed in the following phase. Following parameters defined by BVMF, the system may or may not accept an offer. Furthermore, in the case of acceptance of offers, in all cases following BVMF recommendations, the system will reject or accept the latter to build a theoretical price.

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14.4.4 Opening

The timing of this phase is defined for each instrument group. During this phase, depending on the definitions for the groups, opening trades will take place.

14.4.5 Continuous Trading

The timing of this phase is defined for each instrument group. During this phase, offers, statements of trades or trades against previously registered offers will be introduced.

14.4.6 Pre-Closing

When a stock in a group is in a prolonged fixing, the group does not go on directly to the state of surveillance intervention, but to Pre-closing, in which the entry of offers is the same as during Pre-opening.

14.4.7 Surveillance Intervention

The timing of this phase is defined for each instrument group. This phase is for surveillance interventions (corrections, for instance).

14.4.8 After-Market

Only shares with a base price established in the regular trading phase and belonging to markets authorized by the Exchange may be traded during this phase.

14.4.9 Close of Day

During this phase, no intervention is possible, since it is the end of activities.

14.4.10 Batch

This phase is for batch update operations and maintenance of the MegaBolsa system. For instance, during this phase, the system processes creations, cancellation, or modifications of stocks, as well as indications of distribution of dividends for the following day.

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15 CME Group Market Data Functionality

BVMF will broadcast CMEG market data as per the conditions of the CME Group – BM&FBOVESPA order routing agreement. For more details on the agreement, please visit the website at:

http://www.cmegroup-bmfbovespa.com.br/index_eng.asp

This section describes the functionality available from the CMEG market data feed and important technical information for BVMF customers on how to process this data.

15.1 Instrument Identification

GLOBEX instruments will be disseminated to BVMF customers using the Security List message. The list of instruments is received on the appropriate market data channel, in the instrument definition stream.

The listing of GLOBEX products impacts the following fields in the Security List message:

SecurityList message (MsgType=y)		
Field name	Field number	Description
PriceType	423	Will include support for CBOT fractional pricing, i.e. indicates if a product trades in halves, thirty-seconds, etc. The domain of this field is expanded to accommodate the following values: 12 – Product ticks in full ticks 13 – Product ticks in halves 14 – Product ticks in fourths 15 – Product ticks in eighths 16 – Product ticks in sixteenths 17 – Product ticks in thirty-seconds 18 – Product ticks in sixty-fourths 20 – Product ticks in half thirty-seconds 21 – Product ticks in quarter thirty-seconds 22 – Product ticks in half sixty-fourths
MinPriceIncrement	969	Will contain different tick sizes than the ones regularly specified by GTS to support CBOT fractional prices.
SecurityID	48	Will list the GLOBEX instrument's code, prefixed with "US:".
Symbol	55	Will list the GLOBEX instrument's ticker symbol, prefixed with "US:".
SecurityGroup	1151	Will list GLOBEX group codes.
SecurityExchange	207	The following values are available: XCME = for CME products XCBT = for CBOT products
NoSecurityAltID	454	This repeating group is not available for GLOBEX instruments.

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15.2 Book Depths Available

GLOBEX order books are price-depth, with depth varying on the product: 5 or 10 deep for futures, 1 or 3 deep for options.

Note: Order-depth book is not available for GLOBEX products.

15.3 News Messages

News issued by GLOBEX can be received by BM&FBOVESPA clients, in the incremental stream of the appropriate market data channel.

15.4 Price Banding of CMEG Products

GLOBEX instruments have two types of price bands:

- Static price limits: which establish oscillation limits for a given instrument. These limits establish a low and high price for an instrument. BVMF will broadcast these price bands using the *PriceLimits* component of the Market Data Update Report message;
- Price bands: which establish price limits for errant price orders before acceptance into GLOBEX. This price range is typically narrower than the static price limits, and fluctuates according to the last sale price.

Price bands are listed at the CME Group's website at:
<http://www.cmegroup.com/GLOBEX/files/PriceBanding.pdf>.

15.5 Closing Prices

GLOBEX will only issue opening/closing prices in incremental messages (35=X), not on snapshot messages (35=W). BVMF may not publish the opening/closing price in the snapshot message if not provided by GLOBEX.

15.6 Quantity of the Last Trade in Snapshots

GLOBEX disseminates only the price of the last trade in the snapshot message, without quantity. BVMF will publish this quantity as zero (tag *MDEntrySize* = 0); in case of recovery or start of day, the customer should expect this value.

15.7 CBOT Fractional Pricing

Some CBOT instruments are traded using fractional prices. BVMF will relay price format information for its clients in field *PriceType* (tag 423) in the Security List message, and it is the client's responsibility to display the prices in an appropriate format if desired. However, fractional prices may also be displayed in decimal format.

The following table illustrates the decimal tick representation of its correspondent fractional pricing:

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Fractional Tick	PriceType (tag 423)	Decimal Tick Size (tag 969 – MinPriceIncrement)
Full ticks (1)	12	1
Half ticks (1/2)	13	0.5
Fourths (1/4)	14	0.25
Eighths (1/8)	15	0.125
Sixteenths (1/16)	16	0.0625
Thirty-seconds (1/32)	17	0.03125
Sixty-fourths (1/64)	18	0.015625
Half thirty-seconds (0.5/32)	20	0.015625
Quarter thirty-seconds (0.25/32)	21	0.0078125
Half sixty-fourths (0.5/64)	22	0.0078125

15.7.1 Converting Decimal Prices to Fractional Representation

The order book for products that trade in fractions will be distributed in decimal format, as it is received by GLOBEX. For converting those values to fractional representation, BVMF customers need to take fields *PriceType* (423) and *TickSizeDenominator* (5151). The conversion rule is:

- Take the decimal part of the price;
- Multiply it by the denominator of the fractional price representation – available in field *PriceType*;
- Apply the number of decimals viewable – available in field *TickSizeDenominator*;

The following examples illustrate this conversion:

30 Yr Bonds FUTURE, PriceType=17 (1/32s), TickSizeDenominator=0.01	
Original decimal price	115.28125
Fractional part after conversion	9 (.28125 x 32)
Integer part and fractional part	115 09
Apply 02 decimal positions (0.01)	115 09 ^^ 0.01 (Display places)
Resulting formatted price	115'09 (115 and 9/32s)

10 Yr Note FUTURE, PriceType=20 (0.5/32s), TickSizeDenominator=0.001	
Original decimal price	112.625
Fractional part after conversion	20 (.625 x 32)
Integer part and fractional part	112 20
Apply 03 decimal positions (0.001)	112 20

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	^^^
	0.001 (Display places)
Resulting formatted price	112'200 (112 and 200 0.5/32s)

2 Yr Note FUTURE, PriceType=20 (0.21/32s), TickSizeDenominator=0.001	
Original decimal price	104.8828125
Fractional part after conversion	28.25 (.8828125 x 32)
Integer part and fractional part	104 2825
Apply 03 decimal positions (0.001)	104 2825
	^^^
	0.001 (Display places)
Resulting formatted price	104'282 (104 and 282 0.25/32s)

Special case:

For the specific case of *TickSizeDenominator* = 0.1 and *PriceType* = 13, the conversion of the fractional part must be done using *TickSizeDenominator* = 0.

30-Day Fed Funds Options, PriceType=13 (1/2s), TickSizeDenominator=0.1	
Original decimal price	22.5
Fractional part after conversion	0 (0.5 x 0) → note the special case
Integer part and fractional part	22 0
Apply 01 decimal positions (0.1)	22 0
	^^^
	0.1 (Display places)
Resulting formatted price	22' 0 (22)

For more details on CBOT fractional pricing please contact CMEG's GAM (GLOBEX Account Management).

15.8 Variable Tick Table (VTT)

Since BVMF does not provision support for Variable Tick Table, for GLOBEX instruments that trade using the variable tick table always the smallest tick possible for that instrument will be sent in the Security List message. The trader may enter a different tick depending on the last sale price.

For more information on the Variable Tick Table, please see the documentation at the file <http://www.cmegroup.com/GLOBEX/files/SDKMDPCore.pdf>.

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15.9 Implied Quantities

GLOBEX implied quantities will not be supported for this first release. Instead, BVMF will aggregate both the implied and best quantities into the price point they are stated – therefore customers are able to visualize the full liquidity of GLOBEX order books, but will not be able to differentiate between implied and best quantities. The following example illustrates this:

Example 1:

GLOBEX price-depth book for CMEG Future Instrument

Implied Bid Qty	Bid Qty	Bid Price	Offer Price	Offer Qty	Implied Offer Qty
2000		10.58	11.03	1000	
3000	4000	10.57	11.04	2000	2000
	3000	10.54	11.05	7000	4000
500	4000	10.53	11.06	10000	1000
	6000	10.52	11.07	1000	
4000		10.51	11.08		5000
	7000	10.50			
1000		10.49			

BVMF price-depth book for CMEG Future Instrument

Bid Qty	Bid Price	Offer Price	Offer Qty
2000	10.58	11.03	1000
7000	10.57	11.04	4000
3000	10.54	11.05	11000
4500	10.53	11.06	11000
6000	10.52	11.07	1000

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16 BVMF RLC for Equities to FIX/FAST Mapping

This chapter describes the mapping at field level between BVMF RLC messages for Equities (former Bovespa RLC V800) to the new FIX/FAST messages.

For more information about RLC Message Specification, please request BVMF “**Information_Signal v.5.7.0.0**” and “**NSC V800 Series RLC Message Specifications**” from BVMF Control Center.

Each RLC message will or will not generate only one *MarketDataIncrementalRefresh* (tag 35=X).

Note: Until specified, all FIX fields are mapped to RLC fields described at document: “**Information_Signal v.5.7.0.0**”. Please contact BVMF Control Center for updated documents.

16.1 RLC-01 – Opening Trade

Resulted Market Data Incremental refresh repeating groups:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New)
269	MDEntryType		2 (Trade).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Trade	Date of the event.
273	MDEntryTime	Time of Trade	Time of the event.
1003	TradeID	Trade Number	Numerical sequence: unique per instrument and trading session.
277	TradeCondition	Cross Indicator and Indicator End of Trades at Opening Price and Origin of trade	Space delimited list of conditions describing a trade. Possible values: R=Opening Price is always present. L=If Last Trade at the Same Price Indicator = 1 at RLC message. 9=Trade entered from market surveillance (from Origin of trade).
270	MDEntryPx	Trade Price	Price of trade.
271	MDEntrySize	Quantity traded	Quantity of trade.
425	DayCumQty	Quantity securities traded – Accumulated in day	Total traded quantity of the trading day.

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Tag	Tag Name	Equivalent RLC field	Description
288	MDEntryBuyer	Identification of Buyer Broker	Buying party in a trade.
289	MDEntrySeller	Identification of Seller Broker	Selling party in a trade.
274	TickDirection	Indicator of variation in relation to previous price	Direction of the tick. If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick
451	NetChgPrevDay	Variation in relation to previous day's closing price	Net change from previous day's closing price versus last traded price.

Generate the following *MDEntries*: 7 (Session high price) and 8 (Session low price):

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New)
269	MDEntryType		7 (Session high price) or 8 (Session low price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
270	MDEntryPx	Highest Price Quoted on the day or Lowest Price Quoted on the day	Price of Market Data Entry.

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16.2 RLC-02 – Trade

Resulting *MarketDataIncrementalRefresh* repeating groups:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction	Type of Registration	0 (New) or 2 (Delete). The value will be 2 (Delete) when Value = "00" and 0 (New) when Value = "07".
269	MDEntryType		2 (Trade).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date trade took place	Date of the event.
273	MDEntryTime	Time trade took place	Time of the event.
1003	TradeID	Trade Number	Numerical sequence: unique per instrument and trading session.
277	TradeCondition	Cross Indicator and Origin of trade	Space delimited list of conditions describing a trade. Possible values: X=Crossed if the opening trade is originated from a cross order. L=If Last Trade at the Same Price Indicator = 1 at RLC message. 9=Trade entered from market surveillance (from Origin of trade).
270	MDEntryPx	Trade Price	Price of trade.
271	MDEntrySize	Quantity traded	Quantity of trade.
425	DayCumQty	Quantity securities traded – Accumulated in day	Total traded quantity of the trading day.
288	MDEntryBuyer	Identification of Buyer Broker	Buying party in a trade.
289	MDEntrySeller	Identification of Seller Broker	Selling party in a trade.
274	TickDirection	Indicator of variation in relation to previous price	Direction of the tick. If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick

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Tag	Tag Name	Equivalent RLC field	Description
451	NetChgPrevDay	Variation in relation to previous day's closing price	Net change from previous day's closing price versus last traded price.
63	SettlType	Period for settlement – in days	Indicates order settlement period (for forward market) using the following convention: Dx = FX tenor expression for "days", e.g. "D5", where "x" is any integer > 0.

Generate *MDEntryTypes*: 7 (Session high price) and/or 8 (Session low price), only if the current price (high or low) is changed from the old one:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New)
269	MDEntryType		7 (Session high price), 8 (Session low price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
270	MDEntryPx	Highest Price Quoted on the Day or Lowest Price Quoted on the Day	Price of Market Data Entry.

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16.3 RLC-03 – Price

The MDEntryType of FIX repeating group will depend on the value of RLC-03 “Price Type” field. The table below shows the relationship between RCL-03 “Price Type” field and the FIX MDEntryType that will be generated:

Price type	MDEntryType
30 – First trade price modification	4 – Opening Price
31 – Highest trade price modification	7 – Session High Price
32 – Lowest trade price modification	8 – Session Low Price
32 – Last price modification	2 – Trade
34 – Previous day(s) closing price modification	5 – Closing Price

If **Price type** = First trade price modification (30), the following FIX repeating group is generated:

Tag	Tag Name	Equivalent RLC field	Description
279	MUpdateAction		0 (New).
269	MDEntryType		4 (opening price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
270	MDEntryPx	Last Price of the Day	Opening Price.
274	TickDirection	Indicator of variation in relation to previous price	Direction of the tick. If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick
451	NetChgPrevDay	Variation in relation to previous day's closing price	Net change from previous day's closing price versus last traded price.

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If **Price type** = Highest trade price modification (31), the following FIX repeating group is generated:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New)
269	MDEntryType		7 (Session high price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
270	MDEntryPx	Highest Price Quoted	Price of Market Data Entry.

If **Price type** = Lowest trade price modification (32), the following FIX repeating group is generated:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New)
269	MDEntryType		8 (Session Low Price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at	Time of the event.

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Tag	Tag Name	Equivalent RLC field	Description
		Functional Header	
270	MDEntryPx	Lowest Price Quoted	Price of Market Data Entry.

If **Price type** = Last price modification (33), the following FIX repeating group is generated:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction	Type of Registration	0 (New).
269	MDEntryType		2 (Trade).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
277	TradeCondition		Space delimited list of conditions describing a trade. Possible value: U = Exchange Last.
270	MDEntryPx	Last Price of the Day	Price of last trade.
274	TickDirection	Indicator of variation in relation to previous price	Direction of the tick. If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick
451	NetChgPrevDay	Variation in relation to previous day's closing price	Net change from previous day's closing price versus last traded price.

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If **Price type** = Previous day(s) closing price modification (34), the following FIX repeating group is generated:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New)
269	MDEntryType		5 (Closing Price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
270	MDEntryPx	Last Price of the Day	Price of Market Data Entry.

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16.4 RLC-05 – Instrument State Change

Indicate a change in the state of an instrument. The FIX message generated from this RLC message is a *SecurityStatus* (tag 35=f) and follows this mapping:

Tag	Tag Name	Equivalent RLC field	Comment
[Standard message header]			
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
326	SecurityTradingStatus	Trading status of the stock, Status of stock and Stock type	Values sent by BVMF:
			2 = Trading halt
			5 = Price Indication
			16 = Trade dissemination time
			17 = Ready to trade
			18 = Not available for trading
			20 = Unknown or invalid
342	TradSesOpenTime	Opening Time	Estimated end of the current auction. Included only if SecurityTradingStatus is 16 (Trade dissemination time).
[Standard message trailer]			

The following table illustrates the mappings from their original values on fields: **Trading status of stock**, **Status of stock** and **Stock type** to tag 326-*SecurityTradingStatus*.

Trading status of stock	Status of stock	Stock type	FIX 5.0 value – tag 326 SecurityTradingStatus	Description
-	S	-	2	Security suspended
-	G	-	2	Security frozen
-	-	I	18	Security suspended (no order entry)
H, B, P, R	R	-	5	Security in auction
-	[SPACE]	Other than "I"	17	Trading
-	-	R, P	16	Trading dissemination time – show time scheduled for security re-open

The dash “-” indicates the field value should be ignored.

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16.5 RLC-16 – Group State Change

Indicate a change in the state of an instrument group. The FIX message generated from this RLC message is a *SecurityStatus* (tag 35=f) and follows this mapping:

Tag	Tag Name	Equivalent RLC field	Comment
[Standard message header]			
1151	SecurityGroup	Quotation Group Code	The instrument group that is changing trading phase.
625	TradingSessionSubID	Quotation Group Condition	Identifier for the trading phase. Possible values: C – Preparatory phase P - Pre-opening / Pre-closing phase O - Opening phase E – Promoter intervention phase S – Trading phase R – After-market trading phase N - Surveillance Intervention / Continuous trading for forward market F – End-day consultation phase I - Forbidden Z – Interrupted B – Night processing phase
[Standard message trailer]			

The following trading phases may be mapped from their original values of field **Quotation Group Condition**:

Quotation Group Condition value	FIX 5.0 value – tag 625 TradingSessionSubID	Description
C	C	Preparatory phase
P	P	Pre-opening / Pre-closing phase
O	O	Opening phase
E	E	Promoter intervention phase
S	S	Trading phase
R	R	After-market trading phase
N	N	Surveillance Intervention / Continuous trading for forward market.
F	F	End-day consultation phase
I	I	Forbidden
Z	Z	Interrupted
B	B	Night processing phase

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16.6 RLC-30 – Theoretical Opening Price

Indicate an instrument's Theoretical Opening Price, or Theoretical Opening Price (TOP) (also known as an Indicative Opening Price, or IOP): what the trading price would be if the instrument were to open at the moment when the calculation was made.

A Theoretical Opening message is transmitted if the theoretical price or if any datum of the message (except the variation) varies.

If the theoretical price remain undetermined, but the reason for this indetermination changes, then a Theoretical Opening message is sent.

Here are the FIX tags normally sent for this type of Market Data Entry repeating group:

Tag	Tag Name	Equivalent RLC field	Comment
279	MDUpdateAction		0 (New) or 2 (Delete).
269	MDEntryType		4 (opening price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
270	MDEntryPx	Theoretical Opening Price	Price of of Theoretical Opening. It is not presented in the message when <i>MDUpdateAction=2</i> (Delete).
271	MDEntrySize	Theoretical quantity traded	Quantity of Theoretical Opening. It is not presented in the message when <i>MDUpdateAction=2</i> (Delete).
286	OpenCloseSettlFlag		Value = 5 – Theoretical Price.

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16.7 RLC-32 – Opening Summary

Summarize an instrument's opening trades.

The Opening Summary message is sent after an instrument opening (fixing) that has been traded to summarize the opening (fixing), or if the first trade(s) occurred during continuous trading.

Here are the FIX tags normally sent for this type of Market Data Entry repeating group:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New).
269	MDEntryType		4 (opening price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
270	MDEntryPx	First Price	Opening Price.
271	MDEntrySize	Accumulated quantity	Total traded quantity of all trade that compose the opening.
274	TickDirection	Indicator of variation in relation to previous price	Direction of the tick. If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick
451	NetChgPrevDay	Variation in relation to previous day's closing price	Net change from previous day's closing price versus last traded price.

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Generate *MDEntryTypes*: 7 (Session high price) and/or 8 (Session low price), only if the current price (high or low) is changed from the old one:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New)
269	MDEntryType		7 (Session high price), 8 (Session low price).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of Event at Functional Header	Time of the event.
270	MDEntryPx	Best Price or Lowest Price	Price of Market Data Entry.

16.8 RLC-62 – Deletion of Instrument Characteristics

Indicates that the instrument about which the message is being sent has been modified with effect from D+1. The change renders invalid from D+1 the characteristics for this instrument.

The modification affects one or more data items contained in the RLC-62 – Deletion of Instrument Characteristics, such as instrument characteristics, and/or the name of the issuer, and/or the characteristics of the listed security about which the message is being sent, and/or the prepared item Type of Corporate Event Causing Instrument Modification on D+1.

The message contains the characteristics that are valid on day D. The RLC message header contains the switching criteria that are valid on day D.

This message type is used to indicate to the systems that managed the instrument prior to implementation of the corporate event that they may have to delete it from their local reference database.

A corporate event that causes the switching criterion to be modified can mean that the instrument concerned is removed from a given local reference database and created in another database (e.g. if the instrument changes instrument group).

Dependency on other messages:

- If for a given receiving application, this message is sent with a RLC-63 – Creation of Instrument Characteristics message for the same listed security, it means that the listed security has been modified. However, it is still relevant to the application since it continues to belong to a pair (RLC group and sub-group) that is requested by the receiving application.
- If RLC-62 – Deletion of Instrument Characteristics is not accompanied by RLC-63 – Creation of Instrument Characteristics, it means that the listed security has been modified and that it is no longer relevant to the receiving application (it can therefore be deleted from the application's local reference database).

The FIX tags normally sent for this type of message (*SecurityList*) is the same as described at RLC-63 – Creation of Instrument Characteristics with tag *980-SecurityUpdateAction* set to "D" (Delete).

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16.9 RLC-63 – Creation of Instrument Characteristics

Indicates one of the following:

- The creation of a listed security that is relevant to the receiving application, with effect from D+1, or
- The modification of the listed security mentioned in the message, with effect from D+1. The modification affects at least one of the data items contained in message RLC-62 – Deletion of Instrument Characteristics.

The message contains characteristics that are valid on D+1. The RLC message header contains the switching criteria that are valid on D+1.

Dependency on other messages

If, for a given receiving application (taking into account the parameters of the message switching engine in relation to the receiving application) this message is accompanied by a RLC-62 – Deletion of Instrument Characteristics for the same listed security, it means that the listed security has been modified but is still relevant to the application. If this message is not accompanied by a Delete Instrument Characteristics message, it means that the listed security has been created, or is being added to the listed securities that are relevant to the application (it can therefore be created in the application's local reference database).

Here are the FIX tags normally sent for this type of message (*SecurityList*):

* - please the FIX field is mapped to RLC field described at document: "NSC V800 Series RLC Message Specifications".

Tag	Tag name	Equivalent RLC field	Comment
393	TotNoRelatedSym		Total number of securities available in the channel.
893	LastFragment		Indicates whether this message is the last in the sequence of messages. Valid values: Y = Last message N = Not last message
146	NoRelatedSym		Specifies the number of repeating instruments specified.
→ 55	Symbol	Instrument ID at RLC Header type 1	NSC code identifying the instrument and the market segment it is traded on.
→ 48	SecurityID	Instrument ID at RLC Header type 1	NSC code identifying the instrument and the market segment it is traded on.
→ 22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
→ 207	SecurityExchange		Value issued by BVMF for equities = XBSP
→ 454	NoSecurityAltID		If ISIN code exists, value = 1.
→ → 455	SecurityAltID	Product ISIN Code	Product ISIN Code.
→ → 456	SecurityAltIDSource		Identifies class or source of the <i>SecurityAltID</i> (455) value. Required if <i>SecurityAltID</i> is specified.

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Tag	Tag name	Equivalent RLC field	Comment	
			Values issued by BVMF: 4 = ISIN number	
→	711	NoUnderlyings	Number of underlying instruments. Conditionally required if <i>NoUnderlyings</i> > 0.	
→	→	311	UnderlyingSymbol	Underlying ISIN Code Underlying instrument's ticker symbol. Conditionally required if <i>NoUnderlyings</i> > 0.
→	→	309	UnderlyingSecurityID	Underlying ISIN Code Underlying instrument's security identifier. Conditionally required if <i>NoUnderlyings</i> > 0.
→	→	305	UnderlyingSecurityID Source	Qualifiers for underlying instrument's security ID. Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification). Conditionally required if <i>NoUnderlyings</i> > 0.
→	→	308	UnderlyingSecurityExchange	Underlying instrument's exchange. Value issued by BVMF for equities = XBSP Conditionally required if <i>NoUnderlyings</i> > 0.
→	980	SecurityUpdateAction	Valid value: A=Add (for RLC-63) D=Delete (for RLC-62) Required only from incremental source.	
→	561	RoundLot	Lot Size The trading lot size of the security.	
→	969	MinPriceIncrement	Fixed Price Tick/Amount Number of minimum tick increments.	
→	5151	TickSizeDenominator	Fixed Price Tick/Decimal Point Locator Number of decimals used for pricing this instrument, e.g. price = 0,001, decimals = 3.	
→	9749	MinOrderQty	Minimum Order Quantity Minimum quantity of an order for the security.	
→	9748	MaxOrderQty	Maximum Order Quantity Maximum quantity of an order for the security.	
→	15	Currency	Trading Currency Currency used for the price.	
→	167	SecurityType	NSC Market Segment Values accepted by BVMF: - CS (common stock) - PS (preferred stock) - FUT (future) - OPT (option) - SPOT (spot market) - SOPT (spot options) - FOPT (future options) - DTERM (forward markets, or "termo")	
→	460	Product	Product associated with this instrument. Values issues by BVMF: 5 – Equity	
→	107	SecurityDesc	Long Instrument Name Descriptive string of the security (e.g. "dollar futures" or "gold futures").	
→	541	MaturityDate	Date & Time at which Date of instrument maturity.	

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Tag	Tag name	Equivalent RLC field	Comment
		Trading Ends	
→ 200	MaturityMonthYear	Date & Time at which Trading Ends	Month and year of the maturity (for futures and options).
→ 202	StrikePrice	Strike Price for Derivative / Amount	Strike price of option.
→ 947	StrikeCurrency	Strike Price Currency	Currency of option's strike price.
→ 231	ContractMultiplier	Price Expression	Specifies the ratio or multiply factor to convert from "nominal" units (e.g. contracts) to total units (e.g. shares) (e.g. 1.0, 100, 1000, etc).
→ 667	ContractSettlMonth		Specifies when the contract will settle.
→ 461	CFICode	Instrument Category	Classification of Financial Instruments (CFI code) values, which indicate the type of security using the ISO 10962 standard.
→ 470	CountryOfIssue	Issuer Country	ISO country code of instrument issue.
→ 873	DatedDate	First Trading Day	The date of the security activation, if different from the <i>IssueDate</i> .
→ 63	SettlType	Settlement Delay Type	Indicates order settlement period. If present, <i>SettlDate</i> (64) overrides this field. If both <i>SettlType</i> (63) and <i>SettlDate</i> (64) are omitted, the default for <i>SettlType</i> (63) is 0 (Regular).
→ 423	PriceType	Fixed Price Tick and Index of Variable Price Ticks	See the FIX specification for more details.
→ 6938	SecurityValidityTimestamp	Date & Time at which Trading Ends	Indicates the UTC timestamp when trading for this security expires, i.e. when it is not eligible to trade anymore. Different from <i>MaturityDate</i> .
→ 1151	SecurityGroup	Group ID	Indicates the group this instrument belongs to.

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16.10 RLC-S3 – Market Sheet

This message, which is sent by NSC, indicates the creation or modification of an order for an instrument. It is also used when the Market Sheet is rebroadcast. The deletion of an order is indicated via a RLC-S4 – Delete-N-Lines message. This processing concerns any order type except Stop orders. Indeed, Stop orders are not broadcast to the market participants until their triggering.

This message enables the market participant to consult the full market depth.

The Market Sheet Action Code defines whether the order is to be added or updated.

The order identification (Subscriber ID, Order Entry Date and Order Sequence Number) and characteristics (Order Side, Price Entered, Displayed Price, Displayed Quantity of Order, Remaining Quantity of Order, type of clearing account Order Origin, Order Technical Origin, Type of Limit for an Order, Order Timestamp for priority) are also provided.

The following FIX tags are normally sent for an order-depth book update:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction	Action type	Action code=C => MDUpdateAction=0 (New) Action code=M => MDUpdateAction=1 (Change) Action code=R => MDUpdateAction=0 (New).
269	MDEntryType	Direction of Offer	0 (Bid) or 1 (Offer).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Order Timestamp	Date of the event.
273	MDEntryTime	Order Timestamp	Time of the event.
290	MDEntryPositionNo	Type of price registered + Registered Offer Price + Order Timestamp	Position in the book to insert/update.
270	MDEntryPx	Registered Offer Price	Price of order. If MDUpdateAction = 2 (delete), this field is absent. If Type of price = [O or X], price may be absent too. Otherwise, this is a required field.
271	MDEntrySize	Quantity shown	Quantity of order. If MDUpdateAction = 2 (delete), this field is absent. Otherwise, this is a required field.
37	OrderID	Sequential number of	Represents an order. It is unique per broker firm, per instrument, per trading date.

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Tag	Tag Name	Equivalent RLC field	Description
		Offer	
288	MDEntryBuyer	Broker Identification	Present if <i>MDEntryType</i> = 0 (Bid). It is the buyer broker firm.
289	MDEntrySeller	Broker Identification	Present if <i>MDEntryType</i> = 1 (Offer). It is the seller broker firm.

16.11 RLC-S4 – Delete N Lines

This message, which is sent by NSC, indicates the deletion of an order for an instrument. This processing concerns any order type except Stop orders. Indeed, Stop orders are not broadcast to the market participants until their triggering, thus it is not necessary to broadcast a Delete-N-Lines message in case of Stop order deletion.

This message makes it possible for the market participants to realign their order book by indicating orders that should be deleted.

Three types of deletion are possible (Deletion Type):

Type 1: deletion of an order

Type 2: deletion of all orders for a given side (buy or sell) starting with the referenced order

Type 3: deletion of all orders for the instrument

The referenced order identification (**Offer Date** + **Broker Identification** + **Sequential number of Offer**) and **Direction of Offer** are provided to allow client systems to process the deletion in the market sheet (book) effectively.

The following FIX tags are normally sent for an order-depth book deletion:

Tag	Tag Name	Equivalent RLC field	Description
279	MDUpdateAction	Indication of type of cancellation	If type of cancellation =1 => 2 (Delete); If type of cancellation =2 => 4 (Delete From); If type of cancellation =3 => 3 (Delete Thru) with <i>MDEntryPositionNo</i> = 1;
269	MDEntryType	Direction of Offer	0 (Bid) or 1 (Offer).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
48	SecurityID	Stock Code at Functional Header	NSC code identifying the instrument and the market segment it is traded on.
22	SecurityIDSource		Value issued by BVMF: 8 = Exchange Symbol (BVMF security identification).
207	SecurityExchange		Value issued by BVMF for equities = XBSP
272	MDEntryDate	Date of Event at Functional Header	Date of the event.
273	MDEntryTime	Time of	Time of the event.

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Tag	Tag Name	Equivalent RLC field	Description
		Event at Functional Header	
290	MDEntryPositionNo	Offer Date + Broker Identification + Sequential number of Offer	Position in the book to delete.
37	OrderID	Sequential number of Offer	Represents an order. It is unique per broker firm, per instrument, per trading date.
288	MDEntryBuyer	Broker Identification	Present if <i>MDEntryType</i> = 0 (Bid). It is the buyer broker firm.
289	MDEntrySeller	Broker Identification	Present if <i>MDEntryType</i> = 1 (Offer). It is the seller broker firm.

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16.12 RLC-B1 – Index Value

This message indicates the updates to the index values that are generated by the exchange. It is sent by the exchange systems at specific time intervals.

When a RLC message B1 is received with *Type of Index* = 2, the following repeating group is generated:

Tag number	Tag name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New).
269	MDEntryType		3 (Index Value).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	Composes the Instrument Identification Block.
48	SecurityID	Stock Code at Functional Header	Composes the Instrument Identification Block.
22	SecurityIDSource		Composes the Instrument Identification Block.
207	SecurityExchange		Composes the Instrument Identification Block.
272	MDEntryDate	<i>Date of Event at Functional Header</i>	Date of index generation.
273	MDEntryTime	<i>Time of Event at Functional Header</i>	Time of index generation.
270	MDEntryPx	<i>Last Index of the Day</i>	Day's last index level.
274	TickDirection	<i>Indicator Direction of Variation of Index</i>	Index change direction: If there is no value present, then there is no change. Valid values: 0 = Plus Tick 1 = Zero-Plus Tick 2 = Minus Tick 3 = Zero-Minus Tick
7687	PercentageVar	<i>Percentage Variation of Index</i>	Index variation in percentage, from start of day.
9343	NoUnchangedSecurities	<i>Number of stocks with no variation in Index portfolio</i>	Number of index underlying securities with no variation.
9344	NoNotTradedSecurities	<i>Number of stocks with no quotation in Index portfolio</i>	Number of index underlying securities that are not quoted.
9989	TotTradedSecurities	<i>Number of actively traded stocks in index</i>	Number of quoted securities in the index.
9990	CapitalPct	<i>Percentage</i>	Capitalization percentage of active securities in

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Tag number	Tag name	Equivalent RLC field	Description
		capitalization of the active stocks in Index	the index.
9993	PrevYearVariation	Percentage variation of index in relation to previous year's last	Index variation in percentage, compared to previous year last index.
9996	NoFallingSecurities	Number of stocks falling in Index portfolio	Number of index underlying securities falling in price.
9997	NoRisingSecurities	Number of stocks rising in Index portfolio	Number of index underlying securities rising in price.

When a RLC message B1 is received with **Type of Index** = 1, the following repeating group is generated:

Tag number	Tag name	Equivalent RLC field	Description
279	MUpdateAction		0 (New).
269	MEntryType		4 (Opening Price – first index value of the day).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	Composes the Instrument Identification Block.
48	SecurityID	Stock Code at Functional Header	Composes the Instrument Identification Block.
22	SecurityIDSource		Composes the Instrument Identification Block.
207	SecurityExchange		Composes the Instrument Identification Block.
272	MEntryDate	Date of Event at Functional Header	Date of first index generation.
273	MEntryTime	Time of Event at Functional Header	Time of first index generation.
270	MEntryPx	Last Index of the Day	Day's first index value: Type of Index = 1.

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When a RLC message B1 is received with **Type of Index** = 5, the following repeating group is generated:

Tag number	Tag name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New).
269	MDEntryType		5 (Closing Price – reference index value of the last trading day).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	Composes the Instrument Identification Block.
48	SecurityID	Stock Code at Functional Header	Composes the Instrument Identification Block.
22	SecurityIDSource		Composes the Instrument Identification Block.
207	SecurityExchange		Composes the Instrument Identification Block.
272	MDEntryDate	Date of Event at Functional Header	Date of last index generation.
273	MDEntryTime	Time of Event at Functional Header	Time of last index generation.
270	MDEntryPx	Last Index of the Day	Last trading day's index value: Type of Index = 5.

When a RLC message B1 is received with **Type of Index** = 7, the following repeating group is generated:

Tag number	Tag name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New).
269	MDEntryType		6 (Settlement Price – settlement index for futures).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	Composes the Instrument Identification Block.
48	SecurityID	Stock Code at Functional Header	Composes the Instrument Identification Block.
22	SecurityIDSource		Composes the Instrument Identification Block.
207	SecurityExchange		Composes the Instrument Identification Block.
272	MDEntryDate	Date of Event at Functional Header	Date of settlement index generation.
273	MDEntryTime	Time of Event at	Time of settlement index generation.

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Tag number	Tag name	Equivalent RLC field	Description
		Functional Header	
270	MDEntryPx	Last Index of the Day	Settlement index value: Type of Index = 7.
731	SettlPriceType		Type of settlement price = 1 (Final).

When a RLC message B1 is received with **Type of Index** = 1, 2, 5 or 7; the following repeating group is generated if **Higher Index in the Day** is present:

Tag number	Tag name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New).
269	MDEntryType		7 (Trading Session High Price – highest index value).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	Composes the Instrument Identification Block.
48	SecurityID	Stock Code at Functional Header	Composes the Instrument Identification Block.
22	SecurityIDSource		Composes the Instrument Identification Block.
207	SecurityExchange		Composes the Instrument Identification Block.
272	MDEntryDate	Date of Event at Functional Header	Date of highest index generation.
273	MDEntryTime	Time of the day's highest index	Time of highest index generation.
270	MDEntryPx	Higher Index in the Day	Highest index value: Type of Index = 1, 2, 5 or 7.

When a RLC message B1 is received with **Type of Index** = 1, 2, 5 or 7; the following repeating group is generated if **Day's lowest index** is present:

Tag number	Tag name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New).
269	MDEntryType		8 (Trading Session Low Price – lowest index value).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	Composes the Instrument Identification Block.

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Tag number	Tag name	Equivalent RLC field	Description
48	SecurityID	Stock Code at Functional Header	Composes the Instrument Identification Block.
22	SecurityIDSource		Composes the Instrument Identification Block.
207	SecurityExchange		Composes the Instrument Identification Block.
272	MDEntryDate	Date of Event at Functional Header	Date of lowest index generation.
273	MDEntryTime	Time of the day's lowest index	Time of lowest index generation.
270	MDEntryPx	Day's lowest index	Lowest index value: Type of Index = 1, 2, 5 or 7.

When a RLC message B1 is received with **Type of Index** = 6, the following repeating group is generated:

Tag number	Tag name	Equivalent RLC field	Description
279	MDUpdateAction		0 (New).
269	MDEntryType		9 (Trading Session Average Price – average index value).
83	RptSeq		Sequence number per instrument update.
55	Symbol	Stock Code at Functional Header	Composes the Instrument Identification Block.
48	SecurityID	Stock Code at Functional Header	Composes the Instrument Identification Block.
22	SecurityIDSource		Composes the Instrument Identification Block.
207	SecurityExchange		Composes the Instrument Identification Block.
272	MDEntryDate	Date of Event at Functional Header	Date of average index publication.
273	MDEntryTime	Time of Event at Functional Header	Time of average index publication.
270	MDEntryPx	Last Index of the Day	Trading session average price of index.

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16.13 RLC-Z3 - News

Message used for dissemination of news. Each news item may occupy one or more number of lines.

Tag	Tag Name	Equivalent RLC field	Description
[Standard message header]			
42	OrigTime	Time of Event at Functional Header	Time of message origination (always expressed in UTC - Universal Time Coordinated, also known as "GMT")
6940	NewsSource	Agency Identification	Possible values: 11 – Over-the-counter news agency 13 – Electronic Purchase Exchange 14 – CBLC News Agency 15 – BOVESPA – Index Agency 16 – BOVESPA – Institutional Agency 17 – BOVESPA – Operations Agency 18 – BOVESPA – Companies Agency
1474	LanguageCode		Indicates the language the news is in. Represented by the two-letter ISO 639-1 standard identification. Absence of this field defaults to "pt" – Portuguese.
148	Headline	First line of News item text	The headline of a News message.
146	NoRelatedSym		Not present for equity market.
55	Symbol		Not present for equity market.
48	SecurityID		Not present for equity market.
22	SecurityIDSource		Not present for equity market.
207	SecurityExchange		Not present for equity market.
215	NoRoutingIDs		Indicates the number of destinations of this message.
→	216	RoutingType	Indicates the type of RoutingID (217) specified. Values issued by BVMF: 2 = Target List.
→	217	RoutingID	Assigned value used to identify a specific routing destination. Values issued by BM&FBOVESPA: "1" = Vendors "2" = Traders "3" = BM&FBOVESPA RSS feed "4" = BBMNet "5" = GLOBEX
33	NoLinesOfText	Page number - 1	Identifies number of lines of text body.
→	58	Text	Free format text string.
→	354	EncodedTextLen	Not present for equity market.
→	355	EncodedText	Not present for equity market.
149	URLLink		Not present for equity market.

17 FIX/FAST Channel Definitions

BVMF make available two documents for developers and network engineering teams of client systems to connect to the unified market data feed.

17.1 Certification Environment

The certification environment multicast and TCP replay channel definitions is available at the following website:

http://www.bmfbovespa.com.br/pt-br/servicos/download/MarketDataChannels_CERT.pdf

Changes to the multicast addresses/ports and TCP replay information will be notified by the exchange if applicable. Please keep in mind that message rates in the certification environment may be substantially lower than in production.

17.2 Production Environment – Primary Feed

The production environment multicast and TCP replay channel definitions is available at the following website:

http://www.bmfbovespa.com.br/pt-br/servicos/download/MarketDataChannels_PROD.pdf

Changes to the multicast addresses/ports and TCP replay information will be notified by the exchange if applicable.

18 FIX/FAST Message Specification

The FIX/FAST message specification allows client systems developers to code for the BVMF market data feed. The specification is maintained in a separate document, available at the BVMF website, in the following URL:

http://www.bmfbovespa.com.br/pt-br/servicos/download/FIX_MessageSpecification.pdf

Customers must download this document to begin the development process.