



NYSE EuronextSM

NYSE Imbalances feed

Customer Interface Specification

Version 1.8

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Table of Contents

Chapter 1 Introduction	4
1.0 Copyright/Trademark Statements.....	4
1.1 Document Information	5
1.2 Terms and Definitions	8
Chapter 2 - Customer Impact Guide	9
Chapter 3 – NYSE Imbalance IP Group Assignments	10
3.1 Source Subnet.....	10
3.2 Multicast groups	10
3.3 Joining Multicast groups	10
3.5 Production IP addresses.....	12
3.6 Retransmission Request IP addresses.....	12
3.7 Retransmission IP addresses.....	12
3.8 Retransmission Request Thresholds.....	13
3.9 NYSE Imbalance Testing	14
3.10 Test IP Addresses	14
3.11 Test Retransmission Request IP addresses	14
3.12 Test Retransmission IP addresses.....	14
Chapter 4 - NYSE Imbalance Operational Information	16
4.1 Publication Period	16
4.2 Gap Detection.....	16
4.3 Dual Site	16
Chapter 5 – NYSE Imbalance Message Specifications	17
Overview	17
5.1 Data Delivery format.....	17
5.2 General Processing Notes.....	17
5.3 Sequence Numbers	17
5.4 Symbols	18
5.5 Prices	18
5.5 NYSE Imbalance Data Messages	19
5.6 NYSE Imbalance Data Exceptions.....	20
5.6 Message Header Format	21
5.7 NYSE Opening Imbalance Message	22
5.8 NYSE Closing Imbalance Message.....	23
5.9 NYSE No Imbalance Message available.....	24
Chapter 6 – Message Examples	24

Overview	24
6.1 Scenario 1 -Opening Imbalance message for stock ABC.....	24
6.2 Scenario 2 –Closing Imbalance message for stock DEF Preferred A	25
Appendix A– Common PDP Message Structure	26
Overview	26
A.1 General Processing Notes.....	26
A.2 Common Message Header Format	26
A.3 Sequence Number Reset.....	28
A.4 Sequence Number Processing Notes	28
A.5 Heartbeat Messages	29
A.6 Heartbeat Message Processing Notes	29
A.7 Heartbeat Response Message	29
A.8 Retransmission Request Message.....	30
A.9 Retransmission Response Message	31
A.10 Retransmission Message.....	32
A.11 Retransmission message processing notes.....	32
A.12 Message Unavailable.....	33
Appendix B – Message Processing	34
B.1 Processing of messages.....	34
B.2 Processing of sequence number reset messages	35
B.3 Processing of Heartbeat messages	36
B.4 Processing of Heartbeat response messages	37
B.5 Processing of Heartbeat response messages	38
B.6 Processing of Data messages	39
B.7 Processing of Gap handling	40
B.8 Processing of line level retransmissions	41
Appendix C– Frequently Asked Questions	42

Chapter 1 Introduction

1.0 Copyright/Trademark Statements

Copyright Statement

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Notice

Every effort was made to ensure that the information in this document was complete and accurate at the time of publication. However, information is subject to change without notice.

1.1 Document Information

Document History

The following outlines the evolution of this Customer Interface Specification:

Version	Date	Pages Affected	Comments
Rev 0.1	03/30/08	All	Initial version for internal review.
Rev 0.2	4/21/08	All	New multicast IP addresses added and outbound format finalized
Rev 0.3	4/22/08	20,21	Added Regulatory indicator
Rev 1.0	4/23/08	All	Final version for distribution
Rev 1.1	4/24/08	14	New closing imbalance time parameter
Rev 1.2	7/03/08	14	Changed the Regulatory Indicator field in the Closing Imbalance Message
Rev 1.3	9/25/08	18-23	Inclusion of stock open indicator and no imbalance available msg
Rev 1.4	10/22/09	18-23	Correction to Msg values
Rev 1.5	6/22/09	18	Calculation and Interest Update
Rev 1.6	8/13/09	14-22, 25-28	-Added UAT Environment IPs -Removal MsgType 242 -Addition of Clearing price fields to msg Type 240, 241 -Added HeartBeat Subscription msg type '19'
Rev 1.7	11/30/09	7,10,20-22,28, 43	-page 10: Heartbeat timer updated to 60secs -page 21: Added example for Clearing Price -page 28: MsgSize updated on Opening/Closing imbalance msgs -page 43: Updated FAQ "average msg size"
Rev 1.8	1/25/10	21	-page 21: correction to msg sizes for msg type 240,241 it should be 50 and 54 instead of 48 and 52bytes

**Contact
Information**

NYSE Product/Account Questions
1-212-656-3800

NYSE Service Desk:
1-866-873-7422

**Additional
Product
Information**

For additional product information please visit
<http://www.nyxdata.com/page/642>

For updated capacity figures please visit our capacity pages at :
<http://www.nyxdata.com/page/474>

For additional support information on NYSE Imbalances please visit our
discussion Board at:
<http://www.nyxdata.com/nyxdata/Support/DiscussionBoard/tabid/108/view/topics/forumid/40/Default.aspx>

For additional information on SFTI please visit
<http://sfti.siac.com>

**Referenced
Documents**

Many of the general technical concepts referenced herein are detailed in the
following documents:

[*Data Distribution Model for IP Multicast Based Environment- Version 1.7;
SIAC Communication Engineering Planning and Development; 9 November
2000.*](#)

[*SFTI Customer Guide – Version 1.5; SIAC; 03/12/04*](#)

[*NYSE Symbolology*](#)

1.2 Terms and Definitions

Overview

The following section contains terms and definitions that are used throughout this document.

Terms	Definition
PDP Format	PDP format is a binary format that is used for NYSE Proprietary Data products such as NYSE OpenBook and NYSE Alerts.
Big Endian	Refers to which bytes are most significant in multi-byte data types. In big-endian architectures, the leftmost bytes are most significant. This byte order also corresponds to Network Byte Order.
Group ID	IP Multicast address for PDP data delivery.
Host Symbol Format	A format set internally by NYSE order processing systems. Its representation of suffix is different from NMS systems.
MART	Message Archive and Retransmission – The PDP component that archives and retransmits PDP message packets.
Monotonical	Incrementally increase in value by one.
PDP	NYSE Proprietary Data Product.
Port Number	Socket port assigned to a feed.
Publisher	Generic name for any system/application generating PDP message products.
Recipient	Synonymous with <i>Subscriber</i> .
Sequence Number	A unique, sequential message ID that both ‘tags’ each message and allows recipients to identify message ‘gaps’ and request retransmission (if appropriate).
Subscriber	Any customer/client system that will subscribe to, and receive data products from, the PDP data engine (i.e. the PDP_IMB).
MTU	Maximum Transfer Unit – The largest size of IP datagram that may be transferred on a given network. Most network implementations have a default setting of 1500 bytes.
SFTI	Secure Financial Transaction Infrastructure
NYSE	New York Stock Exchange
SIAC	Securities Industry Automation Corporation
ASCII	American Standard Code for Information Interchange

Chapter 2 - Customer Impact Guide

Overview

We suggest that the subscribers be able to handle the following message rates and sizes for NYSE Imbalance feed traffic.

NYSE Imbalances	Maximum (2008 projected)
Message Rate	3,000
Total Number of Messages in a Day	TBD
Bandwidth recommendations (Mbps)	2Mbps
Retrans/Refresh Bandwidth recommendations (Mbps)	0.2Mbps

Notes

- The maximum message rate may be sustained for a couple of minutes.
- The numbers are based on all feeds added.
- The message size corresponds to the DataFeed message size, without the TCP and IP headers.
- There maybe multiple messages per packet.
- For updated capacity figures please visit our capacity pages at :

<http://www.nyxdata.com/page/474>

Chapter 3 – NYSE Imbalance IP Group Assignments

Overview

The following chapter will provide you with all of the necessary connectivity information in order to subscribe to the NYSE Imbalance Feed.

3.1 Source Subnet

The table below defines the Source subnet and the NetMask for all messages in the NYSE Imbalance datafeed. Please add all **four** ip addresses to your firewall setting.

Subnet	NetMask
198.140.53.64	FF FF FF C0
198.140.54.64	FF FF FF C0
198.140.53.128	FF FF FF C0
198.140.54.128	FF FF FF C0

UAT Subnet	NetMask
198.140.57.208	FF FF FF F0
198.140.57.240	FF FF FF F0

3.2 Multicast groups

Each data stream will deliver a set of imbalance information for a certain range of symbols. The table below describes the categorization of the data feed.

Feed Name	Description
IMB_AZ	Multicast Groups assigned to deliver imbalance messages of symbols starting with letters A through Z.

3.3 Joining Multicast groups

To access the NYSE Imbalances feed, subscribers must join the multicast groups for primary feeds, as well as secondary feeds to assist in recovery. To request retransmissions of lost packets, subscribers must establish a TCP/IP connection (see “Retransmission of dropped packets” below). Please refer to Appendix C for diagrams that illustrate message processing and retrieval.

Data feeds for specific stocks are sent to different multicast addresses. This addressing scheme allows customers to subscribe to the specific data feeds and channels they need. Data feeds types are:

Multicast NYSE Imbalances
Multicast Retransmission

3.4 Packet Retransmissions

In the event a packet is lost on the primary feed for a multicast group, clients can retrieve the lost packet from the secondary feed. UDP can at times be unreliable and may drop packets from both the primary and secondary data feeds. If a packet is lost from both the primary and secondary feeds, clients then make a TCP/IP request to have the packets resent. Packets are resent via the Retransmission Multicast Feed.

Subscribers have the option to connect to the TCP/IP Recovery Server to request dropped packets from the Imbalance feed. This method is highly recommended in order to maintain a stable and accurate order book. The Recovery Server accepts connections on predefined addresses and ports and requires a heartbeat reply before responding to requests. It accepts primary and secondary connections to assist recovery on the subscriber's end.

After a client establishes a TCP/IP connection, NYSE Imbalance application will immediately send a heartbeat request message to the client. Clients must respond to this request with a heartbeat response within a specific timeframe – otherwise, NYSE Imbalance application will close the connection. This timeframe is currently set to thirty seconds but is subject to change—so clients should make this configurable. (Clients will be informed of changes to the timeframe via customer notice.) Regardless of the timeframe, the client should respond immediately with a heartbeat response message. After receiving the initial heartbeat response, the Recovery Server will send heartbeats to the client every 60 seconds to ensure that the TCP/IP connection is live.

Note that the Source ID that the client specifies in the heartbeat response message will be validated by the NYSE Imbalance application. Each Source ID may only be logged in once per port at any given time.

To define a Source ID for retransmission purposes, contact the SIAC Help Desk Technical Support and provide the desired Source ID. The FIX/Connectivity team will evaluate and approve or disapprove Source IDs. In case of disapproval, a new Source ID must be defined. In case of approval, FIX/Connectivity will make the necessary updates on the NYSE Imbalance application side to add the Source ID and applicable rules.

3.5 Production IP addresses The table below defines the IP/Multicast group and port assignments for all messages in the NYSE Imbalance feed.

NYSE Imbalance	IP	Port
Primary data Feed – Symbols A to Z	233.75.215.44	60044
Secondary data Feed – Symbols A to Z	233.75.215.172	60172

3.6 Retransmission Request IP addresses The table below defines the TCP/IP retransmission request group and port assignments for all messages in the NYSE Imbalance feed.

NYSE Imbalance	IP	Port
Primary Retransmission Request for Symbols A to Z	198.140.59.77	8880
Secondary Retransmission Request for Symbols A to Z	198.140.58.77	9880

3.7 Retransmission IP addresses The table below defines the IP/Multicast retransmission group and port assignments for all messages in the NYSE Imbalance feed.

NYSE Imbalance	IP	Port
Primary Retransmission Request for Symbols A to Z	233.75.215.45	60045
Secondary Retransmission Request for Symbols A to Z	233.75.215.173	60173

**3.8
Retransmission
Request
Thresholds**

The table below summarizes the Retransmission request thresholds for the NYSE Imbalance feed. The numbers below represent the thresholds per channel.

Capability	Description	Threshold	Action
Prevention of invalid subscribers	Incoming requests from subscribers that are not in the enabled subscriber's source ID list will not be honored. PDP subscribers will need a source ID, which is a string that uniquely identifies the subscriber of the retransmission requests. Please contact SIAC Customer Service to get a unique source ID.	N/A	Request will not be processed.
Limitation of Requests for a large number of packets	Only retransmission requests for 1000 messages or less will be honored.	1000	Request will not be processed.
Limitation of Generic Requests	If the number of a subscriber's generic requests reaches the threshold number of requests per day, the subscriber will be blocked and its retransmission request will no longer be honored during that particular day.	500	Subsequent retransmissions requests from that subscriber will be blocked.

3.9 NYSE Imbalance Testing

The following section contains the IP/Multicast group assignments and Retransmission request assignments for the test/replay service. These replay tests are generally run at night (**Tues and Thurs from 7PM to 9PM**) and over different multicast groups than the production environment so that subscribers do not need to worry about incorrect data over the production lines.

The data replayed over this network is from a previous trading session—all messages, or a range of messages, for a given service in their original sequence.

3.10 Test IP Addresses

The table below defines the test IP/Multicast retransmission group and port assignments for all messages in the NYSE Imbalance feed.

NYSE Imbalance	IP	Port
Test Primary data Feed – Symbols A to Z	233.75.215.12	60012
Test Secondary data Feed – Symbols A to Z	233.75.215.140	60140

3.11 Test Retransmission Request IP addresses

The table below defines the test TCP/IP retransmission request group and port assignments for all messages in the NYSE Imbalance feed.

NYSE Imbalance	IP	Port
Test Primary Retransmission Request for Symbols A to Z	198.140.58.77	8890
Test Secondary Retransmission Request for Symbols A to Z	198.140.59.77	9890

3.12 Test Retransmission IP addresses

The table below defines the test IP/Multicast retransmission group and port assignments for all messages in the NYSE Imbalance feed.

NYSE Imbalance	IP	Port
Test Primary Retransmission Feed for Symbols A to Z	233.75.215.13	60013
Test Secondary Retransmission Feed for Symbols K to Z	233.75.215.141	60141

3.13 NYSE Imbalances UAT Testing

The following section contains the IP/Multicast group assignments and Retransmission request assignments for the User Acceptance testing environment. These replay tests are generally run intra-day **Mon thru Friday from 9AM to 5PM** and over different multicast groups than the production environment and test environment so that subscribers do not need to worry about incorrect data over the production lines.

The data replayed over this network is from a previous trading session—all messages, or a range of messages, for a given service in their original sequence.

3.14 UAT IP Addresses

The table below defines the Primary UAT IP/Multicast retransmission group and port assignments for all messages in the NYSE Imbalance feed

NYSE Imbalances	IP	Port
Primary UAT data Feed – Symbol range A to Z	233.75.215.49	65043
Secondary UAT data Feed – Symbol range A to Z	233.75.215.177	65143

3.15 UAT Test Retransmission Request IP addresses

The table below defines the UAT TCP/IP retransmission request group and port assignments for all messages in the NYSE Imbalance feed

NYSE Imbalances	IP	Port
UAT Retrans Request – Symbol range A to Z	198.140.57.2	65233

3.16 UAT Retransmission Request IP addresses

The table below defines the UAT IP/Multicast retransmission group and port assignments for all messages in the NYSE Imbalances feed.

NYSE Imbalances	IP	Port
Primary UAT Retransmission feed – Symbol range A to Z	233.75.215.49	65093
Secondary UAT Retransmission feed – Symbol range A to Z	233.75.215.177	65193

Chapter 4 - NYSE Imbalance Operational Information

4.1 Publication Period The following section specifies the frequency and publication period for each message type disseminated by the NYSE Imbalance Product.

Please note: Messages are only sent out if there is a change.

Message	Message Type	Publication Period
NYSE Opening Imbalances	240	<p>Opening Imbalance messages are disseminated every 5 minutes between 8:30am EST and 9:00am EST.</p> <p>Opening Imbalance messages are disseminated every 1 minute between 9:00am EST and 9:20am EST.</p> <p>Opening Imbalance messages are disseminated every 15 second between 9:20am EST and 9:35am EST (or Stock Open whichever is first)</p> <p>Continuous Book Clearing publication 2 minutes prior to the open at approximately 9:28am.</p>
NYSE Closing Imbalances	241	<p>Closing Imbalance messages are disseminated every 5 seconds between 3:45pm EST and 4:00pmEST (or until Market close on early closing days).</p> <p>Please check the NYSE website for any changes to trading hours.</p>

4.2 Gap Detection The PDP Distribution System will assign all data packets a unique, sequential message ID. This will allow recipients to identify ‘gaps’ in the message sequence and, if appropriate, reconcile them ‘locally’ with an alternate feed or request retransmission of the missing/corrupted data packet.

4.3 Dual Site NYSE Imbalance data will be published using two (2) sets of unique IP Multicast Group IDs—each originating from a separate SIAC distribution site. Thus, when appropriate, each NYSE Imbalance channel will transmit a given message packet over two (2) Multicast Groups, one originating from each site and each containing an identical sequence number. This will allow customers to receive two redundant feeds. Additionally, any message on either feed can be retransmitted upon request.

Chapter 5 – NYSE Imbalance Message Specifications

Overview The NYSE Imbalance message reflects the imbalance in each NYSE-traded security if it is available.

5.1 Data Delivery format The NYSE Imbalance service uses the push-based publishing model. This means that data will be published based on its availability. Once an imbalance is calculated, it will be published to NYSE Imbalance' Subscribers.

5.2 General Processing Notes The following processing notes apply to the messages sent through the feed.

- All fields will be sent for every packet.
- Only field values will appear in the published messages (e.g., no names, 'tags', sizes will appear in the message). The field names that appear in the descriptions below are for reference purposes only.
- All the fields are contiguous, with reserved fields for alignment issues.
- All field sizes are fixed and constant.
- The source time referenced will be using Eastern Standard Time (EST).
- Binary fields are provided in *Big Endian* format.
- ASCII string fields are left aligned and null padded

5.3 Sequence Numbers All messages conform to the line level sequencing. Each channel A to Z has its own sequence number. Subscribers can use sequence numbers to determine the following:

- Missing (gapped) messages
- Unordered messages
- Duplicate messages

Clients should note that the message sequence number might restart from one following a failure recovery. A reset sequence number message will be sent to clients via the Multicast Groups to inform of such event.

5.4 Symbols

The stock symbols represented in this feed includes the root (7 characters) and optional suffix (4 characters).

For example, if a symbol's root is "ABC" and its suffix is "PRA", the symbol's root/suffix will be represented as: "ABC PRA\0\0\0\0". Between the root and the suffix there will be one space. After the suffix, null values follow to fill the 11 characters allocated for the stock symbol field.

Note: "\0" represents a null value

5.5 Prices

Prices in this feed are represented by two fields, separating the denominator and the numerator. All prices in the feed share a common denominator, which is represented in the PriceScaleCode.

The PriceScaleCode field value represents the common denominator for the following formula:

$$Price = \frac{Numerator}{10^{PriceScaleCode}}$$

For example, a price of 27.56 is represented by a Numerator of 2756 and a PriceScaleCode equals to 2.

**5.5 NYSE
Imbalance Data
Messages**

The following table contains a list of the message types contains in the NYSE Imbalance feed.

Message Type	Description
240	<p>Interest Included: All electronic interest eligible to trade in the opening including DMM sQuotes at the Reference Price. Odd-lot interest is excluded.</p> <p>Calculation: Reference price is equal to the last sale (previous closing price) unless there is a Rule 15 or Mandatory indication published. If an indication is published, the reference price is determined as follows:</p> <ul style="list-style-type: none"> • If the Bid Price from the indication (the lower price) is higher than the last sale, the Reference Price will be the Bid. • If the Offer Price from the indication (the higher price) is lower than the last sale, the Reference Price will be the Offer. • If the Last Sale is within the indication range the Book shall use the Last Sale as the Reference Price. • If multiple indications have been published, the Book shall always use the latest. <p>Continuous Book Clearing Price is the price closest to Reference Price where imbalance is zero.</p>
241	<p>Interest Included:</p> <ul style="list-style-type: none"> • All MOC/LOC interest eligible for the close will be included as well as the round lot portion of PRLs. • D-Quotes interest is included beginning at 3:55pm EST • Odd-lot interest, DMM and crowd interest will be excluded. • Closing Only order interest Included in calculation only when off-setting <p>Calculation: The Reference Price is the Last Sale if the last sale is at or between the current NY best quote. Otherwise the Reference Price is the Bid Price if last sale is lower than Bid price, or the Offer price if last sale is higher than Offer price. Continuous Book Clearing Price is the price closest to Reference Price where imbalance is zero. Closing Only Clearing Price is defined as the closing only interest where price closest to last sale where imbalance is zero.</p>

5.6 NYSE Imbalance Data Exceptions The following are situations in which no imbalance information will be disseminated:

1. If the NYSE last sale price, paired quantity and imbalance quantity are the same as the previous calculation, No message will be generated.
2. If there is **no** Last Sale Price (e.g., Trading Halted), a single Closing Paired/Imbalance message with zero is published.
3. If there is paired quantity, but no imbalance quantity, the Closing Paired/Imbalance message with paired quantity and paired number of orders and **zero** imbalance quantity will be published.

5.6 Message Header Format

All messages are preceded by a standard header format. The table on the next page describes the header fields of an NYSE Imbalance message.

Field	Offset	Size (Bytes)	Format	Description
MsgSize	0	2	Binary Integer	Sequence Number Reset – '18 Bytes' Heartbeat Message – '14 Bytes' Heartbeat Response Message – '34 Bytes' Message Unavailable – '22 Bytes' Retransmission Request Message – '42 Bytes' Retransmission Response Message – '46 Bytes' NYSE Opening Imbalance Message.- '50 Bytes' NYSE Closing Imbalance Message – '54 Bytes'
MsgType	2	2	Binary Integer	This field identifies the type of message '1' – Sequence Number Reset '2' – Heartbeat Message '5' – Message Unavailable '10' – Retransmission Response message '20' – Retransmission Request Message '22' – Refresh Request Message '24' – Heartbeat Response Message '240' – NYSE Opening Imbalance Message '241' – NYSE Closing Imbalance Message
MsgSeqNum	4	4	Binary Integer	This field contains the message sequence number assigned by PDP for each product. It is used for gap detection. Also known as Line Sequence Number (LSN).
SendTime	8	4	Binary Integer	This field specifies the time message was created by PDP. The number represents the number of milliseconds since midnight of the same day.
ProductID	12	1	Binary Integer	'116' is the product value used in the PDP header to identify the NYSE Imbalance feed
RetransFlag	13	1	Binary Integer	A flag that indicates whether this is an original, retransmitted, or 'replayed' message. Valid values include: '1' – Original message '2' – Retransmitted message '3' – Message Replay '4' – Retransmission of a 'replayed' message '5' – Refresh Retransmission '129' – Test Original Message '130' – Retransmission of a test message '131' – Replay of a test message '132' – Retransmission Replay of a Test Message
NumBodyEntries	14	1	Binary Integer	The number of times the message body repeats in the message. For example, if the body consists of a field (named Volume) and the "NumBodyEntries" field is 2, the number of bytes in the message body will be 8
FILLER	15	1	ASCII String	This is a filler, reserved for future use

5.7 NYSE Opening Imbalance Message

The table below describes the body fields of an NYSE Opening Imbalance message (**MsgType = '240'**) for additional messages such as sequence number reset, retransmission etc, please refer to Appendix A.

Field Name	Offset	Size	Format	Description
Symbol	0	11	ASCII String	This field contains the full symbol in NYSE Symbology. A sequence of characters representing the symbol, padded with NULLs
StockOpenIndicator	11	1	Binary Integer	This field identifies if the stock has been opened. If this field indicates the stock is opened, you will no longer receive an Imbalance message. Valid Values: '0' – Stock is not open at this time '1' – Stock is now open
ImbalanceSide	12	1	ASCII Character	This field indicates the side of the order Buy/sell. Valid Values: 'B' – Buy 'S' – Sell Space – No imbalance
PriceScaleCode	13	1	Binary Integer	The denominator code for the reference price in this message. Represents the number of digits after the decimal place in the price. Example: - For a price of 12.1, the price numerator is 121 and the denomcode is 1 - For a price of 13, the price numerator is 13 and the denomcode is 0
ReferencePriceNumerator	14	4	Binary Integer	This field specifies the Opening Imbalance reference price point
ImbalanceQuantity	18	4	Binary Integer	This field contains the total imbalance quantity at the reference price point
PairedQuantity	22	4	Binary Integer	This field contains the paired off quantity at the reference price point
ClearingPriceNumerator	26	4	Binary Integer	This field contains the clearing price. The Clearing Price is the price closest to Reference Price where imbalance is zero. The Opening Clearing Price will begin publication at approximately 2 minutes (9.28am) and will continue to be published on with the next Opening Imbalance publication interval
SourceTime	30	4	Binary Integer	This field specifies the time when the imbalance message was generated in the order book. The number represents the number of milliseconds since midnight of the same day. Example: If the time is 13:12 56 seconds, 170 milliseconds This field will contain the value 47576170

**5.8 NYSE
Closing
Imbalance
Message**

The table below describes the body fields of an NYSE Closing Imbalance message (**MsgType='241'**) for additional messages such as sequence number reset, retransmission etc, please refer to Appendix A.

Field Name	Offset	Size	Format	Description
Symbol	0	11	ASCII String	This field contains the full symbol in NYSE Symbology. A sequence of characters representing the symbol, padded with NULLs
RegulatoryImbalanceIndicator	11	1	Binary Integer	This field indicates if the imbalance is a regulatory Rule 123c published closing imbalance "1" - Regulatory Imbalance "0" - Informational Imbalance space - not applicable
ImbalanceSide	12	1	ASCII Character	This field indicates the side of the order Buy/sell. Valid Values: 'B' – Buy 'S' – Sell Space – No Imbalance
PriceScaleCode	13	1	Binary Integer	The denominator code for the reference price in this message. Represents the number of digits after the decimal place in the price. Example: - For a price of 12.1, the price numerator is 121 and the denomcode is 1 - For a price of 13, the price numerator is 13 and the denomcode is 0
ReferencePriceNumerator	14	4	Binary Integer	This field specifies the Closing Imbalance reference price point
ImbalanceQuantity	18	4	Binary Integer	This field contains the total imbalance quantity at the reference price point
PairedQuantity	22	4	Binary Integer	This field contains the paired off quantity at the reference price point
ContinuousBookClearingPriceNumerator	26	4	Binary Integer	The Continuous Book Clearing Price is defined as the price closest to last sale where imbalance is zero. If a Book Clearing Price is not reached, the Clearing Price, a zero will be published in the Book Clearing Price Field
Closing Only ClearingPriceNumerator	30	4	Binary Integer	The Closing Only Clearing Price is defined as the closing only interest where price closest to last sale where imbalance is zero.
SourceTime	34	4	Binary Integer	This field specifies the time when the imbalance message was generated in the order book. The number represents the number of milliseconds since midnight of the same day. Example: If the time is 13:12 56 seconds, 170 milliseconds This field will contain the value 47576170

6.2 Scenario 2 – Closing Imbalance message for stock DEF Preferred A – The following scenario displays what a message would look like for a Closing Imbalance for Stock DEF Preferred A

Field Name	Value
MsgSize	52
MsgType	241
MsgSeqNum	2
SendTime	57595676
ProductId	116
RetransFlag	1
NumBodyEntries	1
Filler	N/A
Symbol	DEF PRA\0\0\0\0\0\0\0\0
RegulatoryImbalanceIndicator	0
ImbalanceSide	B
PriceScaleCode	2
ReferencePriceNumerator	6538
ImbalanceQuantity	5000
PairedQuantity	1000
ContinuousBookClearingPrice	6750
ClosingOnlyClearingPrice	6780
SourceTime	57595664

Appendix A– Common PDP Message Structure

Overview

In broad terms, there are two types of messages transmitted as part of this protocol: control and data. Control messages do not contain data per se; rather, they allow conversing parties to exchange session-specific information (e.g., ‘reset sequence number’). Data messages are product specific and, although they will adhere to the general specification, they are defined specifically in a later section.

A.1 General Processing Notes

The following processing notes apply to the messages described above.

- All fields will be sent for every packet.
 - Any physical packet will contain at most one message
 - Only field values will appear in the published messages (e.g., no names, ‘tags’, sizes will appear in the message). The field names that appear in in the descriptions below are for reference purposes only.
 - All the fields are contiguous, i.e., there is no explicit (or implicit) ‘padding’ between fields regardless of the juxtaposed data types, sizes, and alignment issues.
 - All field sizes are fixed and constant.
 - The source time referenced will be using Eastern Standard Time (EST).
 - Binary fields are provided in *Big Endian* format.
 - All binary fields will be unsigned (unless otherwise specified)
 - ASCII string fields are left align, null padded.
-

A.2 Common Message Header Format

All PDP messages will contain a Common Message Header. This model is akin to that of an envelope/letter paradigm. The message header comprises envelope information; the message body comprises the letter. All correspondence will use the same envelope format regardless of content.

The intent of this design is to minimize development burden on behalf of Subscribers. That is, all Subscribers may implement line-level protocol processing once, and then need only develop parsing algorithms for messages of choice.

Field	Offset	Size (Bytes)	Format	Description
MsgSize	0	2	Binary Integer	This field indicates the size of the message body in bytes: Sequence Number Reset – '18 Bytes' Heartbeat Message – '14 Bytes' Heartbeat Response Message – '34 Bytes' Message Unavailable – '22 Bytes' Retransmission Request Message – '42 Bytes' Retransmission Response Message – '46 Bytes' NYSE Opening Imbalance Message.- '50 Bytes' NYSE Closing Imbalance Message.- '54 Bytes'
MsgType	2	2	Binary Integer	This field identifies the type of message '1' – Sequence Number Reset '2' – Heartbeat Message '5' – Message Unavailable '10' – Retransmission Response message '20' – Retransmission Request Message '22' – Refresh Request Message '24' – Heartbeat Response Message '240' – NYSE Opening Imbalance Message '241' – NYSE Closing Imbalance Message
MsgSeqNum	4	4	Binary Integer	This field contains the message sequence number assigned by PDP for each product. It is used for gap detection. Also known as Line Sequence Number (LSN).
SendTime	8	4	Binary Integer	This field specifies the time message was created by PDP. The number represents the number of milliseconds since midnight of the same day.
ProductID	12	1	Binary Integer	'116' is the product value used in the PDP header to identify the NYSE Imbalance feed
RetransFlag	13	1	Binary Integer	A flag that indicates whether this is an original, retransmitted, or 'replayed' message. Valid values include: '1' – Original message '2' – Retransmitted message '3' – Message Replay '4' – Retransmission of a 'replayed' message '5' – Refresh Retransmission '129' – Test Original Message '130' – Retransmission of a test message '131' – Replay of a test message '132' – Retransmission Replay of a Test Message
NumBodyEntries	14	1	Binary Integer	The number of times the message body repeats in the message. For example, if the body consists of a field (named Volume) and the "NumBodyEntries" field is 2, the number of bytes in the message body will be 8
FILLER	15	1	ASCII String	This is a filler, reserved for future use

A.3 Sequence Number Reset

This message is sent to ‘reset’ the Sequence Number at start of day, in response to failures, etc. Note that this message will contain a valid sequence number. The message format is shown below.

Field Name	Offset	Size	Format	Value	Description
Set forth below are the ‘header’ fields of the Sequence Number Reset Message					
MsgSize	0	2	Binary Integer	18	Refer to section A.2
MsgType	2	2	Binary Integer	‘1’	Refer to section A.2
MsgSeqNum	4	4	Binary Integer		Refer to section A.2
SendTime	8	4	Binary Integer		Refer to section A.2
ProductID	12	1	Binary Integer	‘116’	Refer to section A.2
RetransFlag	13	1	Binary Integer	‘1’	Refer to section A.2
NumBodyEntries	14	1	Binary Integer	‘1’	Refer to section A.2
FILLER	15	1	ASCII String		This is a filler, reserved for future use
Defined below are the ‘body’ fields of the Sequence Number Reset Message					
NextSeqNumber	16	4	Binary Integer		This field contains the sequence number value that the recipient should expect in the immediately succeeding data packet. Note that this message will contain its own valid sequence number in the header portion of the message.

A.4 Sequence Number Processing Notes

Sequence numbers normally begin at one (1) and increase monotonically with each subsequent message. There are two scenarios where the sequence number is reset (besides the start of day). First, if the value should exceed the maximum value that the SeqNum field may contain, it will be reset to one (1). Second, if NYSE Imbalance feed has a failure and it recovers, it sends a sequence number reset message. The SeqNum field of that message will be set to one (1) and the NextSeqNumber field will be set to two (2). Please refer to B.2 Processing Sequence Number Reset Messages for a suggest way of processing.

A.5 Heartbeat Messages

Subscribers that choose to establish and remain connected to the TCP/IP retrans/Refresh server will receive heartbeat message to let them know that the connection is still alive.

Field Name	Offset	Size	Format	Value	Description
Set forth below are the 'header' fields of the Heartbeat Message					
MsgSize	0	2	Binary Integer	14	Refer to section A.2
MsgType	2	2	Binary Integer	'2'	Refer to section A.2
MsgSeqNum	4	4	Binary Integer		Refer to section A.2
SendTime	8	4	Binary Integer		Refer to section A.2
ProductID	12	1	Binary Integer	'116'	Refer to section A.2
RetransFlag	13	1	Binary Integer	'1'	Refer to section A.2
NumBodyEntries	14	1	Binary Integer	'0'	Refer to section A.2
FILLER	15	1	ASCII String		This is filler, reserved for future use

A.6 Heartbeat Message Processing Notes

- Heartbeat messages will be sent with the same sequence number as the most recent message that was sent.
- Heartbeat messages will only contain the PDP Message Header with an empty body.
- Subscribers must respond to these heartbeat requests with a heartbeat message.

Please refer to B.3 Processing Heartbeat Messages for a suggest way of processing.

A.7 Heartbeat Response Message

This message will be sent by subscribers that choose to establish and remain connected to the TCP/IP retransmission/refresh server intraday. This message lets the NYSE know that the connection is still alive. Subscribers must respond to these heartbeat requests with a heartbeat response message

Field Name	Offset	Size	Format	Value	Description
Set forth below are the 'header' fields of the Generic Retransmission Request Message					
MsgSize	0	2	Binary Integer	'34'	Refer to section A.2
MsgType	2	2	Binary Integer	'24'	Refer to section A.2
MsgSeqNum	4	4	Binary Integer		Refer to section A.2
SendTime	8	4	Binary Integer		Refer to section A.2
ProductID	12	1	Binary Integer	'116'	Refer to section A.2
RetransFlag	13	1	Binary Integer	'1'	Refer to section A.2
NumBodyEntries	14	1	Binary Integer	'1'	Refer to section A.2
FILLER	15	1	ASCII String		This is filler, reserved for future use
Defined below are the 'body' fields of the Heartbeat Response Message					
SourceID	16	20	ASCII String		This field represents the name of the source requesting retransmission. This field is null padded, left aligned

A.8 Retransmission Request Message This message is sent by Subscribers requesting missing messages. The MART will retransmit the appropriate message(s).

Field Name	Offset	Size	Format	Value	Description
Set forth below are the 'header' fields of the Generic Retransmission Request Message					
MsgSize	0	2	Binary Integer	'42'	Refer to section A.2
MsgType	2	2	Binary Integer	'20'	Refer to section A.2
MsgSeqNum	4	4	Binary Integer		Refer to section A.2
SendTime	8	4	Binary Integer		Refer to section A.2
ProductID	12	1	Binary Integer	'116'	Refer to section A.2
RetransFlag	13	1	Binary Integer	'1'	Refer to section A.2
NumBodyEntries	14	1	Binary Integer	'1'	Refer to section A.2
FILLER	15	1	ASCII String		This is filler, reserved for future use
Defined below are the 'body' fields of the Generic Retransmission Request Message					
BeginSeqNum	16	4	Binary Integer		The beginning sequence number of the requested range of messages to be retransmitted.
EndSeqNum	20	4	Binary Integer		The end sequence number of the requested range of messages to be retransmitted.
SourceID	24	20	ASCII String		This field represents the name of the source requesting retransmission. This field is null padded, left aligned

**A.9
Retransmission
Response
Message**

This message will be sent immediately via TCP/IP in response to the subscribers request for retransmission messages. This message does not contain any information but an ACK or NAK of the request message.

Field Name	Offset	Size	Format	Value	Description
Set forth below are the 'header' fields of the NYSE Retransmission Response Message					
MsgSize	0	2	Binary Integer	'42'	Refer to section A.2
MsgType	2	2	Binary Integer	'10'	Refer to section A.2
MsgSeqNum	4	4	Binary Integer		Refer to section A.2
SendTime	8	4	Binary Integer		Refer to section A.2
ProductID	12	1	Binary Integer	'116'	Refer to section A.2
RetransFlag	13	1	Binary Integer	'1'	Refer to section A.2
NumBodyEntries	14	1	Binary Integer	'1'	Refer to section A.2
FILLER	15	1	ASCII String		This is filler, reserved for future use
Defined below are the 'body' fields of the NYSE Retransmission Response Message					
SourceSeqNum	16	4	Binary Integer		This field contains the request message sequence number assigned by the client. It is used by the client to couple the request with the response message.
SourceID	20	20	ASCII String		This field represents the name of the source requesting retransmission. This field is null padded, left aligned
Status	40	1	ASCII String		This is a flag that indicates whether the retransmissions request was accepted or rejected. Valid values: 'A' – Accepted 'R' - Rejected
Reject Reason	41	1	Binary Integer		This is a flag that indicates the reason why the request was rejected. Valid values: '0' – Message was accepted '1' – Rejected due to permissions '2' – Rejected due to invalid sequence range '3' – Rejected due to maximum sequence range (>1000) '4' – Rejected due to maximum request in a day '5' – Rejected due to maximum number of refresh requests in a day
Filler	42	2	ASCII String		This is filler, reserved for future use.

**A.10
Retransmission
Message**

Upon receipt of a valid retransmission request message, the requested message(s) will be sent. This message(s) has the same message format and content as the original messages sent by the NYSE Imbalance feed, with the exception that the ‘RetransFlag’ in the header is set to the value of ‘2’, ‘4’ or ‘5’ depending on whether the retransmission is for a non-replay or a replay retransmission message, respectively.

Field Name	Offset	Size	Format	Value	Description
Set forth below are the ‘header’ fields of the Retransmitted Message					
MsgSize	0	2	Binary Integer	‘54’	Refer to section A.2
MsgType	2	2	Binary Integer		It will be the MsgType of the original message sent by the PDP_TRD.
MsgSeqNum	4	4	Binary Integer		Refer to section A.2
SendTime	8	4	Binary Integer		Refer to section A.2
ProductID	12	1	Binary Integer	‘116’	Refer to section A.2
RetransFlag	13	1	Binary Integer	‘2’,‘4’ or ‘5’	Refer to section A.2
NumBodyEntries	14	1	Binary Integer	Same as original message	Refer to section A.2
FILLER	15	1	ASCII String		This is filler, reserved for future use
All the ‘body’ fields of the Retransmitted Message are the same as the original message					

**A.11
Retransmission
message
processing
notes**

- All Subscribers will receive retransmission messages through the retransmission channel.
- Due to the multicast nature, subscribers will receive ‘all’ retransmission messages, including messages that were not requested by them.
- Note that when a message for a particular symbol is retransmitted, a new message **for the same symbol** may be sent through the regular channel. This scenario is very likely to occur with busy symbols and may cause confusion as to which message contains the latest information on that symbol.

In order to resolve the conflict, the following qualification method should be applied:

- a. Check the MsgSeqNum field. A retransmitted message retains the same sequence number as the original message. Even refreshes are retransmitted with the original sequence numbers for the message they belonged to.
- b. The most current sequence number (SEQNUM) contains the latest information.
- c. If the SEQNUMS are the same: messages are the same, any of the two messages contains the same information.

Please refer to B.6 Processing of line level Retransmission Messages for a suggest way of processing.

A.12 Message Unavailable

This message will be sent to inform the subscribers of unavailability of a range of messages for which they may have requested retransmission via the Retransmission Multicast channels. Below is the message format.

Field Name	Offset	Size	Format	Value	Description
Set forth below are the 'header' fields of the NYSE Packet Unavailable Message					
MsgSize	0	2	Binary Integer	'22'	Refer to section A.2
MsgType	2	2	Binary Integer	'5'	Refer to section A.2
MsgSeqNum	4	4	Binary Integer		Refer to section A.2
SendTime	8	4	Binary Integer		Refer to section A.2
ProductID	12	1	Binary Integer	'116'	Refer to section A.2
RetransFlag	13	1	Binary Integer	'1'	Refer to section A.2
NumBodyEntries	14	1	Binary Integer	'1'	Refer to section A.2
FILLER	15	1	ASCII String		This is filler, reserved for future use
Defined below are the 'body' fields of the NYSE Packet Unavailable Message					
BeginSeqNum	16	4	Binary Integer		The beginning sequence number of the requested range of messages to be retransmitted.
EndSeqNum	20	4	Binary Integer		The end sequence number of the requested range of messages to be retransmitted.

Appendix B – Message Processing

Overview

The following chapter provides workflow diagrams to simplify how the NYSE Trade messages should be processed

B.1 Processing of messages

The following is the recommended way of processing messages

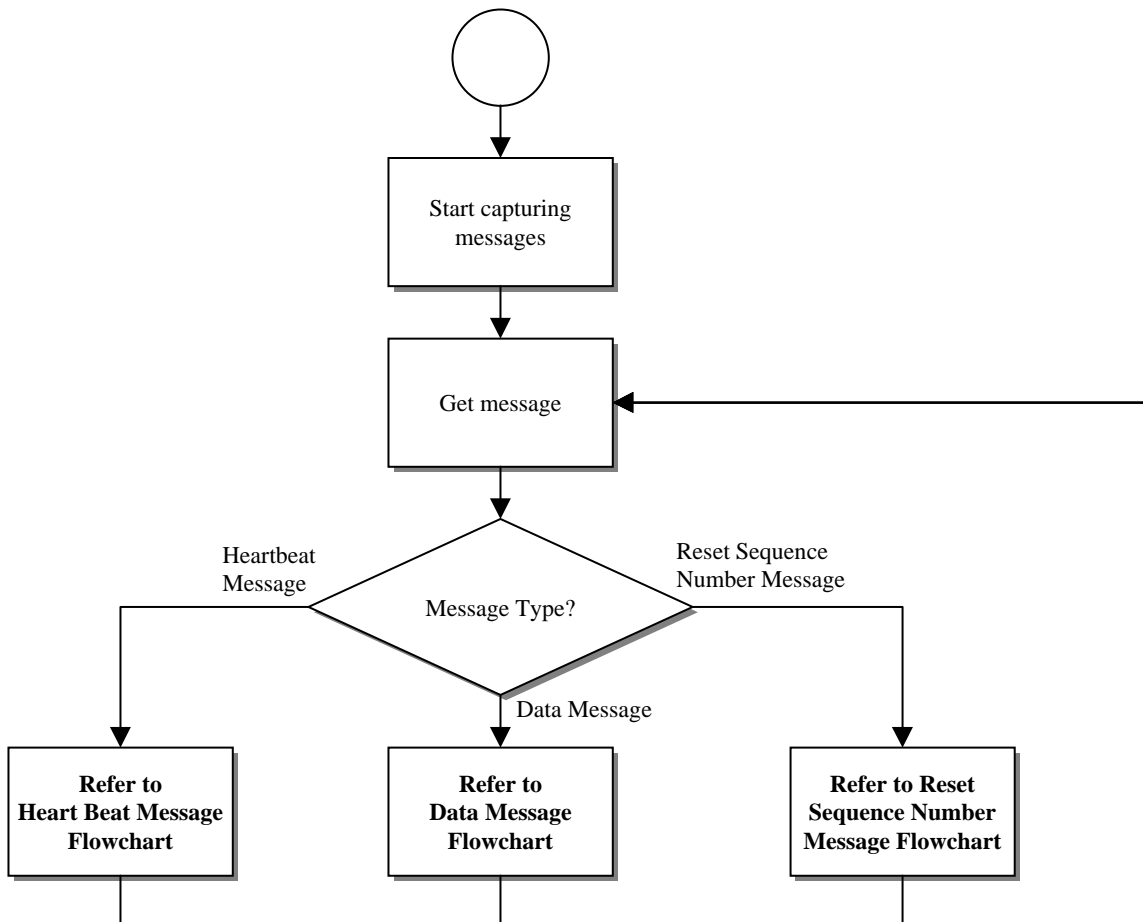


Figure 1. Processing of Messages

B.2 Processing of sequence number reset messages

The following is the recommended way of processing Sequence Number Reset Messages

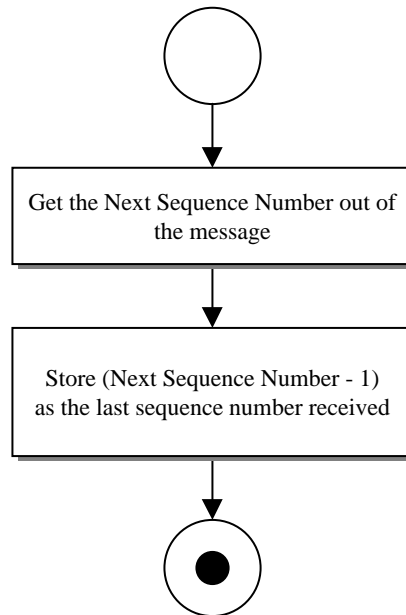


Figure 2. Processing of Sequence Number Reset Message

B.3 Processing of Heartbeat messages

The following is the recommended way of processing Heartbeat messages

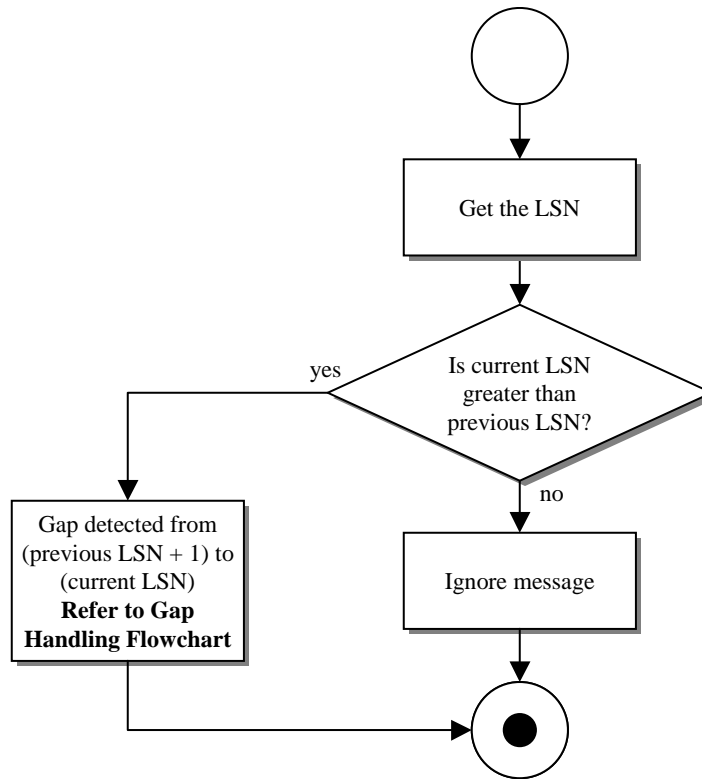


Figure 3. Processing of Heartbeat Messages

B.4 Processing of Heartbeat response messages

The following is the recommended way of processing Heartbeat messages

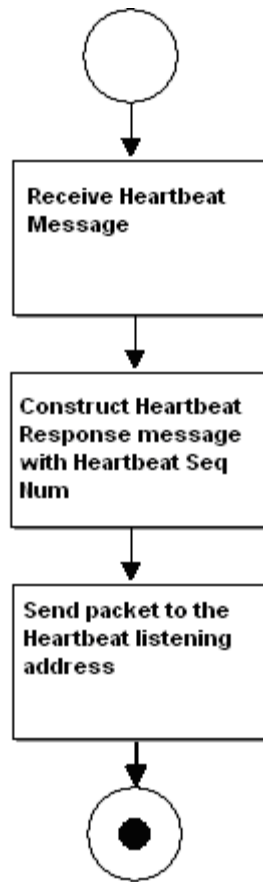


Figure 4. Processing of Heartbeat Response Messages

B.5 Processing of Heartbeat response messages

The following is the recommended way of processing Heartbeat messages

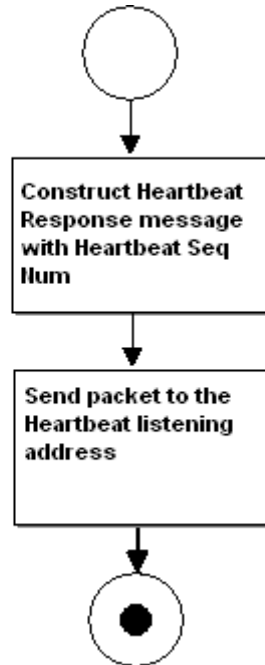


Figure 5. Processing of Heartbeat Response Messages

B.6 Processing of Data messages

The following is the recommended way of processing Data messages

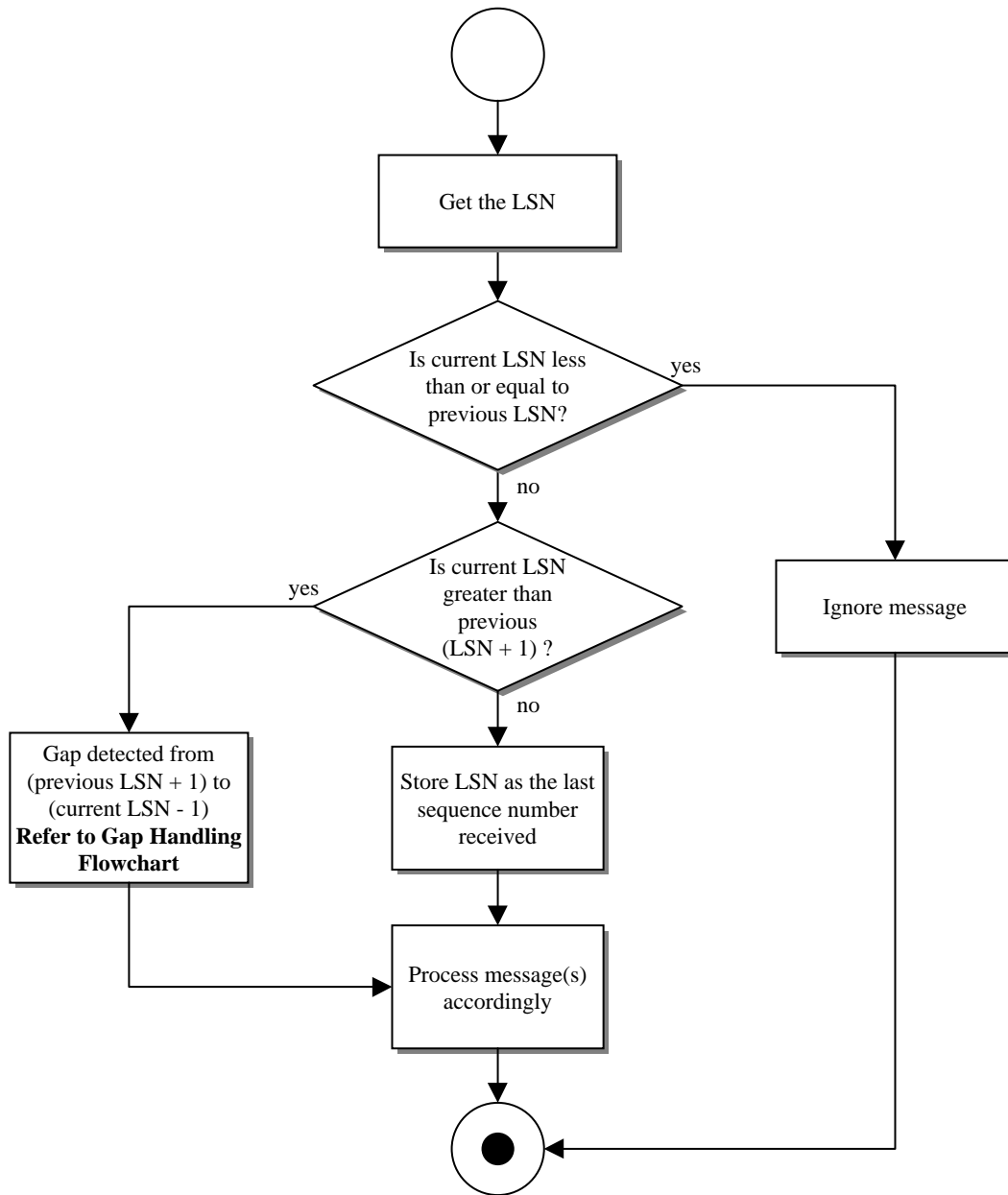


Figure 6. Processing of Data Messages

B.7 Processing of Gap handling

The following is the recommended way of handling message gaps

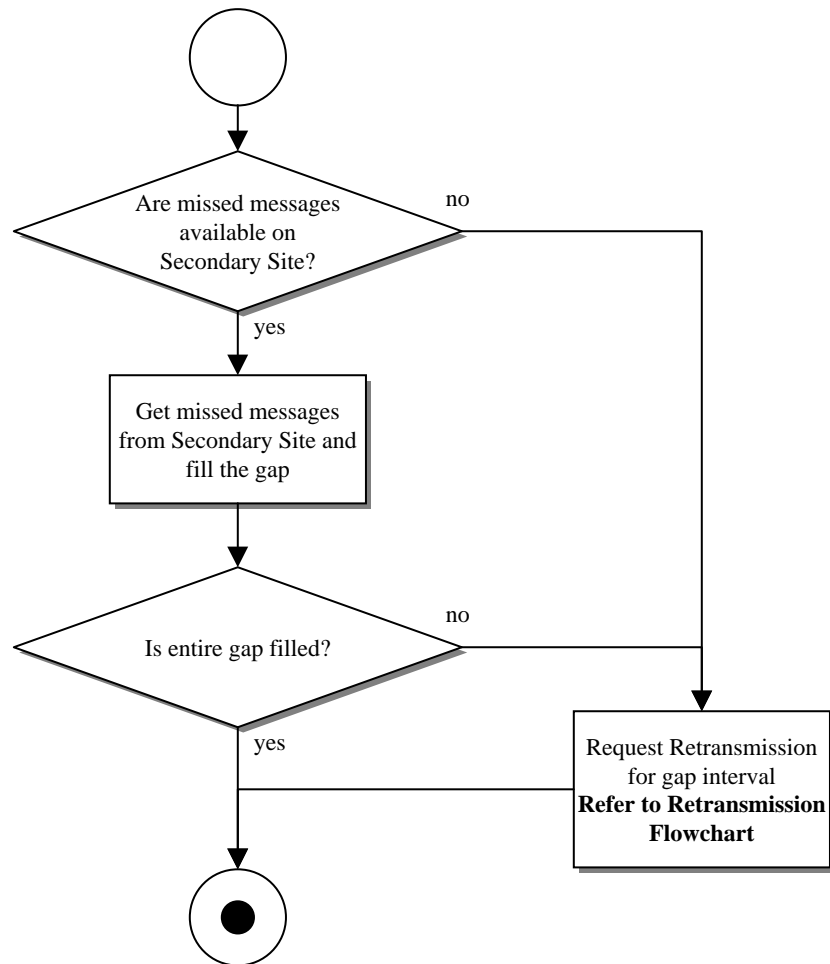


Figure 7. Processing of Gap Handling

B.8 Processing of line level retransmissions

The following is the recommended way of line level retransmissions

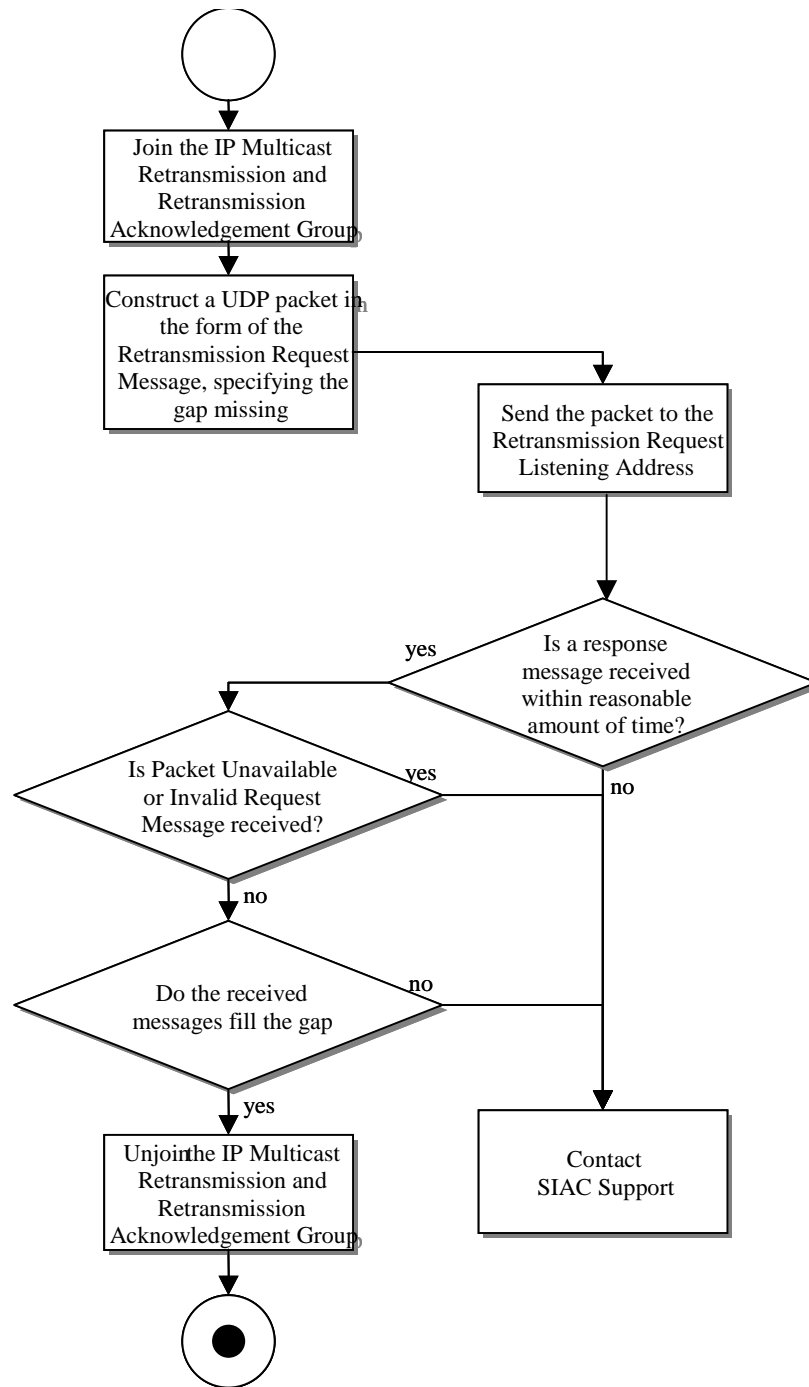


Figure 8. Processing of Line Level Retransmissions

Appendix C– Frequently Asked Questions

Overview

The following section provides information to assist subscribers with frequently asked questions concerning the NYSE Imbalance Product. For more up to date information please visit the NYSE Imbalance discussion board on

<http://www.nyxdata.com/nysedata/Support/DiscussionBoard/tabid/108/view/topics/forumid/40/Default.aspx>

Q: What is the average message size?

The Opening Imbalance Message is 48 bytes long and the Closing Imbalance Message is 52 bytes long.

Q: What is the process to define a Source ID for retransmission purposes?

A: Contact SIAC Support and provide the desired Source ID. SIAC Support will evaluate and approve or disapprove the Source ID. In case of disapproval, a new Source ID has to be defined. In case of approval, SIAC Support will make the necessary updates on the product provider side to add the Source ID and applicable rules.

Q: What is the average message rate (messages per second) seen in a normal day for Imbalance?

A: Refer to the NYSE Imbalance Impact Guide in chapter 2.

Q: What is the average number of messages seen in a normal day?

A: Refer to the NYSE Imbalance Impact Guide in chapter 2.

Q: Will retransmitted data ever come down the normal data feed?

A: No, retransmitted data will always be sent out on the designated retransmission IP/Multicast address/port.

Q: Are the Primary and Secondary feeds identical?

A: The feeds are not identical because they are distributed from 2 (two) different source addresses. However, the data content (like the sequence numbers and message content) are the same and can be used to fill gaps.

Q: We continue to see gaps in the feed even though our network is isolated and our server is underutilized. What could it be?

A: Although collisions are very rare, it is possible to have message gaps due to them. However, it is more likely that your multicast receiver is gapping during a message burst. This may be due to a UDP buffer overflow. SIAC recommends that Subscribers increase the standard UDP buffer setting to capture this burst.

Q: We sent several retransmissions request during the day and they were fulfilled, but now our retransmission requests are no longer being filled. What could it be?

A: Please contact SIAC Support to reactivate your Retransmission ID, as your application may have reached the retransmission thresholds as specified in Chapter 3 – section 3.1.7

Q: Do I need to establish a TCP/IP connection? Do I need to do this on a daily basis?

A: Yes, a TCP/IP connection is needed for requesting retransmissions of any kind, e.g., dropped packets, book refresh, symbol mappings, etc.