

NYSE Amex Order Imbalances Client Specification

Version 1.3a

April 27, 2010

PREFACE

DOCUMENT HISTORY

Document Version	Date	Change Description
1.0	11/17/2008	Final version for distribution
1.1	06/22/2009	Publication Rules change
1.2	11/30/2009	Added UAT Environment IPs Removal MsgType 242 Addition of Clearing price fields to msg Type 240, 241 Added HeartBeat Subscription msg type '19' Heartbeat timer updated to 60secs Added example for Clearing Price MsgSize updated on Opening/Closing imbalance msgs
1.3	01/25/2010	Correction to the test Retrans Request IP address Correction to msg sizes for msg type 240, 241 it should be 50 and 54 instead of 48 and 52 bytes
1.3a	04/27/2010	Formatted into new template IP addresses removed and link to IP Addresses page added

REFERENCE MATERIAL

The following lists the associated documents, which either should be read in conjunction with this document or which provide other relevant information for the user:

- [SFTI US Technical Specification](#)
- [SFTI US Customer Guide](#)
- [NYSE Symbology](#)

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FURTHER INFORMATION

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

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

For details of IP addresses, please visit our IP address pages at: <http://www.nyxdata.com/ipaddresses>

For a full glossary, see <http://www.nyxdata.com/glossary/>

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1 INTRODUCTION

The NYSE Amex Order Imbalances data feed is a separate data feed which publishes Opening and Closing imbalances automatically at specified intervals throughout the trading day for all NYSE Amex- listed securities.

2 NYSE AMEX ORDER IMBALANCES FEED CONFIGURATION

The following chapter provides connectivity information for the NYSE Amex Order Imbalances feed.

2.1 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.

Table 1 Multicast Groups

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

2.2 JOINING MULTICAST GROUPS

To access the NYSE Amex Order 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 [Packet Retransmissions](#)). See [Message Processing](#) 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. The data feed types are:

- Multicast NYSE Amex Imbalances
- Multicast Retransmission.

2.3 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 Amex Order Imbalances 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 Amex Order Imbalances 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 30 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 Amex Order Imbalances 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 Service Desk and provide the desired Source ID. The Service Desk will evaluate and approve or reject the Source IDs. If rejected, a new Source ID must be defined. If approved, the Service Desk will make the necessary updates on the NYSE Amex Imbalances application side to add the Source ID and applicable rules.

2.4 RETRANSMISSION REQUEST THRESHOLDS

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

Table 2 Retransmission Request Thresholds

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 the Service Desk 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.

2.5 NYSE AMEX ORDER IMBALANCES TESTING

Replay tests are generally run at night (**Tuesday and Thursday from 7:00pm to 9:00pm**) 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.

2.6 NYSE AMEX ORDER IMBALANCES UAT TESTING

Replay tests in the User Acceptance environment are generally run intra-day Monday through Friday from 9:00am to 5:00pm 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 NYSE AMEX ORDER IMBALANCES OPERATIONAL INFORMATION

3.1 PUBLICATION PERIOD

The following section specifies the frequency and publication period for each message type disseminated by the NYSE Amex Order Imbalances product.

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

Table 3 Publication Period

Message	Message Type	Publication Period
NYSE Amex 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 seconds between 9:20am EST and 9:35am EST</p>
NYSE Amex Closing Imbalances	241	<p>Closing Imbalance messages are disseminated every 5 seconds between 3:45pm EST and 4:00pm EST (or until Market close on early closing days).</p> <p>Please check the NYSE website for any changes to trading hours.</p>

3.2 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.

3.3 DUAL SITE

NYSE Amex Order Imbalances data will be published using two (2) sets of unique IP Multicast Group IDs—each originating from a separate distribution site. Thus, when appropriate, each NYSE Amex Order 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.

4 NYSE AMEX ORDER IMBALANCES MESSAGE SPECIFICATIONS

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

4.1 DATA DELIVERY FORMAT

The NYSE Amex Order Imbalances 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 Amex Order Imbalances Subscribers.

4.2 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.

4.3 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.

4.4 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

4.5 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.

4.6 NYSE AMEX ORDER IMBALANCES DATA MESSAGES

The following table contains a list of the message types contains in the NYSE Amex Order Imbalances feed.

Table 4 NYSE Amex Order Imbalances Data Messages

Message Type	Description
240	<p>Interest Included:</p> <p>All electronic interest eligible to trade in the opening including DMM sQuotes at the Reference Price. Odd-lot interest is excluded.</p> <p>Calculation:</p> <p>Reference price is equal to the last sale (previous closing price) unless there is a Rule 15 or Mandatory indication published.</p> <p>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:</p> <p>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</p> <p>Continuous Book Clearing Price is the price closest to Reference Price where imbalance is zero.</p> <p>Closing Only Clearing Price is defined as the closing only interest where price closest to last sale where imbalance is zero.</p>

4.7 NYSE AMEX ORDER IMBALANCES DATA EXCEPTIONS

The following are situations in which no imbalance information will be disseminated:

1. If the NYSE Amex 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.

4.8 MESSAGE HEADER FORMAT

All messages are preceded by a standard header format. The table describes the header fields of a NYSE Amex Order Imbalance message.

Table 5 Message Header Format

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 Amex Opening Imbalance Message - '48 Bytes' NYSE Amex Closing Imbalance Message – '52 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 Amex Opening Imbalance Message '241' – NYSE Amex 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 Amex Order Imbalances 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

Field	Offset	Size (Bytes)	Format	Description
				number of bytes in the message body will be 8
FILLER	15	1	ASCII String	This is a filler, reserved for future use

4.9 NYSE AMEX OPENING IMBALANCE MESSAGE

The table below describes the body fields of a NYSE Amex Opening Imbalance message (**MsgType '240'**) for additional messages such as sequence number reset, retransmission etc, see [Common PDP Message Structure](#).

Table 6 NYSE Amex Opening Imbalance Message Format

Field Name	Offset	Size (Bytes)	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 denomcode is 1. - For price 13, the code 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.

Field Name	Offset	Size (Bytes)	Format	Description
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

4.10 NYSE AMEX CLOSING IMBALANCE MESSAGE

The table below describes the body fields of a NYSE Amex Closing Imbalance message (**MsgType '241'**) for additional messages such as sequence number reset, retransmission etc, see [Common PDP Message Structure](#).

Table 7 NYSE Amex Closing Imbalance Message Format

Field Name	Offset	Size (Bytes)	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 denomcode is 1. - For price 13, the code 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

Field Name	Offset	Size (Bytes)	Format	Description
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

5 MESSAGE EXAMPLES

The following section provides examples of the data content for the NYSE Amex Order Imbalances product and discusses the following scenarios:

1. Opening Imbalance message for stock ABC
2. Closing Imbalance message for stock DEF Preferred A.

5.1 SCENARIO 1

The following scenario displays what a message would look like for an Opening Imbalance message for stock ABC:

Table 8 Opening Imbalance message for stock ABC

Field Name	Value
MsgSize	46
MsgType	240
MsgSeqNum	2
SendTime	41000250
ProductId	116
RetransFlag	1
NumBodyEntries	1
Filler	N/A
Symbol	ABC\0\0\0\0\0\0\0\0\0\0\0\0
StockOpenIndicator	0
ImbalanceSide	B
PriceScaleCode	2
ReferencePriceNumerator	6538
ImbalanceQuantity	5000
PairedQuantity	1000
ContinuousBookClearingPrice	6750
SourceTime	41000248□

5.2 SCENARIO 2

The following scenario displays what a message would look like for a Closing Imbalance for Stock DEF Preferred A:

Table 9 Closing Imbalance message for stock DEF Preferred A

Field Name	Value
MsgSize	46
MsgType	241
MsgSeqNum	2
SendTime	57595676
ProductId	116

Field Name	Value
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

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 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.

Table 10 Common Message Header Format

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 Amex Opening Imbalance Message.- '48 Bytes' NYSE Amex Closing Imbalance Message.- '52 Bytes'
MsgType	2	2	Binary Integer	This field identifies the type of message '1' – Sequence Number Reset

Field	Offset	Size (Bytes)	Format	Description
				'2' – Heartbeat Message '5' – Message Unavailable '10' – Retransmission Response message '20' – Retransmission Request Message '22' – Refresh Request Message '24' – Heartbeat Response Message '240' – NYSE Amex Opening Imbalance Message '241' – NYSE Amex 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 Amex Order Imbalances 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.

Table 11 Sequence Number Reset Message Format

Field Name	Offset	Size (Bytes)	Format	Value	Description
Set forth below are the 'header' fields of the Sequence Number Reset Message					
MsgSize	0	2	Binary Integer	18	See Common Message Header Format

Field Name	Offset	Size (Bytes)	Format	Value	Description
MsgType	2	2	Binary Integer	'1'	See Common Message Header Format
MsgSeqNum	4	4	Binary Integer		See Common Message Header Format
SendTime	8	4	Binary Integer		See Common Message Header Format
ProductID	12	1	Binary Integer	'116'	See Common Message Header Format
RetransFlag	13	1	Binary Integer	'1'	See Common Message Header Format
NumBodyEntries	14	1	Binary Integer	'1'	See Common Message Header Format
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.3.1 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 Amex Order Imbalances 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). See [Processing of Sequence Number Reset Messages](#) for a suggest way of processing.

A.4. 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.

Table 12 Heartbeat Message Format

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

A.4.1 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.

See [Processing of Heartbeat Messages](#) for a suggest way of processing.

A.5. 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 NYSE Amex know that the connection is still alive. Subscribers must respond to these heartbeat requests with a heartbeat response message

Table 13 Heartbeat Response Message Format

Field Name	Offset	Size (Bytes)	Format	Value	Description
Set forth below are the 'header' fields of the Generic Retransmission Request Message					
MsgSize	0	2	Binary Integer	'34'	See Common Message Header Format
MsgType	2	2	Binary Integer	'24'	See Common Message Header Format
MsgSeqNum	4	4	Binary Integer		See Common Message Header Format
SendTime	8	4	Binary Integer		See Common Message Header Format
ProductID	12	1	Binary Integer	'116'	See Common Message Header Format
RetransFlag	13	1	Binary Integer	'1'	See Common Message Header Format
NumBodyEntries	14	1	Binary Integer	'1'	See Common Message Header Format
FILLER	15	1	ASCII String		This is a 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.6. Retransmission Request Message

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

Table 14 Retransmission Request Message Format

Field Name	Offset	Size (Bytes)	Format	Value	Description
Set forth below are the 'header' fields of the Generic Retransmission Request Message					
MsgSize	0	2	Binary Integer	'42'	See Common Message Header Format
MsgType	2	2	Binary Integer	'20'	See Common Message Header Format
MsgSeqNum	4	4	Binary Integer		See Common Message Header Format
SendTime	8	4	Binary Integer		See Common Message Header Format
ProductID	12	1	Binary Integer	'116'	See Common Message Header Format
RetransFlag	13	1	Binary Integer	'1'	See Common Message Header Format
NumBodyEntries	14	1	Binary Integer	'1'	See Common Message Header Format
FILLER	15	1	ASCII String		This is a 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

Field Name	Offset	Size (Bytes)	Format	Value	Description
					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.7. 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 just the acceptance or rejection of the request message.

Table 15 Retransmission Response Message Format

Field Name	Offset	Size (Bytes)	Format	Value	Description
Set forth below are the 'header' fields of the NYSE Amex Retransmission Response Message					
MsgSize	0	2	Binary Integer	'42'	See Common Message Header Format
MsgType	2	2	Binary Integer	'10'	See Common Message Header Format
MsgSeqNum	4	4	Binary Integer		See Common Message Header Format
SendTime	8	4	Binary Integer		See Common Message Header Format
ProductID	12	1	Binary Integer	'116'	See Common Message Header Format
RetransFlag	13	1	Binary Integer	'1'	See Common Message Header Format
NumBodyEntries	14	1	Binary Integer	'1'	See Common Message Header Format
FILLER	15	1	ASCII String		This is a filler, reserved for future use
Defined below are the 'body' fields of the NYSE Amex 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

Field Name	Offset	Size (Bytes)	Format	Value	Description
					'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 a filler, reserved for future use.

A.8. 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 Amex Order Imbalances 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-reply or a replay retransmission message, respectively.

Table 16 Retransmission Message Format

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

A.8.1 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:

- 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.
- The most current sequence number (SEQNUM) contains the latest information.
- If the SEQNUMS are the same: messages are the same, any of the two messages contains the same information.

See [Processing of Line Level Retransmissions](#) for a suggest way of processing.

A.9. 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.

Table 17 Message Unavailable Message Format

Field Name	Offset	Size (Bytes)	Format	Value	Description
Set forth below are the 'header' fields of the NYSE Amex Packet Unavailable Message					
MsgSize	0	2	Binary Integer	'22'	See Common Message Header Format
MsgType	2	2	Binary Integer	'5'	See Common Message Header Format
MsgSeqNum	4	4	Binary Integer		See Common Message Header Format
SendTime	8	4	Binary Integer		See Common Message Header Format
ProductID	12	1	Binary Integer	'116'	See Common Message Header Format
RetransFlag	13	1	Binary Integer	'1'	See Common Message Header Format
NumBodyEntries	14	1	Binary Integer	'1'	See Common Message Header Format
FILLER	15	1	ASCII String		This is a filler, reserved for future use
Defined below are the 'body' fields of the NYSE Amex 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.

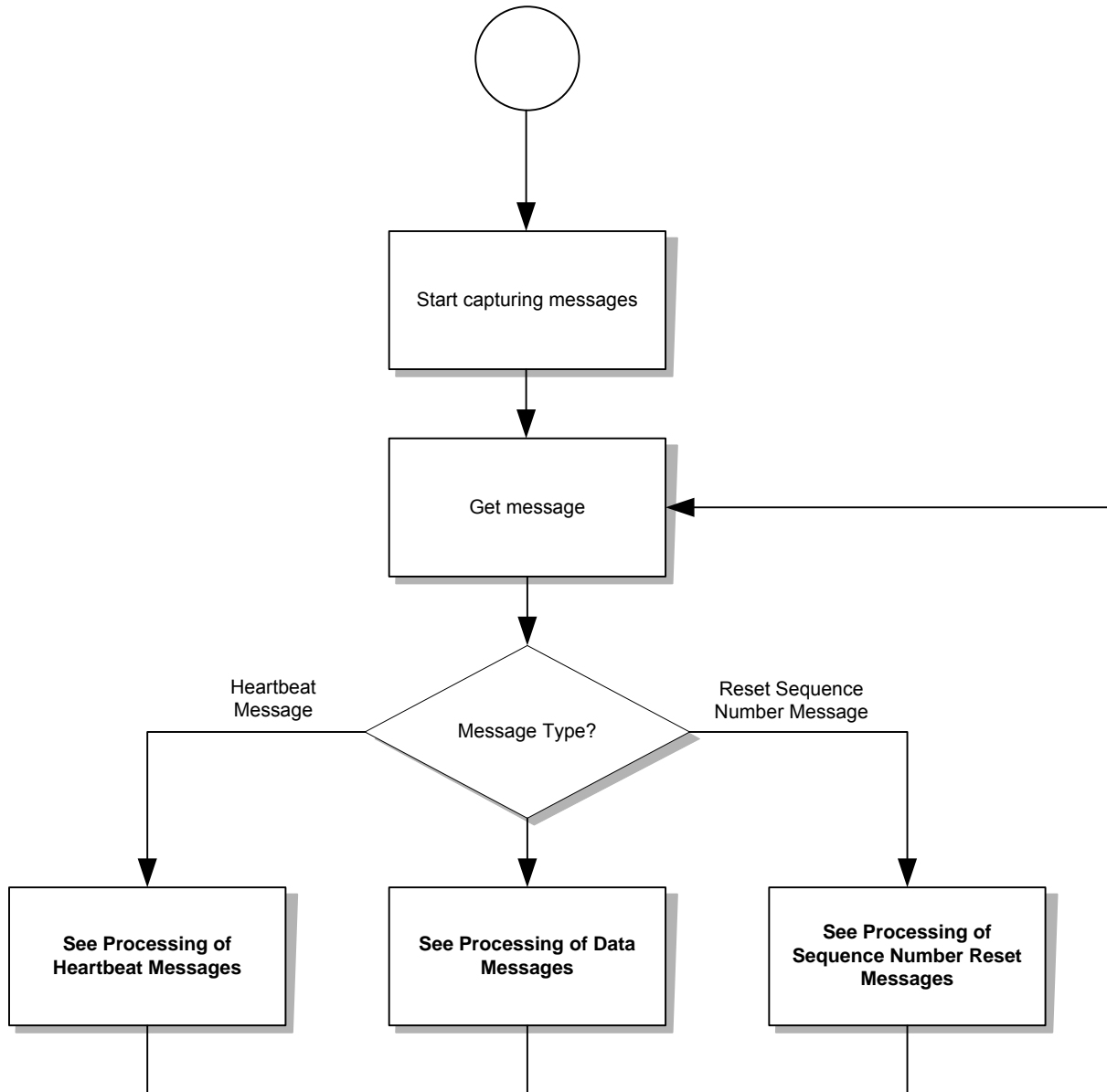
APPENDIX B MESSAGE PROCESSING

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

B.1. Processing of Messages

The following is the recommended way of processing messages:

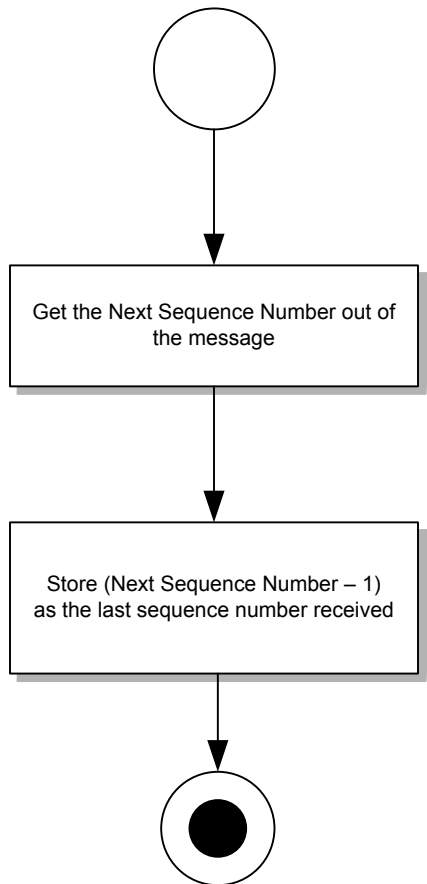
Figure 1 Message Processing



B.2. Processing of Sequence Number Reset Messages

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

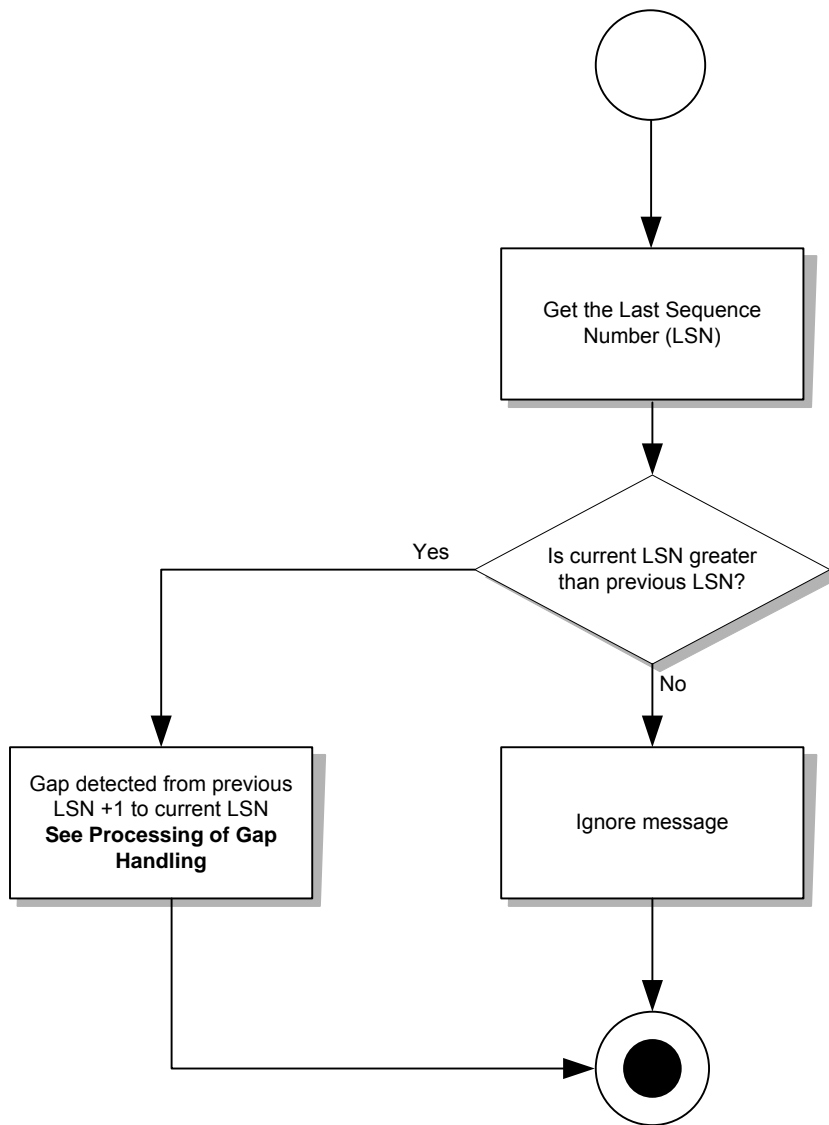
Figure 2 Sequence Number Reset Message Processing



B.3. Processing of Heartbeat Messages

The following is the recommended way of processing Heartbeat messages:

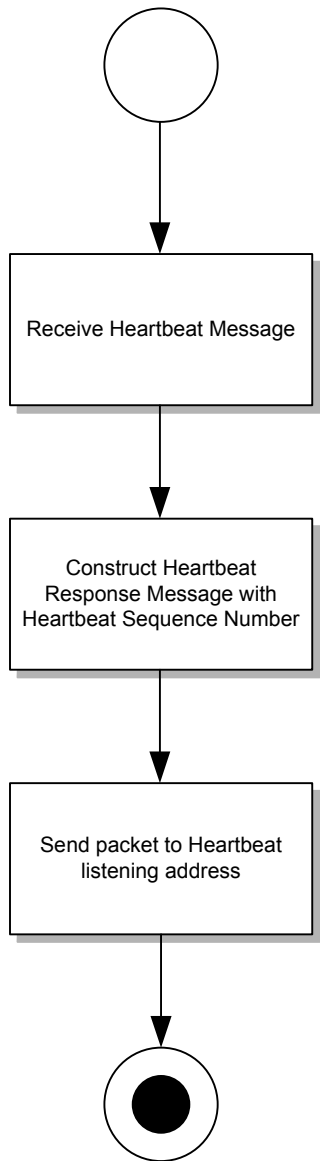
Figure 3 Heartbeat Message Processing



B.4. Processing of Heartbeat Response Messages

The following is the recommended way of processing Heartbeat messages

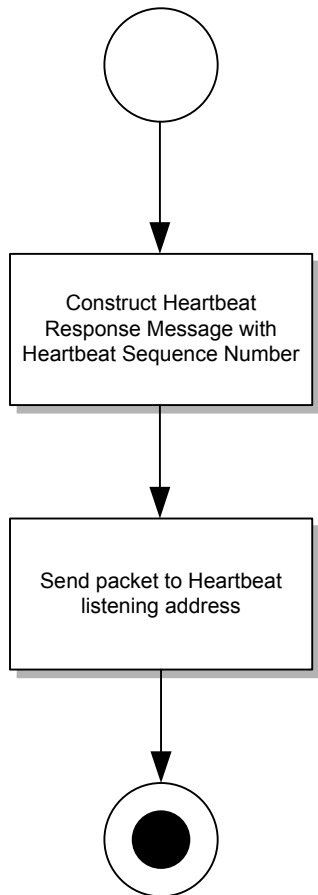
Figure 4 Heartbeat Response Message Processing



B.5. Processing of Heartbeat Response Messages

The following is the recommended way of processing Heartbeat messages:

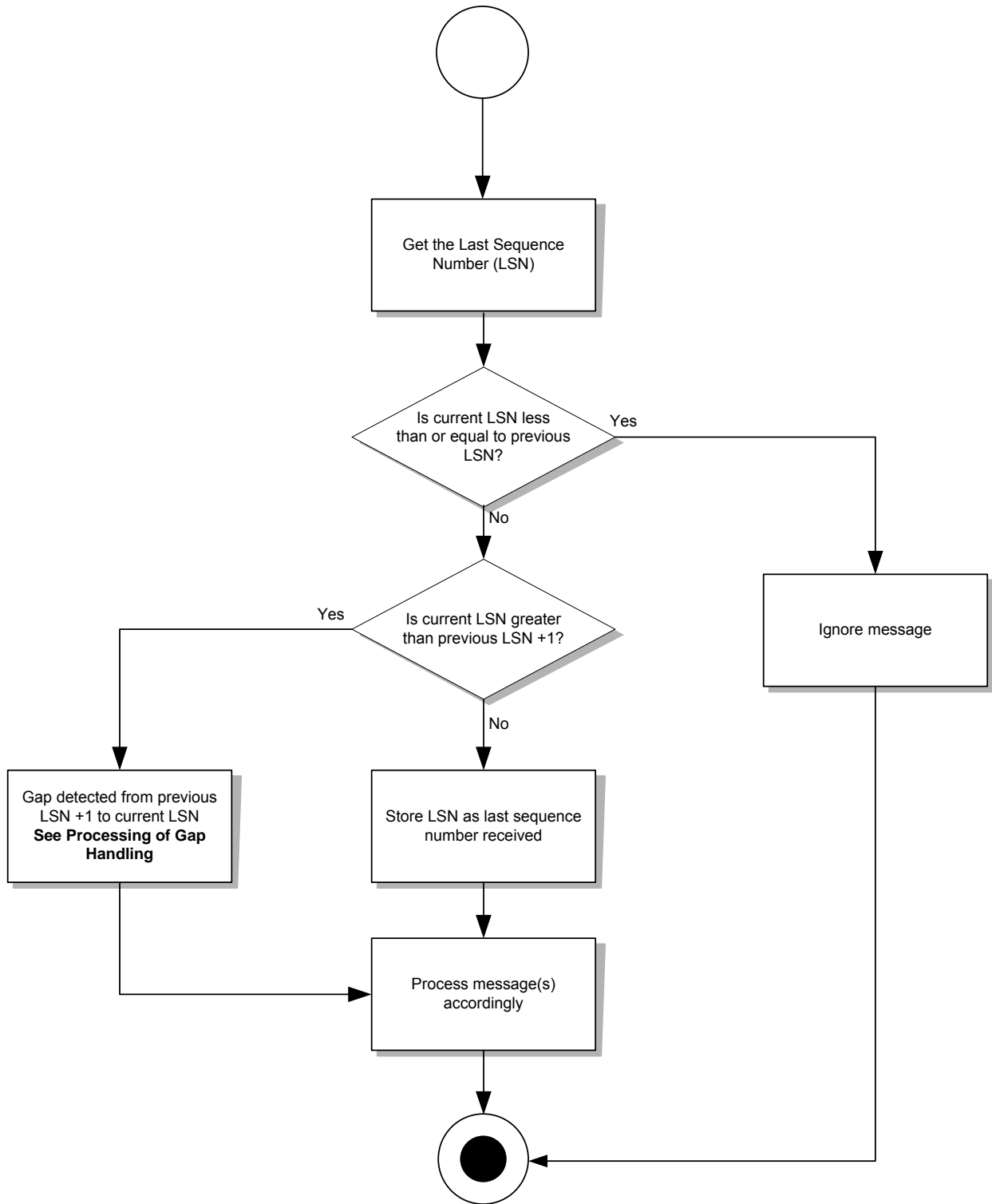
Figure 5 Heartbeat Response Message Processing



B.6. Processing of Data Messages

The following is the recommended way of processing Data messages:

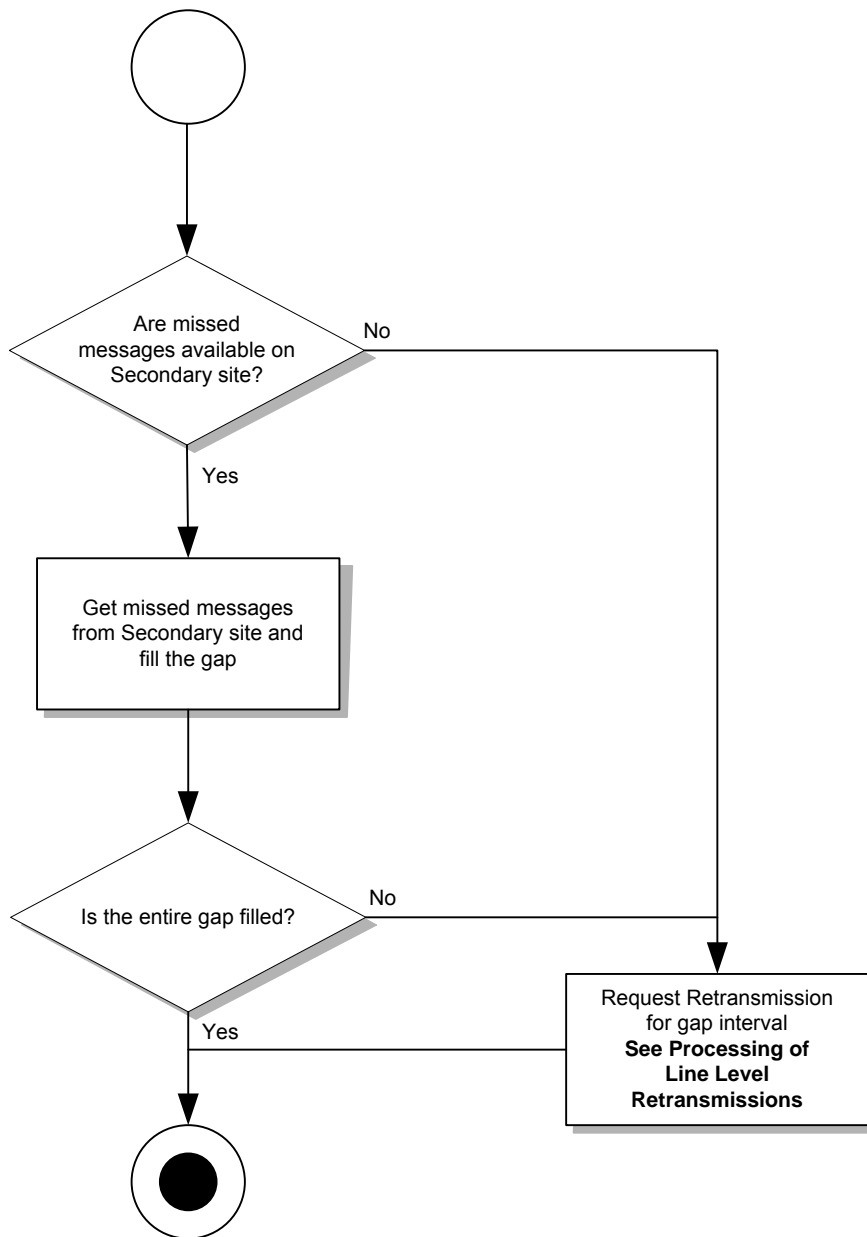
Figure 6 Data Message Processing



B.7. Processing of Gap Handling

The following is the recommended way of handling message gaps:

Figure 7 Message Gap Handling



B.8. Processing of Line Level Retransmissions

The following is the recommended way of line level retransmissions:

Figure 8 Line Level Retransmission Processing

