

Document title

NYSE BEST BID AND OFFER (BBO) CLIENT SPECIFICATION

Version

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PREFACE

DOCUMENT HISTORY

The following table provides a description of all changes to this document.

VERSION NO.	DATE	CHANGE DESCRIPTION
1.0	07/14/2006	Submitted for Inspection
1.1	07/28/2006	Changes based on feedback received
1.2	08/07/2006	Changes based on additional feedback received
1.3	09/05/2006	Changes based on inspection held on 9/5/06
1.4	10/06/2006	Changes based on feedback received on 10/06/06.
1.5	11/01/2006	Added retransmission bandwidth
1.6	04/09/2007	Changed Source IP addresses
1.7	11/05/2008	Changed Retrans request IP addresses
1.8	02/23/2009	Bandwidth Recommendation change
1.8a	04/26/2010	Reformatted to new template IP addresses removed and link to IP Addresses page added
1.9	05/30/2012	Added 'RPI Interest' field to Table 6 (Message Body format) and reduced 'Filler' field size to 3 bytes. Artwork updated throughout
	09/03/2012	Rebranded with new NYSE Technologies template

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, visit: <http://www.nyxdata.com/Data-Products/NYSE-BBO>
- For updated capacity figures, visit our capacity pages at: <http://www.nyxdata.com/capacity>
- For details of IP addresses, visit our IP address pages at: <http://www.nyxdata.com/ipaddresses>
- For a full glossary, visit: <http://www.nyxdata.com/glossary/>

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1. INTRODUCTION

The NYSE BBO feed provides NYSE Quotes (best bid/ask quotations) for all NYSE-traded securities as part of the NYSE OpenBook product offering.

For no additional fees, customers of NYSE OpenBook can choose to receive the NYSE Best Quote directly from NYSE rather than through the Consolidated Quotation System (CQS). This means that firms will be provided a complete liquidity picture containing both depth of book and best market quote interest directly and more efficiently than ever before. The NYSE best market quote differs from top of book information in that it contains not only limit orders on the book but specialist and Floor Broker interest that is not on the book.

If you already are a NYSE Real-Time OpenBook customer, you are already provisioned to receive the NYSE Quotes data feed and just need the specifications for IP address information, and so forth.

If you do not currently receive NYSE OpenBook, you will need to become a NYSE OpenBook customer in order to receive the NYSE BBO data feed.

2. NYSE BBO FEED CONFIGURATION

This chapter provides connectivity information for the NYSE BBO feed.

2.1 MULTICAST GROUPS

Due to capacity measures, the NYSE BBO data feed will be split into four (4) data streams. Each data stream will deliver a set of Best Quotes for a certain range of symbols. **Table 1** describes the categorization of the data feed.

Table 1 Multicast Groups

FEED NAME	DESCRIPTION
BQ_AC	Multicast Groups assigned to deliver quotes of symbols starting with letters A through C
BQ_DJ	Multicast Groups assigned to deliver quotes of symbols starting with letters D through J
BQ_KQ	Multicast Groups assigned to deliver quotes of symbols starting with letters K through Q
BQ_RZ	Multicast Groups assigned to deliver quotes of symbols starting with letters R through Z

2.2 JOINING MULTICAST GROUPS

Recipients' applications/hosts will be responsible for issuing multicast subscriptions to one or more of the multicast groups assigned to the PDP_BQ product. In response to each authorized subscription request, SFTI[®] network will complete the tasks associated with delivering the multicast packets from the NYSE data source to the recipients' network.

The process of subscribing to a Multicast Group ID is also known as 'joining' a multicast group. Upon session termination, the subscriber's host system should issue an 'unjoin' message. This will terminate delivery of data to that host's local network. If an application/host terminates without issuing an 'unjoin' message, the network will eventually issue a 'timeout' for the multicast group subscription that will automatically terminate delivery of the multicast packets to the host's local network.

2.3 RETRANSMISSION REQUEST THRESHOLDS

Table 2 summarizes the Retransmission request thresholds for the NYSE BBO 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 NYSE Service Desk to get a unique source ID.	N/A	Request will not be processed.
Limitation of Requests for a large number of	Only retransmission requests for 1000 messages or less will be honored.	1000	Request will not be

CAPABILITY	DESCRIPTION	THRESHOLD	ACTION
packets			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.
Limitation of requests for refresh messages	Only refresh requests for 5000 messages or less will be honored.	5000	Request will not be honored.

2.4 NYSE BBO 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.

3. NYSE BBO OPERATIONAL INFORMATION

3.1 PUBLICATION PERIOD

This section specifies the frequency and publication period for each message type disseminated by the NYSE BBO product.

Table 3 Publication Period

MESSAGE TYPE	PUBLICATION PERIOD
Best Quote	A Best Quote is generated based on events. Every BQ will be transmitted based on that event. The transmission time for the BQ is between 9:30am (EST) until market close (4:00pm (EST) for most securities). Please check the NYSE website for any changes to trading hours.

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.

For the NYSE BBO product, each data stream will have its unique set of sequence numbers. In other words, the message sequence for NYSE BBO A to C channel (BQ_AC) is independent from the message sequence of NYSE BBO D to J channel (BQ_DJ) and so on. The following is an example of sequencing for each channel.

BQ_AC : SeqNum=1, SeqNum=2, SeqNum=3, ..., SeqNum=n

BQ_DJ : SeqNum=1, SeqNum=2, SeqNum=3, ..., SeqNum=x

BQ_KQ : SeqNum=1, SeqNum=2, SeqNum=3, ..., SeqNum=m

BQ_RZ: SeqNum=1, SeqNum=2, SeqNum=3, ..., SeqNum=y

If there is a gap in the sequence of any channel, it has to be recovered independently. Therefore, if there is a sequence number gap on channel BQ_DJ, then the gap filling has to be done through the appropriate BQ_DJ retransmission channel. The same is valid for the other channels.

3.3 DUAL SITE

NYSE BBO 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 BBO 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 can be retransmitted upon request.

4. NYSE BBO MESSAGE SPECIFICATIONS

The NYSE Best Quote is a firm quote that reflects the highest bid and lowest offer in each NYSE-traded security (the NYSE BBO). The Specialist is required to maintain the NYSE Best Quote continuously for each specialty security. The size of the NYSE Best Quote is comprised of the total shares associated with the NYSE BBO based on interest on the book, in the crowd and specialist proprietary interest.

4.1 DATA DELIVERY FORMAT

The NYSE BBO service uses the push-based publishing model. This means that data will be published based on its availability. Once a Best Quote is available, it will be published to NYSE BBO' 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 (for example, 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 C, D to J, K to Q, and R 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 per channel 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 include the root and optional suffix.

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\0\0\0\0". Between the root and the suffix there will be one space. After the suffix, null values follow to fill the 16 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 BBO DATA MESSAGES

Table 4 contains a list of the message types in the NYSE BBO feed.

Table 4 NYSE Best Quotes Data Message

MESSAGE TYPE	DESCRIPTION
NYSE Best Quote	This message contains the NYSE Best Quote.

4.7 MESSAGE HEADER FORMAT

All messages are preceded by a standard header format. **Table 5** describes the header fields of a NYSE Best Quote message.

Table 5 Message Header Format

FIELD	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
MsgSize	0	2	Binary Integer	<p>This field indicates the size of the message body in bytes. The value in this field does not account for the MsgSize field size.</p> <ul style="list-style-type: none"> ■ 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' ■ Refresh Request Message – '50 bytes' ■ Quote Message - '58 Bytes'
MsgType	2	2	Binary Integer	<p>This field identifies the type of message:</p> <ul style="list-style-type: none"> ■ '1' – Sequence Number Reset ■ '2' – Heartbeat Message ■ '5' – Message Unavailable ■ '10' – Retransmission Response message ■ '20' – Retransmission Request Message

FIELD	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
				<ul style="list-style-type: none"> ■ '22' – Refresh Request Message ■ '24' – Heartbeat Response Message ■ '140' – Quote 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	'107' is the product value used in the PDP header to identify the NYSE BBO feed.
RetransFlag	13	1	Binary Integer	A flag that indicates whether this is an original, retransmitted, or 'replayed' message. Valid values include: <ul style="list-style-type: none"> ■ '1' – Original message ■ '2' – Retransmitted message ■ '3' – Message Replay ■ '4' – Retransmission of a 'replayed' message ■ '5' – Refresh Retransmission
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.

4.8 MESSAGE BODY FORMAT

Table 6 describes the body fields of a NYSE Best Quote message. For additional messages such as sequence number reset, retransmission and so forth, refer to [Common PDP Message Structure](#).

Table 6 Message Body Format

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
SourceTime	16	4	Binary Integer	This field specifies the quote generation time. The number in this field represents the number of milliseconds

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
				since midnight of the same day.
FILLER	20	3	Binary Integer	This is filler, reserved for future use.
RPI Interest	23	1	ASCII Character	<p>This field indicate the side(s) where Retail Price Indication (RPI) orders exist. The valid values are:</p> <ul style="list-style-type: none"> ■ ' ' – space representing no Retail Interest (Default) ■ 'A' - representing Retail Interest on Bid Quote ■ 'B' - representing Retail Interest on Offer Quote ■ 'C' - representing Retail Interest on both the Bid and Offer Quotes
AskPriceNumerator	24	4	Binary Integer	Ask Price for Quote
AskSize	28	4	Binary Integer	Size of the Quote on Ask side in round lots
BidPriceNumerator	32	4	Binary Integer	Bid Price for Quote
BidSize	36	4	Binary Integer	Size of the Quote on Bid side in round lots
PriceScaleCode	40	1	Binary Integer	See Prices
ExchangeID	41	1	ASCII Character	<p>The id of the originating exchange of the quote. Valid values:</p> <ul style="list-style-type: none"> ■ 'N' – NYSE
SecurityType	42	1	ASCII Character	<p>This field specifies the security type for this message. Valid values:</p> <ul style="list-style-type: none"> ■ 'E' – equity
QuoteCondition	43	1	ASCII Character	<p>Valid values:</p> <ul style="list-style-type: none"> ■ 'A' - Slow on Ask side ■ 'B' - Slow on Bid side ■ 'C' - Closing ■ 'E' - Slow on the Bid Due to an LRP or Gap Quote ■ 'F' - Slow on the Ask Due to an LRP or Gap Quote

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
				<ul style="list-style-type: none"> ■ 'H' - Slow on both Ask and Bid ■ 'N' - Non-firm quote ■ 'O' - Opening quote ■ 'R' - Regular quote ■ 'U' - Slow on the Bid and Ask Due to an LRP or Gap Quote ■ 'W' - Slow on the Bid and Ask due to a "Set Slow List"
Symbol	44	16	ASCII String	See Symbols

5.2 SCENARIO 2

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

Table 8 BestQuote for Stock DEF Preferred A

FIELD NAME	VALUE
MsgSize	58
MsgType	140
MsgSeqNum	3
SendTime	41000250
ProductId	107
RetransFlag	1
NumBodyEntries	1
Filler	N/A
SourceTime	41000000
Filler	N/A
AskPriceNumerator	6540
AskSize	300
BidPriceNumerator	6538
BidSize	200
PriceScaleCode	2
ExchangeId	N
SecurityType	E
QuoteCondition	R
Symbol	DEF PRA\0\0\0\0\0\0\0\0

APPENDIX A: COMMON PDP MESSAGE STRUCTURE

In broad terms, there are two types of messages transmitted as part of this protocol:

- **Control** Control messages do not contain data *per se*; rather, they allow conversing parties to exchange session-specific information (for example, 'reset sequence number').
- **Data** 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 Control and Data messages:

- All fields will be sent for every packet.
- Only field values will appear in the published messages (for example, 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 with the exception of the Order Book Refresh Message. 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 9 Common Message Header Format

FIELD	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
MsgSize	0	2	Binary Integer	<p>This field indicates the size of the message body in bytes. The value in this field does not account for the MsgSize field size.</p> <ul style="list-style-type: none"> ■ Sequence Number Reset – '18 Bytes' ■ Heartbeat Message – '14 Bytes' ■ Heartbeat Response Message – '34 Bytes'

FIELD	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
				<ul style="list-style-type: none"> ■ Message Unavailable – ‘22 Bytes’ ■ Retransmission Request Message – ‘42 Bytes’ ■ Retransmission Response Message – ‘42 Bytes’ ■ Refresh Request Message – ‘50 bytes’ ■ Quotes Message - ‘58 Bytes’
MsgType	2	2	Binary Integer	<p>This field identifies the type of message.</p> <ul style="list-style-type: none"> ■ ‘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 ■ ‘140’ – Quotes Message
MsgSeqNum	4	4	Binary Integer	<p>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).</p>
SendTime	8	4	Binary Integer	<p>This field specifies the time message was created by PDP. The number represents the number of milliseconds since midnight of the same day.</p>
ProductID	12	1	Binary Integer	<p>‘107’ is the product value used in the PDP header to identify the NYSE BBO feed.</p>
RetransFlag	13	1	Binary Integer	<p>A flag that indicates whether this is an original, retransmitted, or ‘replayed’ message. Valid values include:</p> <ul style="list-style-type: none"> ■ ‘1’ – Original message ■ ‘2’ – Retransmitted message ■ ‘3’ – Message Replay ■ ‘4’ – Retransmission of a ‘replayed’ message ■ ‘5’ – Refresh Retransmission
NumBodyEntries	14	1	Binary Integer	<p>The number of times the message body repeats in the message. For example, if the body consists of a field (named Volume) and the</p>

FIELD	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
				"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 10 Sequence Number Reset Message Format

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
Defined below are the 'header' fields of the Sequence Number Reset Message					
MsgSize	0	2	Binary Integer	18	See Common Message Header Format
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	'107'	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 PDP_BQ 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 [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 11 Heartbeat Message Format

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
Defined 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	'107'	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.

Please refer to [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 the NYSE know that the connection is still alive. Subscribers must respond to these heartbeat requests with a heartbeat response message.

Table 12 Heartbeat Response Message Format

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
Defined 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	'107'	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					
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 13 Retransmission Request Message Format

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
Defined below are the 'header' fields of the Generic Retransmission Request Message					
MsgSize	0	2	Binary	'42'	See Common Message Header

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
MsgType MsgSeqNum SendTime ProductID RetransFlag NumBodyEntries FILLER			Integer		Format
	2	2	Binary Integer	'20'	See Common Message Header Format
	4	4	Binary Integer		See Common Message Header Format
	8	4	Binary Integer		See Common Message Header Format
	12	1	Binary Integer	'107'	See Common Message Header Format
	13	1	Binary Integer	'1'	See Common Message Header Format
	14	1	Binary Integer	'1'	See Common Message Header Format
	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 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 QUOTE REFRESH REQUEST

This message will be sent by subscribers requesting a refresh message based on a symbol.

Subscribers shall send one request per symbol. It is imperative that the NumBodyEntries field be set to 1.

Table 14 Quote Refresh Request Message Format

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
Defined below are the 'header' fields of the Refresh Request Message					
MsgSize	0	2	Binary Integer	'50'	See Common Message Header Format

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
MsgType	2	2	Binary Integer	'22'	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	'107'	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 'header' fields of the Refresh Request Message					
Symbol	16	16	ASCII String		The symbol for which refresh is requested.
SourceID	32	20	ASCII String		This field represents the name of the source requesting retransmission. This field is null padded, left aligned.

A.8 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
Defined below are the 'header' fields of the NYSE 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

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
SendTime	8	4	Binary Integer		See Common Message Header Format
ProductID	12	1	Binary Integer	'107'	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 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: <ul style="list-style-type: none"> ■ '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: <ul style="list-style-type: none"> ■ '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

FIELD NAME	OFFSET	SIZE (BYTES)	FORMAT	VALUE	DESCRIPTION
					day
Filler	42	2	ASCII String		This is a filler, reserved for future use.

A.9 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 PDP_BQ, 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.

Table 16 Retransmission Message Format

Field Name	Offset	Size (Bytes)	Format	Value	Description
Defined 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_BQ.
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	'107'	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.9.1 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.

Please refer to [Processing of Line Level Retransmission Messages](#) for a suggest way of processing.

A.10 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
Defined below are the 'header' fields of the NYSE 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	'107'	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

Field Name	Offset	Size (Bytes)	Format	Value	Description
					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.

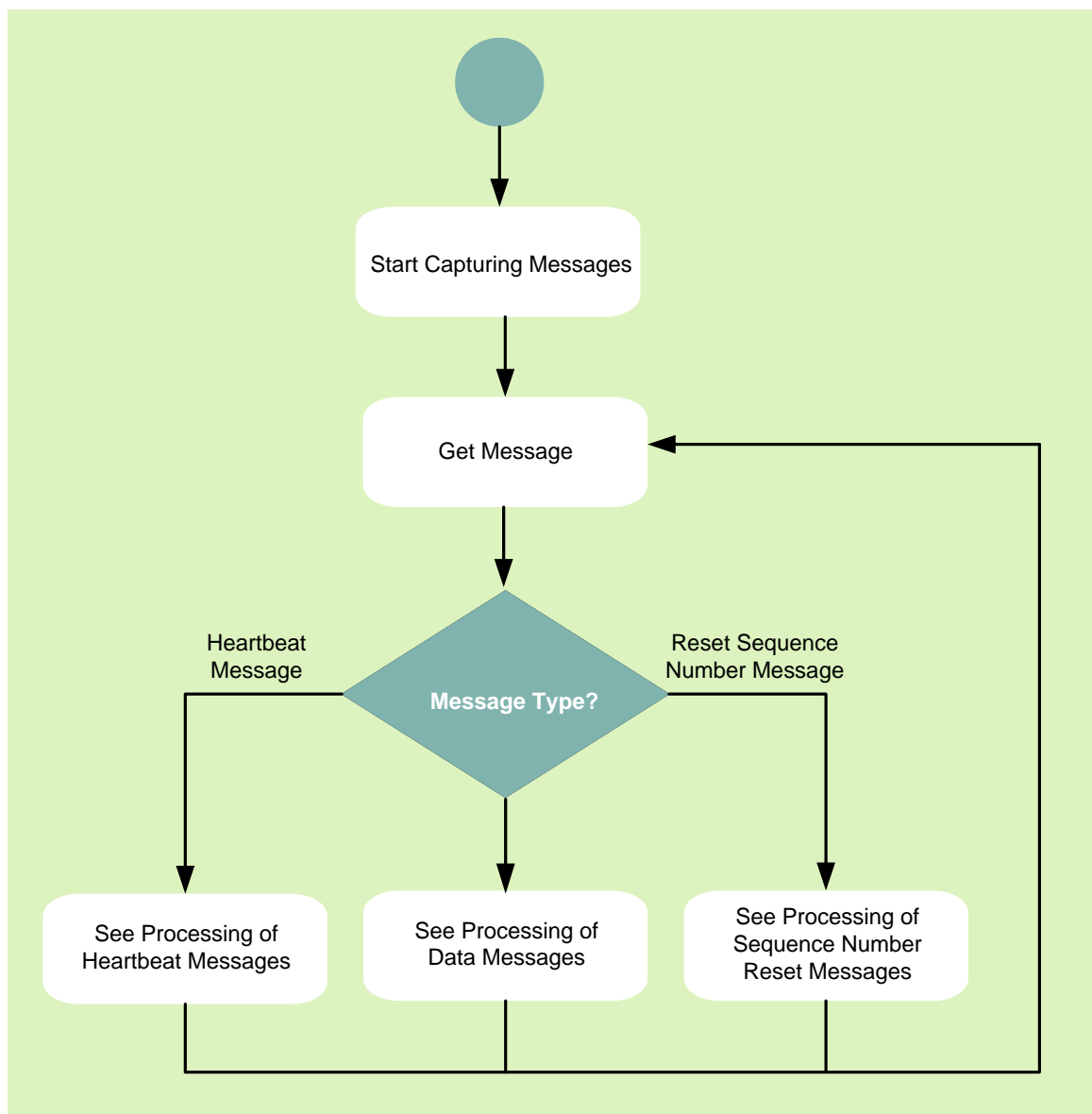
APPENDIX B: MESSAGE PROCESSING

This appendix provides workflow diagrams to simplify how the NYSE BBO data feed messages should be processed.

B.1 PROCESSING OF MESSAGES

The following is the recommended way of processing messages:

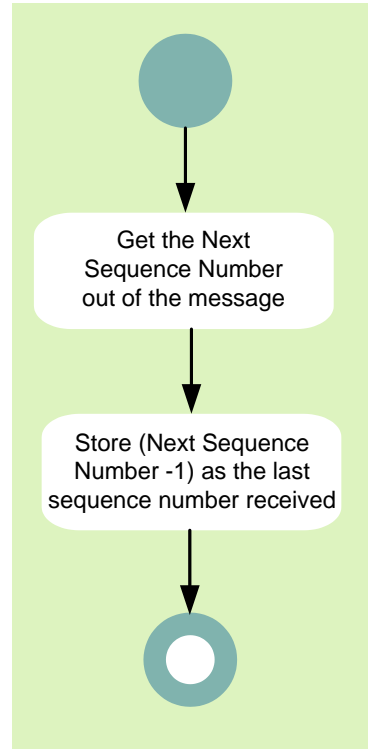
Figure 1 Message Processing



B.2 PROCESSING OF SEQUENCE NUMBER RESET MESSAGES

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

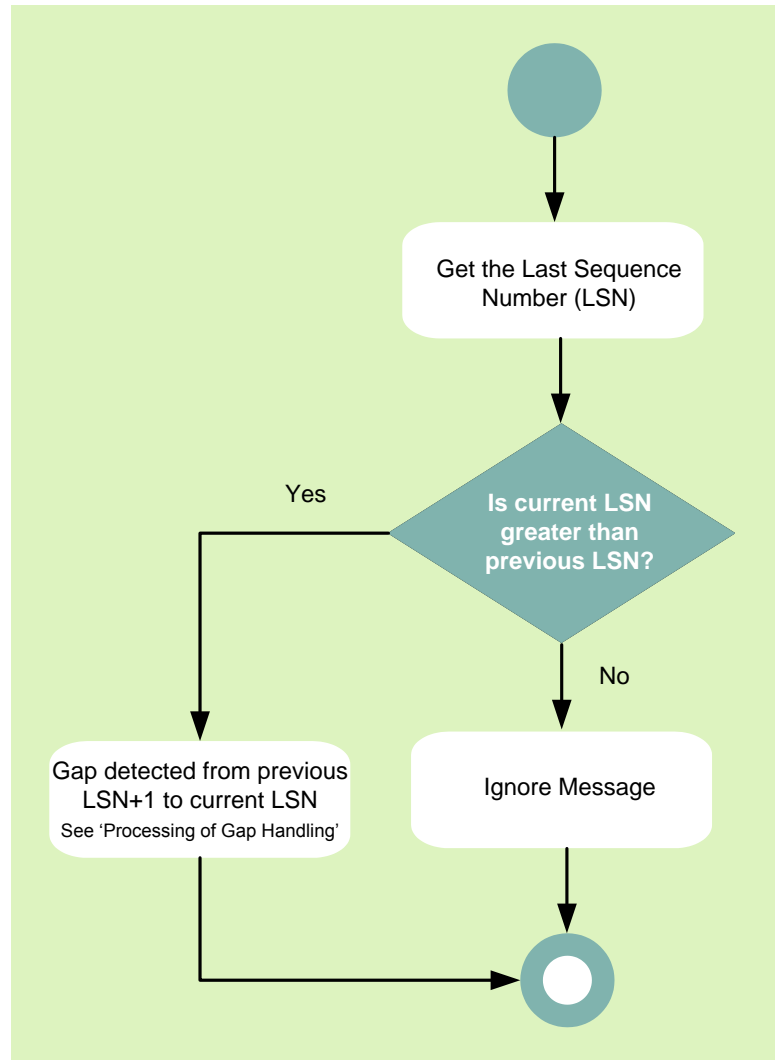
Figure 2 Sequence Number Reset Message Processing



B.3 PROCESSING OF HEARTBEAT MESSAGES

The following is the recommended way of processing heartbeat messages:

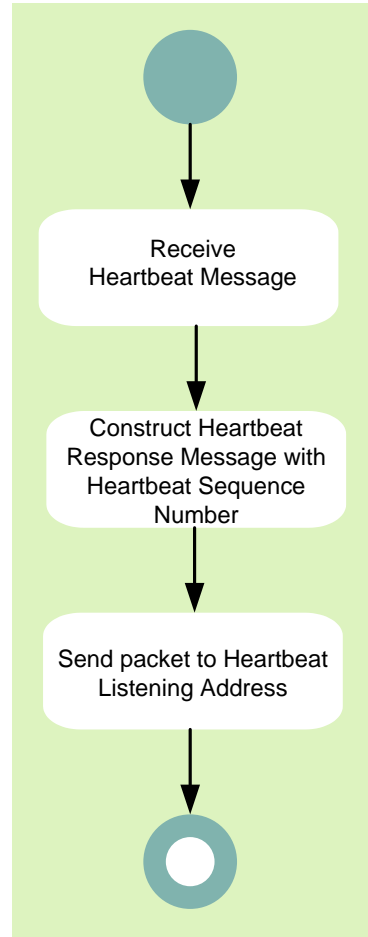
Figure 3 Heartbeat Message Processing



B.4 PROCESSING OF HEARTBEAT RESPONSE MESSAGES

The following is the recommended way of processing heartbeat response messages:

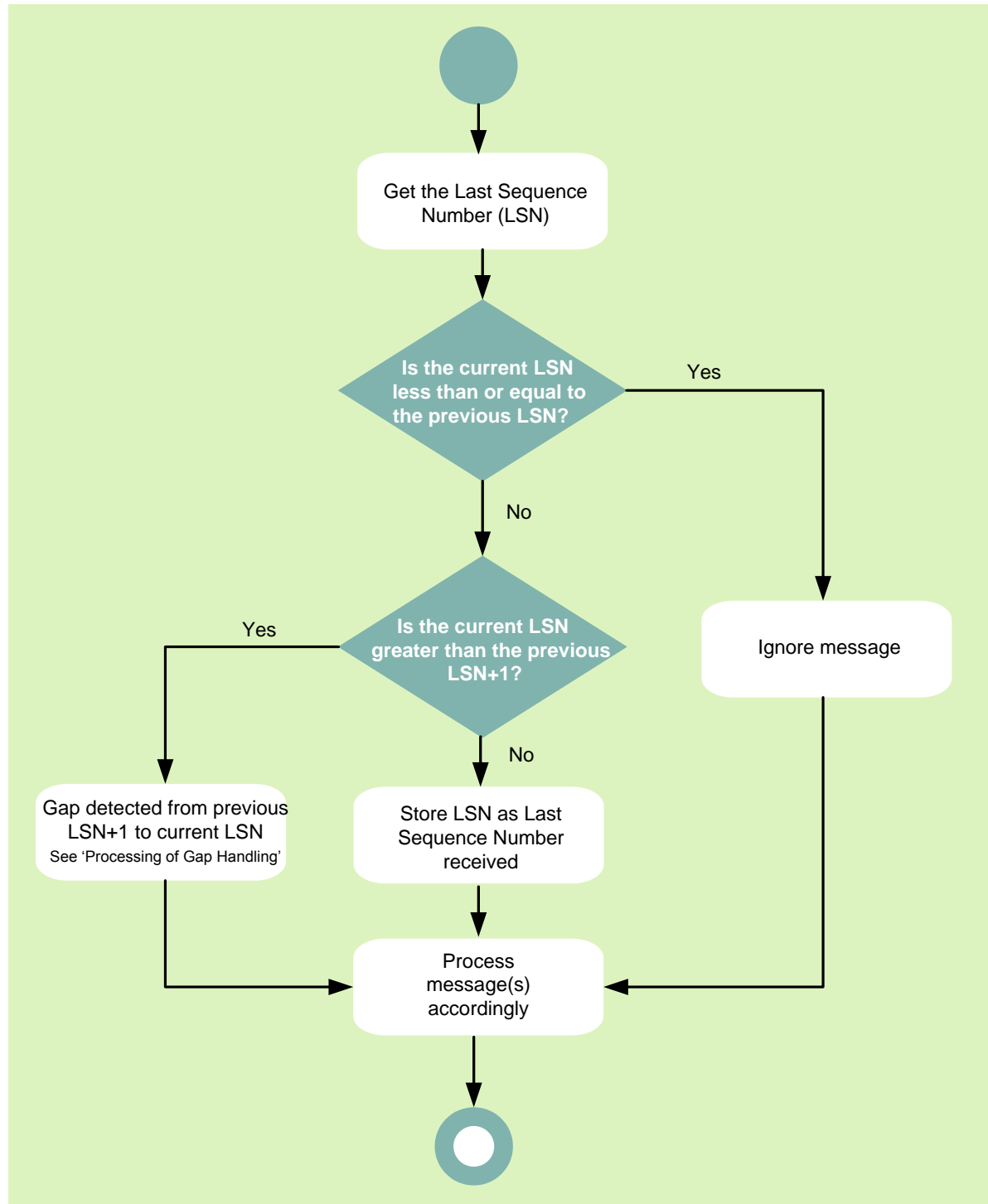
Figure 4 Heartbeat Response Message Processing



B.5 PROCESSING OF DATA MESSAGES

The following is the recommended way of processing data messages:

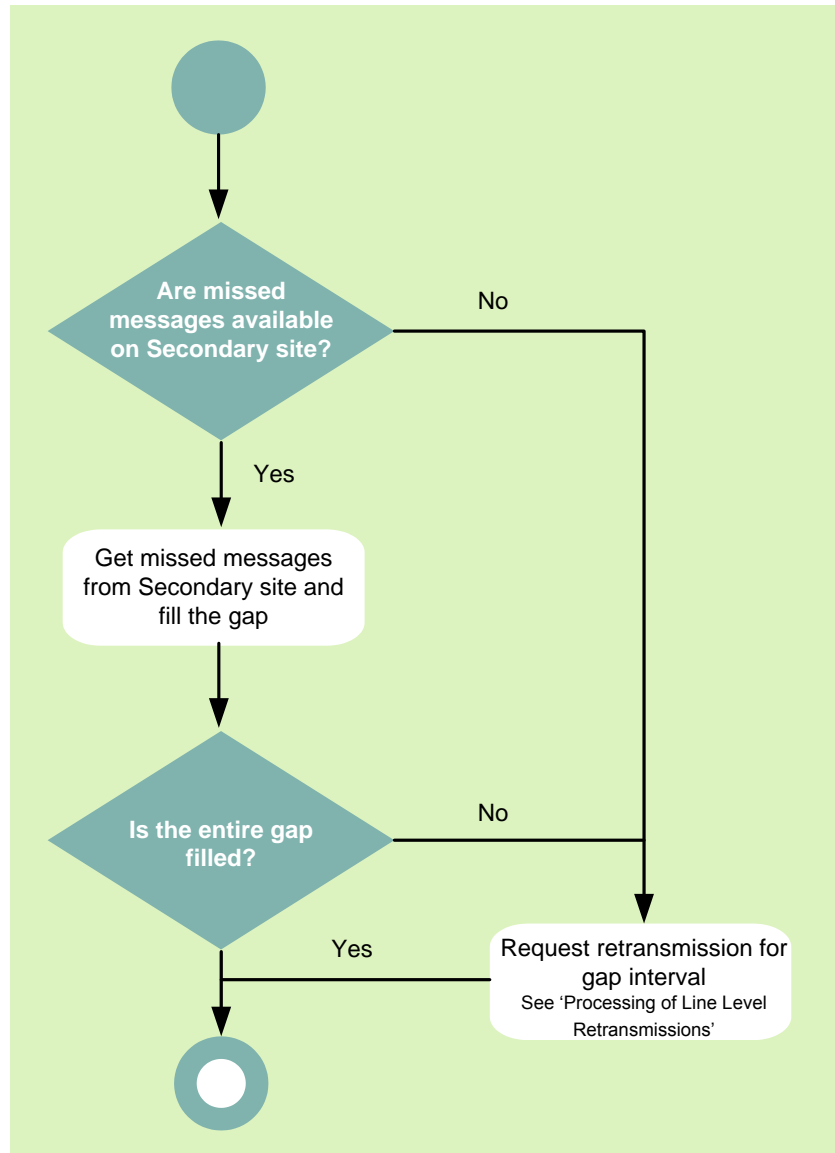
Figure 5 Data Message Processing



B.6 PROCESSING OF GAP HANDLING

The following is the recommended way of handling message gaps:

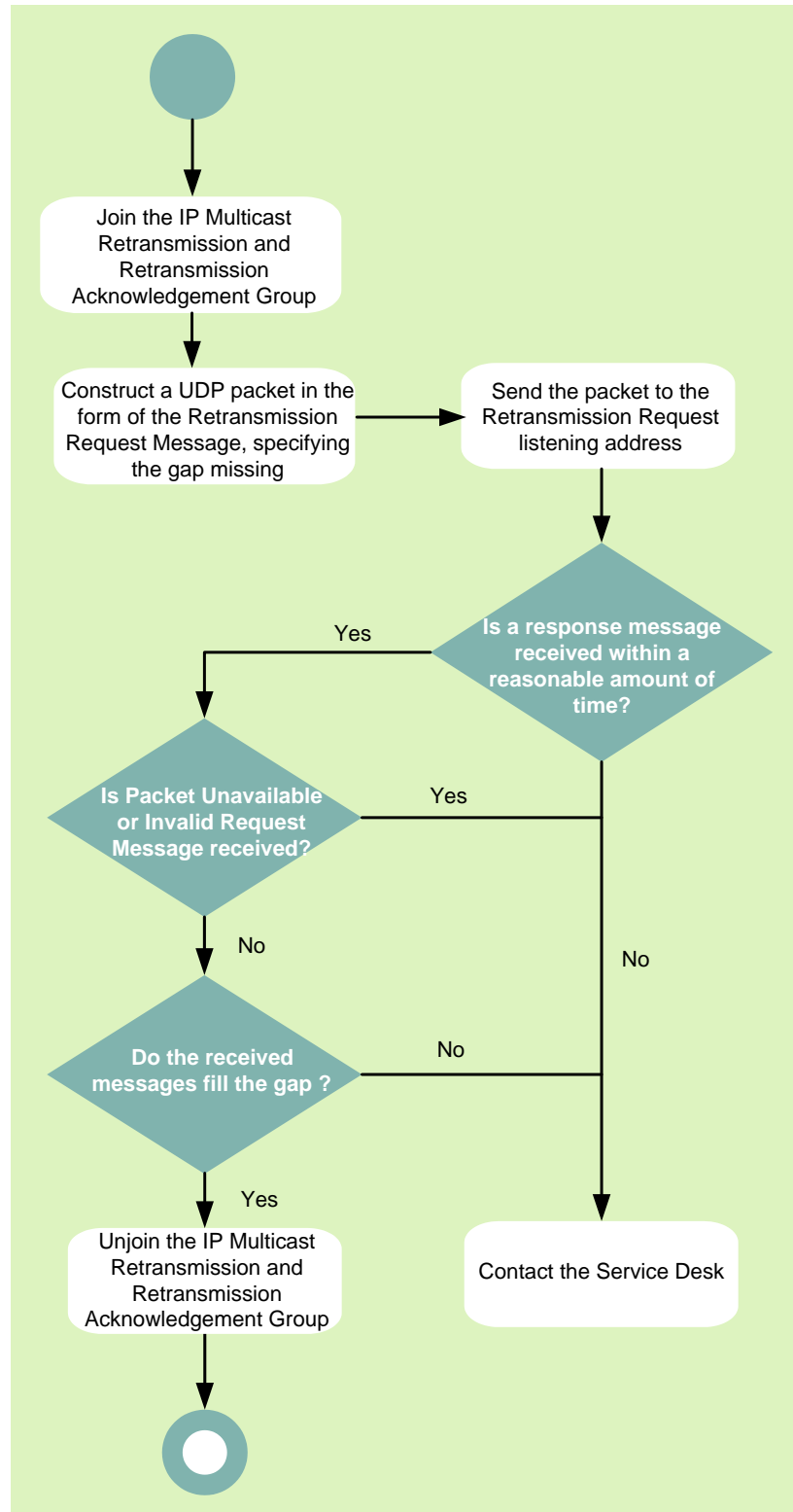
Figure 6 Message Gap Handling



B.7 PROCESSING OF LINE LEVEL RETRANSMISSIONS

The following is the recommended way of line level retransmissions:

Figure 7 Line Level Retransmission Processing



B.8 PROCESSING OF REFRESH MESSAGES

The following is the recommended way of processing Refresh messages:

Figure 8 Refresh Message Processing

