



NYSE BONDS TRADES CLIENT SPECIFICATION

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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	12/07/2005	New Format. Updated Introduction And Recovery Drawings. Updated Message Type Field In Last Sales And Trade Bust And Corrections Messages
1.01	01/05/2006	Updated Possible Message Types In Standard Header
1.02	01/06/2006	Added Fields To Last Sale And Bust Messages.
1.03	01/10/2006	Added Fields To Last Sale And Bust Messages.
1.04	03/06/2006	Copy Edits And Formatting. Changes For Bond Symbology And New Fields For Bond Messages.
1.05	03/13/2006	Adjusted Alignments
1.06	03/27/2006	Edited Nyse Bond Closing Price
1.07	04/24/2007	Section 5: Updated Message Body Length =64 (Value Excludes 4 Byte Header)
1.07a	06/15/2010	Formatted into new template
	09/04/2011	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:

- [NYSE Symbology](#)
- [IP Addresses](#)

CONTACT INFORMATION

Service Desk

- Telephone: +1 212 896-2830
- Email: support@nyse.com

FURTHER INFORMATION

- For additional product information, visit [NYSE Bonds trades](#).
- For updated capacity figures, visit our capacity pages [here](#).

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1. INTRODUCTION

NYSE ArcaTrade allows subscribers to produce and display the NYSE Arca last sale ticker.

NYSE Arca provides two NYSE ArcaTrade interfaces to meet different customer requirements:

INTERFACE	BONDS	OPTIONS	DESCRIPTION
ArcaTrade for Bonds	✓		A data feed for bond trades and trade modifications.
ArcaTrade for Options		✓	A data feed for option trades and trade modifications.

This specification is for developers that wish to write applications that interface with NYSE ArcaTrade for Bonds.

Trade data only reflects trades that take place within NYSE Arca exchanges, rounded down to the nearest lot. Routed, mixed, and odd lot trades may be added to the feed at a later date.

1.1 NYSE ARCATRADE INTERFACE

This interface is message-based, using fixed length messages over the TCP IP protocol with binary numeric and fixed length ASCII fields. Binary values are in network Endian (Big-Endian) format.

The interface contains the following categories of messages:

- Session Management, to manage connections.
- Application Messages, to disseminate trade and trade modification data

1.1.1 NYSE Arca API Certification

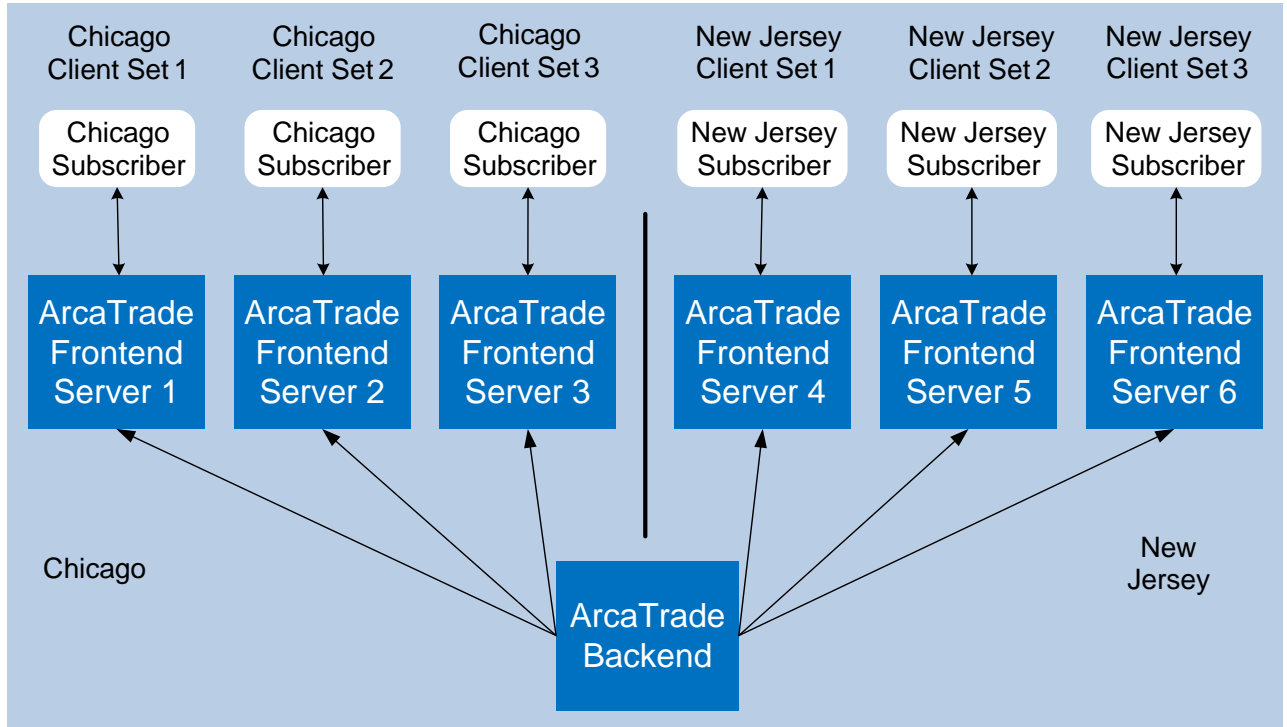
Subscribers must certify their NYSE ArcaTrade subscription clients with NYSE Arca. NYSE Arca provides an IP address, port number, username and password to use for testing. To schedule a test, please call the Service Desk.

1.2 SYSTEM ARCHITECTURE

Archipelago has several instances of ArcaTrade running in both its New Jersey and Chicago data centers. Subscribers connect to an IP address and port on one of these instances as shown in Figure 1 below.

NYSE ArcaTrade for Bonds / V1.07a

Figure 1: Normal ArcaTrade Data Flow



2. COMMUNICATION

2.1 ACCESS

NYSE ArcaTrade clients connect via TCP/IP to a predefined IP address and port. Clients may connect to both a primary connection and a secondary connection to assist in recovery. Clients must log in before NYSE ArcaTrade begins broadcasting data.

Clients supply NYSE Arca with their IP address and port and request either the binary or FAST compacted data feed. Archipelago supplies clients with the:

- IP address
- Port
- Username
- Password

NYSE ArcaTrade is accessible from 3:30 am to 8:00 pm EST. NYSE ArcaTrade may be accessible prior to or after these times depending on start- and end-of-day processing.

2.1.1 Bandwidth Requirements

The recommended minimum bandwidth for NYSE ArcaTrade is 0.05 Megabits per second for the bond trade data currently available. As additional NYSE Arca trade data becomes available in NYSE ArcaTrade, the recommended bandwidth will increase substantially.

NYSE Arca offers connectivity to both its Chicago and New Jersey data centers. NYSE ArcaTrade clients are strongly recommended to implement redundant connectivity to ensure they continue to receive last sale data in the event of issues with their primary connection.

2.2 SESSIONS

NYSE ArcaTrade accepts connections at the beginning of the NYSE Arca trading day and shuts down after the close of NYSE Arca exchanges. Once NYSE Arca exchanges begin trading, NYSE ArcaTrade begins broadcasting to clients that have logged in.

Clients must log in within 30 seconds after establishing a TCP/IP connection or NYSE ArcaTrade closes the connection. Each user ID may have only one client session active at any given time with NYSE ArcaTrade.

Once clients have successfully logged in, NYSE ArcaTrade immediately sends messages starting from the sequence number the client specified in the Login message. This sequence number must be between zero (0) and the most current sequence number assigned by NYSE ArcaTrade. To begin receiving current updates, a client logs in with a starting sequence number of zero (0).

Clients may close the client session with the Logoff message or they may simply close the TCP/IP socket.

2.2.1 TCP/IP Connections

NYSE ArcaTrade sends Heartbeat messages during periods of client inactivity to verify the TCP/IP connection is still active. Clients must respond with a Heartbeat Response message or NYSE ArcaTrade will close the connection. Clients may use the Test Request message to test the connection to NYSE ArcaTrade.

When a TCP/IP connection fails, clients must reconnect and log in again. Clients can specify the sequence number of the last message they received to ensure data integrity. If the requested sequence number is

greater than zero (0) in a login message, NYSE ArcaTrade begins sending messages from the specified sequence number.

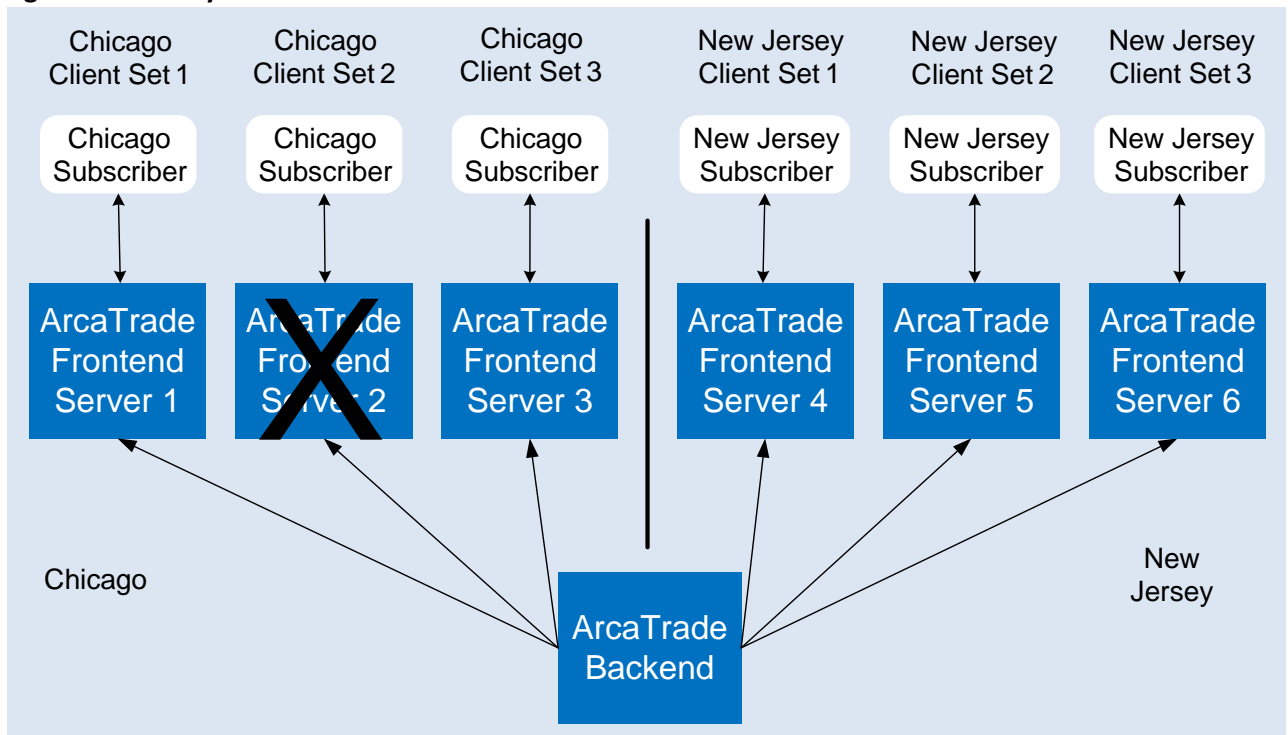
2.3 RECOVERY

Clients are assigned a primary IP address to connect to ArcaTrade (see Figure 1). Clients with connections to both Archipelago Chicago and New Jersey data centers may also be issued a secondary NYSE ArcaTrade IP address to connect to for recovery purposes.

Note: once NYSE ArcaTrade data feeds include trade data from other markets (equities or options), NYSE ArcaTrade messages may not have the same sequence number in each data center.

Figure 2 shows an NYSE ArcaTrade data flow after connections are rerouted because of a failure.

Figure 2 Recovery ArcaTrade Data Flow



3. NYSE ARCATRADE MESSAGES

NYSE ArcaTrade messages sent from the server begin with a four byte standard header, indicating the type of message and the length of the message body, followed by fixed length fields specific to a given message.

Outbound messages do not end with a termination character. Data may be numeric or alphanumeric (see Data Types for more information).

3.1 HEADER MESSAGE FORMAT

Table 1 NYSE ArcaTrade Standard Header

HEADER	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Body Length	0	2	Numeric	0 - 68 (excludes 4 byte header)
Message Type	2	1	Alpha	Character indicating the type of message
Padding	3	1	Alpha	Not used

Client messages do not use the standard header. They should use alpha data (ASCII) and should end with the message terminating character <ETX>. Table 2 lists NYSE ArcaBook messages and message types by the sending system.

Table 2 NYSE ArcaTrade Client and Server Messages

	CLIENT MESSAGES (TYPE)	SERVER MESSAGES (TYPE)
Session management	Login (L)	
		Login Accepted (Q)
		Login Rejected (R)
	Logoff (O)	
		Heartbeat (H)
	Heartbeat Response (H)	
	Test Request (T)	
Application messages for bonds		Last Sale (X)
		Last Sale Bust/Correction (U)
		NYSE Bond Closing Price (Z)

3.2 DATA TYPES

All numeric fields, **except** Price Scale Code and Auction Time, are binary. Price Scale Code and Auction Time are alphanumeric. All alphanumeric fields are left justified and null padded. Alphanumeric fields may not terminate in a null character if their full length is used for data.

Binary data is in network Endian (Big-Endian) format. Depending on their machine architecture, clients may have to perform conversions to properly process the incoming network byte order.

3.2.1 Sequence Numbers

Sequence Numbers are four byte integers that are assigned to application messages. These numbers start at one (1) at the beginning of a trading session and increment for each new message. Clients may use sequence numbers to recover missed messages. See [Recovery](#) for more information.

3.2.2 Prices

Prices are four byte integers in binary. The decimal position can be determined from the value in the Price Scale Code field. To determine the decimal price, divide the whole integer price by the denominator value shown in Table 3.

- **Example 1:**

Whole integer price is 1350 and the price scale code is 2. The decimal price = $1350 \div 100$ (102) = 13.50.

- **Example 2:**

Whole integer price is 135000 and the price scale code is 4. The decimal price = $135000 \div 10,000$ (104) = 13.50.

- **Example 3:**

Whole integer price is 25 and the price scale code is 0. No division is necessary ($100 = 1$). The result is a price of 25 (same 25.00).

Table 3 Price Scale Codes

PRICE SCALE CODE	DENOMINATOR VALUE	DENOMINATOR VALUE (FACTOR OF 10)
0	N/A	N/A
1	10	10^1 (101)
2	100	10^2 (102)
3	1,000	10^3 (103)
4	10,000	10^4 (104)
5	100,000	10^5 (105)
6	1,000,000	10^6 (106)

Note: Price Scale Code of 0 indicates that the whole integer price in the price field is the actual price and no conversion or division is necessary.

3.2.3 Timestamps

The timestamp field is a four byte integer that provides time in milliseconds starting from Midnight (00:00:00:000) of the trading day. NYSE ArcaTrade computes timestamps as:

Seconds x 1000 + milliseconds

For example, the timestamp for 10:00:00:.376 is converted to $(36000 \times 1000) + 376 = 36000376$.

3.3 SYMBOLOGY

NYSE ArcaTrade offers two ways to identify a corporate bond:

- CUSIP/ISIN is available for clients who satisfy licensing requirements. By default CUSIP data is not disseminated in messages and will be left null. CUSIP data is only disseminated to clients that request this by contacting the Service Desk.
- NYSE Bond Symbol is a unique identifier for the bond assigned by NYSE®. See [NYSE Security Master File](#) for information correlating these symbols to bonds traded on NYSE Arca.

4. SESSION MANAGEMENT MESSAGES

Clients and NYSE ArcaTrade use these messages to begin and end sessions, define data feed subscriptions, recover messages after disconnections and test the TCP/IP connection. See [Sessions](#) and [Recovery](#) for more information on session management.

4.1 LOGIN MESSAGE

Clients send this message to authenticate the subscriber and specify which types of trade data the session is subscribing to. Currently, only subscriptions to bond trades are available. If the message does not specify any subscriptions, NYSE ArcaTrade returns a Login Rejected message and closes the connection.

Note: If a client chooses to change subscriptions intraday (by disconnecting the original session and sending a new Login message with different subscriptions), the sequence numbers from the new NYSE ArcaTrade session will not be the same as the sequence numbers from the original session.

Clients also specify a starting message sequence number which can request either current data (0) or messages beginning from a specific sequence number (for recovery). If this field is null or blank or the number specified is greater than NYSE ArcaTrade's current sequence number, NYSE ArcaTrade simply begins sending current messages. If this field is negative, NYSE ArcaTrade returns a Login Rejected message and closes the connection.

See also [Sessions](#) for more information.

Table 4 Login Message

LOGIN MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Type	0	1	Alpha	"L"
Username	1	8	Alpha	Username
Password	9	10	Alpha	Password
Sequence Number	19	10	Alpha/Numeric	Recovery sequence number or 0 to receive current updates. 0 – 2147483647
Listed Subscription	29	1	Alpha	Reserved for future use
ETF Subscription	30	1	Alpha	Reserved for future use
OTC Subscription	31	1	Alpha	Reserved for future use
ArcaEdge/BB Subscription	32	1	Alpha	Reserved for future use
Bond Subscription	33	1	Alpha	"Y" = Yes "N" = No

Options Subscription	34	1	Alpha	Reserved for future use
Padding	35	5	Alpha	Reserved for future use
ETX	40	1	Numeric	Message Terminating Character

4.2 LOGIN ACCEPTED MESSAGE

NYSE ArcaTrade sends this message to indicate a successful login. This message also includes the current version of NYSE ArcaTrade.

Table 5 Login Accepted Message

LOGIN ACCEPTED MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Body Length	0	2	Numeric	6 bytes (value excludes 4 byte header)
Message Type	2	1	Alpha	“Q”
Padding	3	1	Alpha	Not used
Login Accepted Message Body				
Version ID	4	5	Alpha	Version of ArcaTrade protocol (vv.vv)
Padding	9	1	Alpha	Not used

4.3 LOGIN REJECTED MESSAGE

NYSE ArcaTrade sends this message in response to a Login message when:

- The Login Message failed authentication or authorization.
- The client connected to NYSE ArcaTrade but failed to log in within 30 seconds.
- The client did not subscribe to any trade data feeds.
- The sequence number in the Login message was invalid
- NYSE ArcaTrade has no available connections

After sending this message, NYSE ArcaBook closes the socket connection.

Table 6 Login Rejected Message

LOGIN REJECTED MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Body Length	0	2	Numeric	2 bytes (value excludes 4 byte header)
Message Type	2	1	Alpha	“R”
Padding	3	1	Alpha	Not used
Login Rejected Message Body				
Reject Code	4	1	Alpha	“A” = Not Authorized “M” = Maximum Server Connections Reached “R” = Invalid Subscription “S” = Invalid Sequence “T” = Timeout
Padding	5	1	Alpha	Not used

4.4 LOGOFF MESSAGE

Clients send this message to close a session. This message only has a message type.

Table 7 Logoff Message

LOGOFF MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Type	0	1	Alpha	“O”
ETX	1	1	Numeric	Message Terminating Character

4.5 HEARTBEAT REQUEST MESSAGE

NYSE ArcaTrade sends this message every 60 seconds during periods of client inactivity. This prevents some firewalls from timing out the TCP/IP connection. Clients must respond with a Heartbeat Response. This message only has a message type.

4.6 HEARTBEAT REQUEST

Table 8 Heartbeat Request

HEARTBEAT REQUEST MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Body Length	0	2	Numeric	Always zero (0). There is no message body.
Message Type	2	1	Alpha	"H"
Padding	3	1	Alpha	Not used

4.7 HEARTBEAT RESPONSE MESSAGE

Clients send this message in response to a Heartbeat Request message. If clients do not respond within 60 seconds of ArcaTrade sending a Heartbeat request, ArcaTrade closes the connection. **Table 9 Heartbeat**

Response Message

HEARTBEAT RESPONSE MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Type	0	1	Alpha	"H"
Username	1	1	Numeric	Message Terminating Character

4.8 TEST REQUEST MESSAGE

Clients can send this message to regularly signal or to test that the TCP/IP connection to NYSE ArcaBook is open. Clients can specify a text message for NYSE ArcaBook to echo back.

Table 10 Test Request Message

TEST REQUEST MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Type	0	1	Alpha	"T"
Test Message	1	20	Alpha	Optional text to be echoed
ETX	21	1	Numeric	Message Terminating Character

4.9 TEST RESPONSE MESSAGE

NYSE ArcaTrade sends this message in response to a Test Request message. If the Test Request message specifies text, NYSE ArcaBook echoes this text back to the client.

4.10 TEST RESPONSE

Table 11 Test Response Message

TEST RESPONSE MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Body Length	0	2	Numeric	20 bytes (value excludes 4 byte header)
Message Type	2	1	Alpha	"S"
Padding	3	1	Alpha	Not used
Test Response Message Body				
Test Message	4	20	Alpha	Text sent in Test Request message

5. APPLICATION MESSAGES

5.1 LAST SALE

NYSE ArcaTrade sends this message for the following trade events:

- An order partially trades
- An order completely trades

Table 12 Last Sale Message

LAST SALE MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Body Length	0	2	Numeric	64 bytes (value excludes 4 byte header)
Message Type	2	1	Alpha	"X"
Padding	3	1	Alpha	Not used
Last Sale Message Body				
Last Sale Time	4	4	Numeric	Time the trade occurred in milliseconds since Midnight.
Sequence Number	8	4	Numeric	1 – 2147483647
Trade Reference Number	12	4	Numeric	The unique reference number per trading platform (system code) assigned to this trade.
Quantity	16	4	Numeric	Number of bonds traded.
Price	20	4	Numeric	Trade price.
Price Scale Code	24	1	Alpha/Numeric	See Prices for details.
System Code	25	1	Alpha	"F" = Bonds Trading Platform
Exchange Code	26	1	Alpha	"N" = NYSE listed bond Blank = all other bonds
Trade Condition	27	1	Numeric	Reserved for future use.
Security Type	28	1	Numeric	The type of bond. Additional types will be supported in future releases. 1 = corporate bonds

NYSE Bond Symbol	29	22	Alpha	A NYSE Arca-specific identity for this bond. See Symbology for more information.
CUSIP/ISIN	51	14	Alpha	CUSIP/ISIN for the bond. This field is null unless clients have requested the data and have a license.
Padding	65	3	Alpha	Not used.

5.2 TRADE BUST OR CORRECTION MESSAGE

NYSE ArcaTrade send this message when trades are busted or corrected. The Event Code field identifies the type of trigger for this message.

Table 13 Trade Bust or Correction Message

TRADE BUST OR CORRECTION MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Body Length	0	2	Numeric	64 bytes (value excludes 4 byte header)
Message Type	2	1	Alpha	“U”
Padding	3	1	Alpha	Not used
Last Sale Message Body				
Last Sale Time	4	4	Numeric	Time the trade occurred in milliseconds since Midnight.
Sequence Number	8	4	Numeric	1 – 2147483647
Trade Reference Number	12	4	Numeric	The unique reference number per trading platform (system code) assigned to the trade that has been busted or modified.
Quantity	16	4	Numeric	Number of bonds busted or corrected.
Price	20	4	Numeric	Busted or corrected trade price.
Price Scale Code	24	1	Alpha/Numeric	See Prices for details.
System Code	25	1	Alpha	“F” = NYSE Arca Bonds

Event Code	26	1	Alpha	“B” = Trade Bust “C” = Trade Correction
Exchange Code	27	1	Alpha	“N” = NYSE listed bond Blank = all other bonds
Trade Condition	28	1	Numeric	Reserved for future use.
Security Type	29	1	Numeric	The type of bond. Additional types will be supported in future releases. 1 = corporate bonds
NYSE Bond Symbol	30	22	Alpha	A NYSE Arca-specific identity for this bond. See Symbology for more information.
CUSIP/ISIN	52	14	Alpha	CUSIP/ISIN for the bond. This field is null unless clients have requested the data and have a license.
Padding	66	2	Alpha	Not used.

5.3 NYSE BOND CLOSING PRICE

ArcaTrade sends this message during day-end processing with the final closing price and volume for a bond. The NYSE Bond Closing Price functionality is not supported at this time and will be implemented in a future release.

Table 14 NYSE Bond Closing Price Message

NYSE BOND CLOSING PRICE MESSAGE	OFFSET	SIZE (BYTES)	FORMAT	DESCRIPTION
Message Body Length	0	2	Numeric	bytes (value excludes 4 byte header)
Message Type	2	1	Alpha	“Z”
Padding	3	1	Alpha	Not used
NYSE Bond Closing Price Message Body				
Closing Time	4	4	Numeric	Time the closing price was set in milliseconds since Midnight.

Sequence Number	8	4	Numeric	1 – 2147483647
Trade Reference Number	12	4	Numeric	The unique reference number per trading platform (system code) assigned to the closing price.
Quantity	16	4	Numeric	Number of bonds for the closing price
Closing Price	20	4	Numeric	The closing price
Price Scale Code	24	1	Alpha/Numeric	See Prices for details.
System Code	25	1	Alpha	“F” = NYSE Arca Bonds
Exchange Code	26	1	Alpha	“N” = NYSE listed bond Blank = all other bonds
Trade Condition	27	1	Numeric	Reserved for future use.
Security Type	28	1	Numeric	The type of bond. Additional types will be supported in future releases. 1 = corporate bonds
NYSE Bond Symbol	29	22	Alpha	A NYSE Arca-specific identity for this bond. See Symbology for more information.
CUSIP/ISIN	51	14	Alpha	CUSIP/ISIN for the bond. This field is null unless clients have requested the data and have a license.
Padding	65	3	Alpha	Not used