



TOP Specification

Version 1.0

October 6, 2008

Overview

BATS members may use the TOP protocol to receive real-time top of book quotations direct from BATS. BATS also reflects its top of book quote via the SRO (self regulatory organization) upon which it is quoting. Market data received through TOP is more timely than obtaining the same data via the consolidated feed. The TOP protocol offers approximately 66% reduction in the number of events and 84% reduction in the number of bytes of application data sent, compared to the BATS PITCH protocol.

The quotations received via TOP provide an aggregated size and do not indicate the size or number of individual orders at the best bid or ask. Hidden orders (FIX 9479=I) are not represented in TOP. The TOP protocol also provides last trade price and size and cumulative volume data.

Complete depth of book market data can be received via the BATS PITCH protocol (http://www.batstrading.com/subscriber_resources.php).

TOP cannot be used to enter orders. For order entry, refer to the BATS FIX Specification (http://www.batstrading.com/subscriber_resources/BATS_FIX_Specification.pdf).

Protocol

The TOP data feed is comprised of a series of fixed-length, line-oriented, unsequenced messages. The length of each message is dependent upon the message type. Each message consists of non-control ASCII bytes.

Upon connection, the member must send a **Logon** message. The message indicates whether the member would like a spin of the current top of book for all symbols. The server will respond with either a **Logon Accepted** or **Logon Rejected** message. If a spin was requested, a **Spin** message is sent for each symbol, followed by a **Spin Done** message. If updates occur *during* the spin, you will receive **Seconds**, **Milliseconds**, **Long/Short Bid Update**, **Long/Short Ask Update**, **Long/Short Two-Sided Update**, and **Long/Short Trade** messages *before* receiving the **Spin Done** message. Seconds and Milliseconds messages are used to interleave timestamp information between messages, preventing duplicate timestamp information from being embedded in multiple messages.

The client must send **Client Heartbeat** messages once per second. If a client heartbeat isn't received for five seconds, the connection is terminated. The server will send **Server Heartbeat** messages once per second if no other messages have been sent in the last second.

Typography

Example messages are shown in a constant width typeface. Some invisible ASCII characters are shown using special characters:

- Space (0x20); shown as an underscore: “_”
- New line (0x0A); shown as “<”

Data Types

The data types used are similar to the data types used in BATS PITCH.

- **Numeric** fields are a string of ASCII digits, right justified and zero filled on the left. For example, for a six place numeric field, 000123 represents 123.
- **Alpha** and **Alphanumeric** fields are left justified and space padded on the right. For example, for a six place alpha field for symbol ZVZZT is represented as ZVZZT_.
- **Prices** are decimal with either long form (6 whole number digits followed by 4 decimal digits) or short form (3 whole number digits followed by 2 decimal digits). The whole number portion is zero filled on the left; the decimal portion is zero filled on the right. The decimal point is implied by position and does not explicitly appear in the field. For a long form price, 0000123400 represents 12.34. For a short form price, 01234 represents 12.34.
- **Boolean** fields contain either “Y” or “N”.

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- **Timestamp** fields are 8 whole number milliseconds past midnight, Eastern Time, right justified and zero filled on the left, with no decimal point. For example, 32483556 represents 9:01:23.556 am.

Logon Related Messages

Logon Message (Client)

A logon message must be the first message sent after connection.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"L"	Logon message
Username	1	6	Alphanumeric	Username, assigned by BATS
Password	7	10	Alphanumeric	Password, assigned by BATS
Spin Flag	17	1	Boolean	If "Y", spin current top of book
\n	18	1	\n	End of message

Logon Accepted (Server)

Field Name	Offset	Length	Value	Description
Message Type	0	1	"C"	Logon Accepted message
\n	1	1	\n	End of message

Logon Rejected (Server)

Field Name	Offset	Length	Value	Description
Message Type	0	1	"J"	Logon Rejected message
Reject Reason	1	1	Alpha	"A" = Authentication or authorization problem (currently the only reason sent)
\n	2	1	\n	End of message

Example

Successful login:

```
L A B C _ _ _ p a s s _ _ _ _ _ Y <
C <<
```

Rejected login:

```
L A B C _ _ _ p a s s _ _ _ _ _ Y <
J A <<
```

Spin Related Messages

Spin Message (Server)

If a spin was requested in the **Logon** message, spin messages will be sent for any symbol which has had a visible order placed for it that day. If the connection is established prior to market open, no orders will have been placed and zero spin messages will be sent. If a symbol has had orders that day but currently has no orders, a spin message will be sent with zero price and quantity for each side. If a symbol has a one sided quote, zero price and quantity will be sent for the side which has no orders.

The timestamp reflected in the Spin message is the time at which the update to the top of book occurred, *not* the time when the Spin message was sent to the member.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"S"	Spin message
Timestamp	1	8	Timestamp	Time of top of book update; milliseconds since midnight, Eastern time
Symbol	9	6	Alpha	Symbol
Bid Price	15	10	Price	Bid price; 0 if no bids
Bid Quantity	25	6	Numeric	Bid quantity; 0 if no bids
Ask Price	31	10	Price	Ask price; 0 if no offers
Ask Quantity	41	6	Numeric	Ask quantity; 0 if no offers
Last Trade Time	47	8	Timestamp	Time of last trade; milliseconds since midnight, Eastern time
Last Trade Price	55	10	Price	Last trade price; 0 if no trades
Last Trade Size	65	6	Numeric	Last trade size; 0 if no trades
Cumulative Volume	71	9	Numeric	Cumulative volume executed today; 0 if no trades
\n	80	1	\n	End of message

Spin Done Message (Server)

Once all Spin messages have been sent, a **Spin Done** message is sent. A Spin Done message is not sent if a spin wasn't requested during logon.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"D"	Spin Done message
\n	1	1	\n	End of message

Example

Spin of TESTA (two sided quote), TESTB (one sided quote, offer only), and ZVZZT (no current quote):

```

S 3 4 3 4 8 1 1 2 TESTA_ 0 0 0 1 2 3 4 0 0 0 0 2 0 0 0 0 0 1 2 3 5 0 0 0 0 1 0 0 0 3 4 3 4 7 0 0 0 0 0 0
1 2 3 4 0 0 0 0 0 1 0 0 0 0 0 1 2 0 1 0 0 «
S 3 4 3 9 9 8 0 8 TESTB_ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 7 1 2 0 0 0 0 0 9 0 0 3 4 3 4 6 1 1 0 0 0 0
9 7 1 1 0 0 0 0 0 2 0 0 0 0 0 0 3 0 3 0 0 «
S 3 4 2 5 0 5 2 2 ZVZZT_ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 «
D «
    
```

Heartbeat Messages

Server Heartbeat Message (Server)

A Server Heartbeat message is sent once per second if no update messages have been sent.

Field Name	Offset	Length	Value	Description
Message Type	0	1	“H”	Server Heartbeat message
\n	1	1	\n	End of message

Client Heartbeat Message (Client)

A Client Heartbeat message should be sent once per second by the client. If a Client Heartbeat is not received for five seconds, the connection will be terminated.

Field Name	Offset	Length	Value	Description
Message Type	0	1	“R”	Server Heartbeat message
\n	1	1	\n	End of message

Time Update Messages

Seconds Message (Server)

Sent for every second for which at least one message is being generated.

Field Name	Offset	Length	Value	Description
Message Type	-	1	"T"	Seconds message
Seconds	1	5	Numeric	Number of seconds since midnight; e.g., 32400 = 9:00am
\n	6	1	\n	End of message

Milliseconds Message (Server)

Sent for every millisecond for which at least one message is being generated.

Field Name	Offset	Length	Value	Description
Message Type	-	1	"M"	Milliseconds message
Milliseconds	1	3	Numeric	Number of milliseconds since last Second message
\n	4	1	\n	End of message

Top of Book Update Messages

There are both long and short forms of bid and ask updates. Short form messages are sent if the symbol is less than five characters, the price is less than or equal to 999.99, and the size can be expressed in five characters.

Long Bid Update Message (Server)

Replaces the previous top of book bid for a symbol.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"B"	Long Bid Update message
Symbol	1	6	Alpha	Symbol
Bid Price	7	10	Price	Bid price; 0 if no bids
Bid Quantity	17	6	Numeric	Bid size; 0 if no bids
\n	23	1	\n	End of message

Short Bid Update Message (Server)

Replaces the previous top of book bid for a symbol.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"b"	Short Bid Update message
Symbol	1	4	Alpha	Symbol
Bid Price	5	5	Price	Bid price; 0 if no bids
Bid Quantity	10	5	Numeric	Bid size; 0 if no bids
\n	15	1	\n	End of message

Long Ask Update Message (Server)

Replaces the previous top of book offer for a symbol.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"A"	Long Ask Update message
Symbol	1	6	Alpha	Symbol
Ask Price	7	10	Price	Ask price; 0 if no offers
Ask Quantity	17	6	Numeric	Ask size; 0 if no offers
\n	23	1	\n	End of message

Short Ask Update Message (Server)

Replaces the previous top of book offer for a symbol.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"a"	Short Ask Update message
Symbol	1	4	Alpha	Symbol
Ask Price	5	5	Price	Ask price; 0 if no offers
Ask Quantity	10	5	Numeric	Ask size; 0 if no offers
\n	15	1	\n	End of message

Long Two-Sided Update Message (Server)

Replaces both the previous bid and offer for a symbol.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"U"	Long Two-Sided Update message
Symbol	1	6	Alpha	Symbol
Bid Price	7	10	Price	Bid price; 0 if no bids
Bid Quantity	17	6	Numeric	Bid size; 0 if no bids

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Ask Price	23	10	Price	Ask price; 0 if no offers
Ask Quantity	33	6	Numeric	Ask size; 0 if no offers
\n	39	1	\n	End of message

Short Two-Sided Update Message (Server)

Replaces both the previous bid and offer for a symbol.

Field Name	Offset	Length	Value	Description
Message Type	0	1	"u"	Short Two-Sided Update message
Symbol	1	4	Alpha	Symbol
Bid Price	5	5	Price	Bid price; 0 if no bids
Bid Quantity	10	5	Numeric	Bid size; 0 if no bids
Ask Price	15	5	Price	Ask price; 0 if no offers
Ask Quantity	20	5	Numeric	Ask size; 0 if no offers
\n	25	1	\n	End of message

Example

Long/Short Bid Update and Long/Short Ask Update messages interleaved with Seconds and Milliseconds messages (Client Heartbeat messages are not shown):

```

T34348 <
M110 <
aQID_0394500200 <
bRIMM1312200100 <
bRIMM1312200400 <
M118 <
BZVZZT_0000123400001100 <
M801 <
BZVZZT_0000123500000100 <
UQQQQ__00004870002402000000487100000200 <
T34349 <
M009 <
aSPY_1417005500 <
bIWM_0727700500 <
BQQQQ__0000487000240000 <
uQID_039441200000394500300 <

```

Trade Messages

When an execution occurs, a message is sent which includes the cumulative volume and last price and size. Multiple executions which occur concurrently will be compressed into a single update for bandwidth savings. TOP does not send a trade message for every individual fill. See the example messages below.

As with book updates, both short- and long-form execution messages will be sent.

In the event of a trade break or correction, it is possible that the cumulative volume will *decrease* from the previous update.

Long Trade Message (Server)

Updates the cumulative volume and last price and size for a symbol.

Field Name	Offset	Length	Value	Description
Message Type	0	1	“v”	Long Trade message
Symbol	1	6	Alpha	Symbol
Last Price	7	10	Price	Last trade price
Last Quantity	17	6	Numeric	Last trade quantity
Cumulative Volume	23	9	Numeric	Cumulative number of shares traded today
\n	32	1	\n	End of message

Short Trade Message (Server)

Updates the cumulative volume and last price and size for a symbol.

Field Name	Offset	Length	Value	Description
Message Type	0	1	“v”	Short trade message
Symbol	1	4	Alpha	Symbol
Last Price	5	5	Price	Last trade price
Last Quantity	10	5	Numeric	Last trade quantity
Cumulative Volume	15	7	Numeric	Cumulative number of shares traded today
\n	22	1	\n	End of message

Example

Trade messages interleaved with quote updates:

```
T34348 <
M110 <
bRIMM1312200400 <
bRIMM1312200100 <
vRIMM13122003001200400 <
M801 <
VSPY___0001379800000100024250601 <
```

Symbology

TOP symbology is identical to PITCH symbology.

BATS allows a maximum of 6 characters for symbols which requires the conversion of certain CQS issues to a 6 character format. The conversion for these CQS symbols is found below:

Type	SIAC/CQS Suffix	Exchange/CMS Suffix	BATS Suffix
Preferred	p	PR	-
Preferred Class "A"	pA	PRA	-A
Preferred Class "B"	pB	PRB	-B
Class "A"	/A	A	.A
Class "B"	/B	B	.B
Warrants	/WS	WS	+
Warrants Class "A"	/WS/A	WSA	+A
Warrants Class "B"	/WS/B	WSB	+B
Preferred when distributed	p/WD	PRWD	-\$
When distributed	/WD	WD	\$
Called	/CL	CL	*
Class "A" called	/A/CL	ACL	.A*
Preferred called	p/CL	PRCL	.*
Preferred "A" called	pA/CL	PRACL	-A*
Preferred "A" when issued	pAw	PRAWI	-A#
Emerging Company Marketplace	/EC	EC	!
Partial Paid	/PP	PP	@
Convertible called	/CV/CL	CVCL	%*
Rights	r	RT	^
Units	/U	U	=
When issued	w	WI	#
Rights when issued	rw	RTWI	^#
Preferred when issued	pw	PRWI	-#
Class "A" when issued	/Aw	AWI	.A#
Warrant when issued	/WSw	WSWI	+#
Test	/TEST	TEST	~

BATS does not convert NASDAQ-listed securities as they are limited to 5 characters.

Support

Please e-mail questions or comments regarding this specification to tradedesk@batstrading.com.

Revision History

June 16, 2008	Initial Version 1.0
June 26, 2008	Corrected Typos in symbology table
October 6, 2008	Revised wording to reflect transition to BATS Exchange