<u>O*U*C*H</u>
Version 2.11A
Updated December 23, 2015

Table of Contents

Functionality that is not available will be greyed out in the specifications. Any changes will be
conveyed via the NASDAQ OMX Head Trader Alerts or Technical Updates.

1

1 Overview

NASDAQ accepts limit orders from system subscribers and executes matching orders when possible. Non-matching orders may be added to the NASDAQ Limit Order Book, a database of available limit orders, where they wait to be matched in price-time priority.

OUCH is a simple protocol that allows NASDAQ subscribers to enter orders, cancel existing orders, and receive executions. It is intended to allow subscribers and their software developers to integrate NASDAQ into their proprietary trading systems or build custom front ends.

OUCH only provides a method for subscribers to send orders to NASDAQ and receive updates on those orders entered. For information about all orders entered into and executed on the NASDAQ book, refer to the ITCH protocol (available separately).

OUCH is the low-level native protocol for connecting to NASDAQ. It is designed to offer the maximum possible performance at the cost of flexibility and ease of use. For applications that do not require this extreme level of performance, NASDAQ offers other more standard interfaces that may be more suitable and easier to develop to.

1.1 Architecture

The OUCH protocol is composed of logical messages passed between the OUCH host and the client application. Each message type has a fixed message length. All messages are composed of non-control ASCII bytes.

All messages sent from the OUCH host to the client are assumed to be sequenced and their delivery must be guaranteed by some lower level protocol. The SoupTCP (available separately) is typically used to guarantee the delivery and sequencing of OUCH messages sent from the host to the client.

Messages sent from the OUCH client to the host are inherently non-guaranteed, even if they are carried by a lower level protocol that guarantees delivery (like TCP/IP sockets). Therefore, all host-bound messages are designed so that they can be benignly resent for robust recovery from connection and application failures.

Each physical OUCH host port is bound to an NASDAQ assigned logical OUCH Account. On a given day, every order entered on OUCH is uniquely identified by the combination of the logical OUCH Account and the subscriber created Token field.

1.2 Data Types

Numeric fields are a string of ASCII coded digits, right justified and zero filled on the left.

Alpha fields are left justified and padded on the right with spaces.

Prices are given in decimal format with 6 whole number places followed by 4 decimal digits. The whole number portion is padded on the left with zeros; the decimal portion is padded on the right with zeros. The decimal point is implied by position; it does not appear inside

Functionality that is not available will be greyed out in the specifications. Any changes will be conveyed via the NASDAQ OMX Head Trader Alerts or Technical Updates.

2

the price field. The maximum valid price value on NASDAQ is $199,999.00. Timestamp fields are given in milliseconds past midnight Eastern Time.

1.3   Fault Redundancy

A single OUCH Account can be bound to multiple physical OUCH machines. These OUCH machines then act as mirrors of each other for fault redundancy. In this configuration, both machines are be able to accept orders and cancel requests and any outbound messages would be simultaneously generated by both physical OUCH hosts

1.4   Service Bureau Configuration

A single OUCH Account can accept orders from one or more firms, allowing a service bureau configuration. The service bureau OUCH Account must be specifically authorized to enter trades on behalf of each represented subscriber with an NASDAQ Service Bureau Agreement, available separately. Once an agreement has been submitted, the OUCH Account set up as the service bureau may enter orders for the represented firm by putting the represented firm's Market Maker Identifier in the Firm field upon order entry

2   Inbound Messages

Inbound messages are sent from the subscriber's application to the OUCH host. They are not sequenced. All Inbound Messages may be repeated benignly. This gives the client the ability to re-send any Inbound message if it is uncertain whether NASDAQ received it in the case of a connection loss or an application error.

The idea of benign inbound message retransmission with end-to-end acknowledgement is fundamental to NASDAQ's fail-over redundancy. Should your connection ever fail, there is no way for you to know if pending messages actually made it over the link before the failure. A robust OUCH client can safely re-send any pending messages over a mirrored link without worrying about generating duplicates. This applies to NASDAQ's disaster fail over capability as well; should NASDAQ ever need to fail over to the backup site, some messages sent at the moment of the failure may be lost. A robust application can simply re -send the pending messages, making the fail over seamless to the end user.

All inbound messages on an OUCH port are processed sequentially. This guarantees that if two orders are entered consecutively on the same connection, the first order entered will always be accepted first.

2.1 Enter Order Message

The Enter Order Message lets you enter a new order into NASDAQ. Each new order must have a Token that is unique to the day and that logical OUCH account. If you send a valid order, you should receive an Accepted Order Message. If you send an Enter Order Message with a previously used Token, the new order will be ignored.

Enter Order Message				
Name	*Offset*	*Length*	*Value*	*Notes*
Type	0	1	"O"	Identifies this message an Enter Order Message type.

Order Token	1	14	Alpha numeric	This is a freeform alphanumeric field. You can put any information you like. Token must be day unique for each OUCH account. Token is case sensitive, but mixing upper- and lower-case Tokens is not recommended.
Buy/Sell Indicator	15	1	Alpha	"B" = buy order "S" = sell order "T" = sell short, client affirms ability to borrow securities in good deliverable form for delivery within three business days "E" = sell short exempt, client affirms ability to borrow securities in good deliverable form for delivery within three business days
Shares	16	6	Numeric	Total number of shares entered. Must be greater than zero.
Stock	22	6	Alpha	Stock Symbol.
Price	28	10	Price	The limit price of the order. The price is a 6 digit whole number portion followed by a 4 digit decimal portion. The whole number part should be left padded with zeroes and the decimal part must be right filled with zeroes. Must be greater than zero.
Time in Force	38	5	Numeric	The number of seconds that this order should live before being timed automatically canceled. Special values for Time in Force are listed here.
Firm	43	4	Alpha	This field should contain the all caps Firm Identifier for the order entry firm. One logical OUCH Account can potentially enter orders for multiple firms in a Service Bureau configuration. If this field is blank filled, the default firm for the OUCH Account will be used.
Display	47	1	Alpha	
Capacity	48	1	Alpha	Can be "P" for principal, "A" for agency, or "R" for riskless. For reporting purposes only.

2.1.1 Special Values for Time in Force

Special Values for Time in Force	
Value	Explanation
0	Immediate or cancel. If no match for the order is available at the moment the order is accepted, any unexecuted shares in the order are immediately canceled.
99998	Market Day. Indicates that the order should live until the market close on the primary market for the security.
99999	NASDAQ Day. Indicates that the order should live until the end of the NASDAQ trading day.

2.2 Cancel Order Message

The Cancel Order Message is used to request that an order be canceled or reduced. In the Cancel Order Message, you must specify the new "intended order size" for the order. The "intended order size" is the maximum number of shares that can be executed in total after the cancel is applied.

To cancel the entire balance of an order, you would enter a Cancel Order Message with a Shares field of zero.

Cancel Order Message				
Name	*Offset*	*Length*	*Value*	*Notes*
Type	0	1	"X"	A single byte identifying this message as a Cancel Order Message.
Order Token	1	14	Alpha numeric	The Order Token as was originally transmitted in an Enter Order Message.
Shares	15	6	Numeric	This is the new intended order size. This limits the maximum number of shares that can potentially be executed in total after the cancel is applied. Entering a zero here will cancel any remaining open shares on this order.

Note that the only acknowledgement to a Cancel Order Message is the resulting Canceled Order Message. There is no "too late to cancel" message since by the time you received it, you would already have gotten the execution. Superfluous Cancel Order Messages are silently ignored.

3   Outbound Sequenced Messages

Outbound messages are generated by the OUCH host port and received by your client application.

3.1 System Event Messages

System Event Messages signal events that affect the entire NASDAQ system

System Event Message				
Name	*Offset*	*Len*	*Value*	*Notes*
Time Stamp	0	8	Timestamp	See Data Types here.
Message Type	8	1	"S"	System Event Message identifier.
Event Code	9	1	Alpha	See Event Codes here.

Functionality that is not available will be greyed out in the specifications. Any changes will be conveyed via the NASDAQ OMX Head Trader Alerts or Technical Updates.

5

3.1.1 System Events Code

System Events Code	
Code	*Explanation*
"S"	Start of Day. This is always the first message each day. It indicates that NASDAQ is open and ready to start accepting orders.
"E"	End of Day. This indicates that NASDAQ is now closed will not accept any new orders in this session. There will not be any more executions during this session, however it is still possible to receive Broken Trade Messages and Canceled Order Messages.

3.2 Order Messages

Order messages inform you about each event in the lifetime of your orders.

3.2.1 Accepted Order Message

An Accepted Order Message acknowledges the receipt and acceptance of a valid Enter Order Message. The data fields from the Enter Order Message are echoed back in the Order Accepted Message. Note that the accepted values may differ from the entered values for some fields. You will always receive an Accepted Order Message for an order before you get any Canceled Order Messages or Executed Order Messages for the order.

Accepted Order Message				
Name	*Offset*	*Len*	*Value*	*Notes*
Time Stamp	0	8	Numeric	Timestamp.
Message Type	8	1	"A"	Accept Order Message Identifier.
Token	9	14	Alpha-Numeric	The order Token field as entered.
Buy/Sell Indicator	23	1	Alpha	Buy/sell indicator as entered.
Shares	24	6	Numeric	Total number of shares accepted. Note that the accepted shares could potentially be different than the number entered if the stock trades in round lots only, and a mixed lot was entered.
Stock	30	6	Alpha	Stock symbol as entered.
Price	36	10	Price	The accepted limit price of the order. Note that the accepted price could potentially be different than the entered price if the order was repriced by NASDAQ on entry. The accepted price will always be better than or equal to the entered.
Time in Force	46	5	Numeric	The accepted Time in Force of the order. Note that the accepted Time in Force may potentially be different than the entered Time in Force. The accepted Time in Force will always be equal to or shorter in scope than the entered Time in

Functionality that is not available will be greyed out in the specifications. Any changes will be conveyed via the NASDAQ OMX Head Trader Alerts or Technical Updates.

6

				Force.
Firm	51	4	Alpha	The accepted firm for the order. Note that if the firm was left blank on entry, the default firm for the OUCH account will appear here.
Display	55	1	Alpha	The display type for the order. "A" = Attributable - Price to Display "Y" = Anonymous - Price to Comply "N" = Non-Display "P" = Post-Only "L" = Post-Only and Attributable – Price to Display "M" = Mid-Point Peg "Z" = Entered as displayed but changed to non-displayed (Priced to comply)
Order Reference Number	56	12	Numeric	The day-unique Order Reference Number assigned by NASDAQ this order.
Capacity	68	1	Alpha	The capacity specified on the order.

3.2.2 Canceled Order Message

A Canceled Order Message informs you that an order has been reduced or canceled. This could be acknowledging a Cancel Order Request Message or it could be the result of the order timing out or being canceled automatically.

Note that a Cancel Order Message does not necessarily mean the entire order is dead; some portion of the order may still be alive.

Canceled Order Message				
Name		*Len*	*Value*	*Notes*
Time Stamp	0	8	Numeric	Timestamp.
Message Type	8	1	"C"	Canceled Order Message.
Order Token	9	14	Alpha numeric	The order Token field as entered.
Decrement Shares	23	6	Numeric	The number of shares just decremented from the order. This number is incremental, not cumulative.
Reason	29	1	Alpha	The reason the order was reduced or canceled. See Cancel Order Reasons here.

3.2.2.1 Cancel Order Reasons

Cancel Order Reasons	
Reason	*Explanation*
"U"	User requested cancel. Sent in response to a Cancel Request Message.

Functionality that is not available will be greyed out in the specifications. Any changes will be conveyed via the NASDAQ OMX Head Trader Alerts or Technical Updates.

7

"I"	Immediate or Cancel order. This order was originally sent with a timeout of zero and no further matches were available on the book so the remaining non-executed shares were immediately canceled.
"T"	Timeout or self match prevention. The Time In Force for this order has expired, or the order cancelled because it would have executed with an existing order entered by the same MPID.
"S"	Supervisory. This order was manually canceled or reduced by an NASDAQ supervisory terminal. This is usually in response to a subscriber request via telephone.
"D"	Downtick. This order was a short sale that cannot be executed because of a downtick in the stock.
"Z"	System cancel. This order was cancelled by the system.
"K"	This order cannot be executed because of Market Collars
"H"	Halted. The on-open order was canceled because the symbol remained halted after the opening cross completed.
"X"	Open Protection. Orders that are cancelled as a result of the Opening Price Protection Threshold.
"E"	Closed. Any market hours day order that was received after 4 PM will receive this cancel reason.

3.2.3 Rejected Order Message

A Rejected Order Message may be sent in response to an Enter Order Message if the order cannot be accepted at this time. The reason for the rejection is given. No further actions are permitted on this order.

The Token of a rejected order cannot be re-used.

Rejected Order Message				
Name	*Offset*	*Length*	*Value*	*Notes*
Time Stamp	0	8	Numeric	Timestamp.
Message Type	8	1	"J"	Rejected Order Message
Order Token	9	14	Alpha-numeric	This is the order Token field as was transmitted with the order when entered.
Reason	23	1	Alpha	The reason the order was rejected. See Rejected Order Reasons here.

3.2.3.1 Rejected Order Reasons

Rejected Order Reasons	
Reason	*Explanation*
"T"	Test Mode. This OUCH Account is configured for test mode and is not able to accept orders in non-TEST securities.
"H"	Halted. There is currently a trading halt on the primary exchange so no orders can be accepted in this stock at this time.

Functionality that is not available will be greyed out in the specifications. Any changes will be conveyed via the NASDAQ OMX Head Trader Alerts or Technical Updates.

8

"Z"	Shares exceeds configured safety threshold. The number of shares entered must be less than the safety threshold configured for this Account. The safety threshold can be added/updated through NASDAQ Subscriber Services.
"S"	Invalid stock. The stock field must be a valid issue, tradable on NASDAQ.
"D"	Invalid display field. NASDAQ is not able to accept the requested display type in the requested stock due to regulatory restrictions.
"C"	NASDAQ is closed.
"L"	Requested firm not authorized for requested clearing type on this account. To authorize additional firms, use the NASDAQ Service Bureau Agreement.
"M"	Outside of permitted times for requested clearing type.
"O"	Other. A reason not contemplated in this version of OUCH.
"X"	Invalid Price
"I"	Rejected because ISO Order was sent (only when the port is configured to reject ISOs)

3.2.3.2 PRM Rejected Order Reasons

PRM Rejected Order Reasons	
Reason	**Explanation**
"a"	Reject All enabled
"b"	Easy to Borrow (ETB) reject
"c"	Restricted symbol list reject
"d"	ISO order restriction
"e"	Odd lot order restriction
"f"	Mid-Point order restriction
"g"	Pre-Market order restriction
"h"	Post market order restriction
"i"	Short sale order restriction
"j"	On Open order restriction
"k"	On Close order restriction
"l"	Two sided quote reject
"m"	Exceeded shares limit
"n"	Exceeded dollar value limit

3.2.4 Executed Order Message

An Executed Order Message informs you that all or part of an order has been executed.

Executed Order Message				
Name	**Offset**	**Length**	**Value**	**Notes**
Time Stamp	0	8	Numeric	Timestamp.
Message Type	8	1	"E"	Order Executed Message.

Order Token	9	14	Alpha numeric	The order Token field as entered.
Executed Shares	23	6	Numeric	Incremental number of shares executed.
Execution Price	29	10	Price	The price at which these shares were executed.
Liquidity Flag	39	1	Alpha	See Liquidity Flag Values table here.
Match Number	40	12	Numeric	Assigned by NASDAQ to each match executed. Each match consists of one buy and one sell. The matching buy and sell executions share the same match number.

3.2.4.1 Liquidity Flags

Liquidity Flags	
Flag	Value
A	Added
R	Removed
O	Opening Cross
M	Opening Cross (imbalance-only)
C	Closing Cross
L	Closing Cross (imbalance-only)
H	Halt/IPO Cross
K	Halt Cross
J	Non-displayed adding liquidity
W	Added post-only
m	Removed liquidity at a midpoint
k	Added liquidity via a midpoint order
0	Supplemental order execution
7	Displayed, liquidity-adding order improves the NBBO
8	Displayed, liquidity-adding order sets the QBBO while joining the NBBO
4	Added displayed liquidity in a Select Symbol
5	Added non-displayed liquidity in a Select Symbol
6	Removed liquidity in a Select Symbol
g	Added non-displayed mid-point liquidity in a Select Symbol

3.2.5 Broken Trade Message

A Broken Trade Message informs you that an execution has been broken. The trade is no longer good and will not clear. The reason for the break is given.
You will always get an Executed Order Message prior to getting a Broken Trade Message for a given order/execution.

Broken Trade Message				
Name	Offset	Length	Value	Notes

Functionality that is not available will be greyed out in the specifications. Any changes will be conveyed via the NASDAQ OMX Head Trader Alerts or Technical Updates.

10

Time Stamp	0	8	Numeric	Timestamp.
Message Type	8	1	"B"	Broken Trade Message.
Order Token	9	14	Alpha numeric	The order Token field as entered.
Match Number	23	12	Numeric	Match Number as transmitted in the preceding Executed Order Message.
Reason	35	1	Alpha	The reason the trade was broken. See Broken Trade Reasons table here.

3.2.5.1 Broken Trade Reason

Broken Trade Reasons	
Reason	Explanation
"E"	Erroneous. The trade was deemed clearly erroneous.
"C"	Consent. The two parties mutually agreed to break the trade.
"S"	Supervisory. The trade was manually broken by an NASDAQ supervisory terminal.
"X"	External. The trade was broken by an external 3rd party.

4   Support

If you have any questions or comments about this specification, just E-mail to tradingservices@nasdaqomx.com. We also welcome any suggestions for new features or improvements.

5   Revision History

Revision #	Date	Change
2.1a	10/22/2008	Derived Version 2.1a from Version 2.0a and Updated the Reference Number length from 9 to 12 characters Derived Version 2.1a from Version 2.0a and Updated the Match Number length from 9 to 12 characters
2.1a	01/02/2009	Updated Display field to contain "P" for Post-Only for sections 2.2.1.1 and 3.1.
2.1a	05/06/2009	Updated Display field to contain "S" for Flash for sections 2.2.1.1 and 3.1. Updated Display field to contain "F" for Flash Post Only for sections 2.2.1.1 and 3.1. Updated description of liquidity flags "J"
2.1a	06/05/2009	Updated description of cancelled order reason "T" for anti-internalization
2.1a	08/10/2009	Updated Display field to remove "S" for Flash for sections 2.2.1.1 and 3.1. Updated Display field to remove "F" for Flash Post Only for sections 2.2.1.1 and 3.1. Updated description of liquidity flags "J" to remove flash reference
2.11a	12/10/2009	Revised anti-internalization language, replaced with self match

2.11a		prevention
2.11a	04/16/2010	Added display value "M" for mid-point pegging
2.11a	08/12/2010	Re-introduced the sell short exempt value in the buy sell indicator field
2.11a	10/13/2010	Added reject reason code "I"
2.11a	04/04/2011	Revised PRM reject reason code
2.11a	08/01/2011	Added display value "L" for Post-Only and Attributable – Price to Display
2.11a	10/26/2011	Removed display value "P", "L" from order accept message
2.11a	11/07/2011	Added numeric liquidity flag values
2.11a	04/19/2012	Added cancel reason "Z" Added liquidity flag values "k", "m" for midpoint executions
2.11a	10/23/2012	Added liquidity flag values "7", "8"
2.11a	01/28/2013	Added liquidity flag values "6"
2.11a	06/09/2014	Updated the formatting of the document to make more standardized across all specs
2.11a	06/30/2014	Added "Z" to Display of Enter Order Message Added "P", "L" to Display of Accepted Order Message Added footer
2.11a	01/15/2015	Added Liquidity flag values "0", 4", "5", "g" Modified the definitions of liquidity flag values "M", "L", "K"
2.11a	03/23/2015	Added cancel reasons "E", "X"
2.11a	06/08/2015	Greyed out cancel order reasons "E", "X"
2.11a	12/23/2015	Added cancel reasons "H", "K", "X"