

AIX Trading Platform

ITCH Specification for AIX

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1 Context

1.1 Requirements

The INET ITCH® protocol is widely used and considered an industry standard. This standard is ideal for a low latency messaging.

The point-to-point transport layer for ITCH® payloads will be SoupBinTCP.

SoupBinTCPv3.0 is required as it supports binary types in the payload. Binary types are employed in the latest ITCH® and OUCH standards so required for AIX Trading Platform.

The transport for one-to-many distribution of ITCH® market data is MoldUDP64. The Mold protocol provides a sequenced and recoverable UDP multicast stream.

2 **ITCH[®] Data Types**

Table 1 – ITCH[®] Data Types

DATA TYPE	DESCRIPTION
Alpha	Left justified and right padded
Unsigned Integer	Unsigned big-endian binary encoded
Signed Integer	Signed integer

3 ITCH® Message Sets

Table 2 – ITCH Total View Messages

MESSAGE TYPE	DESCRIPTION
T	ITCH Timestamp, number of seconds since midnight of the system start
S	System event message
L	Orderbook price tick table
M	Orderbook quantity tick table
R	Orderbook directory
H	Trading action message
A	Order add message
E	Order executed
C	Order executed with price
P	Trade message
B	Broken trade message
D	Order delete message
U	Order replace message
I	Indicative price/quantity message
X	Orderbook Reference Price message

Table 3 – ITCH Basic Messages

MESSAGE TYPE	DESCRIPTION
T	ITCH Timestamp, number of seconds since midnight of the system start
S	System event message
L	Orderbook price tick table
M	Orderbook quantity tick table
R	Orderbook directory
H	Trading action message
P	Trade message
Q	Best bid offer message
X	Orderbook Reference Price message

Table 4 – ITCH News Messages

MESSAGE TYPE	DESCRIPTION
T	ITCH Timestamp, number of seconds since midnight of the system start
S	System event message
L	Orderbook price tick table
M	Orderbook quantity tick table
R	Orderbook directory
F	Participant directory
H	Trading action message
N	News message

4 ITCH® Messages

This section describes the messages used by the ITCH® market data feeds generated by AIX Trading Platform.

Table 5 – ITCH® Time Stamp – Seconds [T]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"T"	Time Stamp -Seconds Message Id.
Second	1	4	Unsigned Integer	Number of seconds since midnight of the first day of the system cycle.

Table 6 – ITCH® System Event Message [S]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"S"	System Event Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Group	5	8	Alpha	Id for symbol grouping. Left blank if at System level or Orderbook level.
Event Code	13	1	Alpha	Event Code. Refer to System Event codes in table below.
Orderbook	14	4	Unsigned Integer	Used to identify if the event applies to a single orderbook within the Group. Orderbook Code set to 0 if the event applies at a System level or Group level.

Table 7 – System Event Codes

SYSTEM EVENT CODE	EXPLANATION
'O'	Start of Messages. This is the first message sent.
'S'	Start of System Hours.
'R'	Enquiry session.
'I'	Enquiry session for IPO board
'L'	Trading at Last Session.
'Q'	Start of Market Hours. Trading session. It indicates the Exchange is open and ready to start accepting orders.
'M'	End of Market Hours. End of Trading session.
'V'	Scheduled auction starts
'U'	Scheduled auction closes
'E'	End Of System Hours. It indicates that the Exchange is closed.

SYSTEM EVENT CODE	EXPLANATION
'C'	End of Messages. Last message sent.

Table 8 – ITCH® Price Tick Size [L]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"L"	Tick Size Table.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Tick Size Table Id	5	4	Unsigned Integer	Indicates the Tick Size Table id.
Tick Size	9	4	Unsigned Integer	Price Tick Size.
Price Start	13	4	Unsigned Integer	Start of Price for this Tick Size.

Table 9 – ITCH® Quantity Tick Size [M]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"M"	Tick Size Table.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Tick Size Table Id	5	4	Unsigned Integer	Indicates the Tick Size Table id.
Tick Size	9	8	Unsigned Integer	Quantity Tick Size.
Quantity Start	17	8	Unsigned Integer	Start of Quantity for this Tick Size.

Table 10 – ITCH® Orderbook Directory [R]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"R"	Orderbook Directory Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Unsigned Integer	Unique orderbook identifier.
Security Code	9	30	Alpha	Security code.
Currency	39	3	Alpha	Trading currency.
Group	42	8	Alpha	Id for symbol grouping.
Minimum Quantity	50	8	Unsigned Integer	Minimum Quantity.

NAME	OFFSET	LEN	VALUE	NOTES
Quantity Tick Size Table Id	58	4	Unsigned Integer	Quantity Tick Size Table. Cross reference to Quantity Tick Size table.
Quantity Decimals	62	4	Unsigned Integer	Quantity Decimals.
Price Tick Size Table Id	66	4	Unsigned Integer	Price Tick Size Table Id. Cross reference to Price Tick Size table.
Price Decimals	70	4	Unsigned Integer	Price Decimals.

Table 11 – ITCH Participant Directory [F]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"F"	Market Participant Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Participant Id	5	4	Integer	Unique identifier for the market participant.
Participant Code	9	12	Alpha	Company's participant code.

Table 12 – ITCH® Orderbook Trading Action [H]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"H"	Orderbook Trading Action Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Unsigned Integer	Unique orderbook identifier.
Trading State	9	1	Alpha	Current trading state for orderbook. At the start of the system cycle "V" is sent for each symbol which is suspended, no message implies state is 'T' Trading. Suspended intra-day with "V" then unsuspended with "T".
Reason	10	1	Alpha	Refer to reason in table below.

Table 13 – Trading Action Reasons

TRADING ACTION REASON	EXPLANATION
'N'	Normal Trading
'L'	Trade Lock period started
'A'	Continuous Auction Start
'B'	Continuous Auction End

Table 14 – ITCH TV Orderbook Reference Price [X]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"X"	OrderBook Reference Price Message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Integer	Unique orderbook identifier.
Reference Price	9	4	Integer	The reference price. The price is 0x7FFFFFFF (hex) 2147483647 (dec) when the reference price is unavailable.
Price Type	13	1	Alpha	Refer to reference price type in table below.
Reason	14	1	Alpha	Refer to reference price reason in table below.

Table 15 – Orderbook Reference Price Types

ORDERBOOK REFERENCE PRICE TYPE	EXPLANATION
'C'	Close Price

Table 16 – Orderbook Reference Price Reasons

ORDERBOOK REFERENCE REASON	EXPLANATION
' '	None

Table 17 – ITCH® Add Order Message [A]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"A"	Add Order Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Order Number	5	8	Unsigned Integer	The unique reference number assigned to the new order. A value of zero indicates that this is a reference price update.
Order Verb	13	1	Alpha	"B"uy "S"ell Blank if reference price update.
Quantity	14	8	Unsigned Integer	The total quantity of the order being added to the book. A value of zero indicates that this is a reference price update.
Orderbook	22	4	Unsigned Integer	Unique orderbook identifier.

NAME	OFFSET	LEN	VALUE	NOTES
Price	26	4	Signed Integer	The price of the new order. The price is 0x7FFFFFFF (hex) 2147483647 (dec) for a 'market' order or that a reference price is unavailable.

Table 18 – ITCH® Order Executed [E]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"E"	Order Executed Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Order Number	5	8	Unsigned Integer	The unique executed order reference number.
Executed Quantity	13	8	Unsigned Integer	The number of shares executed.
Match Number	21	8	Unsigned Integer	The unique match identifier.

Table 19 – ITCH® Order Executed With Price Message [C]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"C"	Order Executed with Price Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Order Number	5	8	Unsigned Integer	The unique executed order reference number.
Executed Quantity	13	8	Unsigned Integer	The number of shares executed.
Match Number	21	8	Unsigned Integer	The unique match identifier.
Printable	29	1	Alpha	Indicates if the execution should be reflected in volume calculations. 'N' = Non Printable 'Y' = Printable
Execution Price	30	4	Signed Integer	The price at which the execution occurred.

Table 20 – ITCH® Broken Trade Message [B]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"B"	Broken Trade Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Match Number	5	8	Unsigned Integer	The match number of the execution that was broken.
Reason	13	1	Alpha	The reason the trade was broken. See currently supported Broken Trade Reasons table below.

Table 21 – ITCH® Broken Trade Reasons

REASON	EXPLANATION
'S'	Supervisory – The trade was manually broken by the Exchange.

Table 22 – ITCH® Order Delete Message [D]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"D"	Order Delete Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Order Number	5	8	Unsigned Integer	The reference number of the order being cancelled.

Table 23 – ITCH® Order Replace Message [U]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"U"	Order Replace Message Id
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Original Order Number	5	8	Unsigned Integer	The original order number of the order being replaced.
New Order Number	13	8	Unsigned Integer	The new reference number for the order at the time of replacement.
Quantity	21	8	Unsigned Integer	The new total open quantity, i.e. the balance of the new order.
Price	29	4	Signed Integer	The new price for the order.

Table 24 – ITCH® Indicative Price/Quantity Message [I]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"I"	Indicative Price/Quantity Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Theoretical Opening Quantity	5	8	Unsigned Integer	The total quantity eligible to be matched at the current Theoretical Opening Price.
Orderbook	13	4	Unsigned Integer	Unique orderbook identifier.
Best Bid	17	4	Signed Integer	The current best buy price. 0x7FFFFFFF (hex) or 2147483647 (dec) indicates there are no limit orders on this side of the book.
Best Offer	21	4	Signed Integer	The current best sell price. 0x7FFFFFFF (hex) or 2147483647 (dec) indicates there are no limit orders on this side of the book.
Theoretical Opening Price	25	4	Signed Integer	The current opening price for this orderbook. 0x7FFFFFFF (hex) or 2147483647 (dec) indicates there is no TOP.
Cross Type	29	1	Alpha	Cross Type code. Refer to Cross Type codes in table below.

Table 25 – Cross Type Codes

CROSS TYPE CODE	EXPLANATION
'O'	Pre-opening session
'C'	Closing Auction

Table 26 – ITCH® Trade Message [P]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"P"	Trade Message Id.
Timestamp	1	4	Unsigned Integer	Nanoseconds since last Time Stamp seconds message.
Executed Quantity	5	8	Unsigned Integer	The number of shares executed.
Orderbook	13	4	Unsigned Integer	Unique orderbook Identifier.
Printable	17	1	Alpha	Indicates if the execution should be reflected in volume calculations. 'N' = Non Printable 'Y' = Printable

NAME	OFFSET	LEN	VALUE	NOTES
Execution Price	18	4	Signed Integer	The price at which the execution occurred.
Match Number	22	8	Unsigned Integer	The unique match identifier. MatchNumber 0 used to indicate update of index value.

Table 27 – ITCH Best Bid Offer Message [Q]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"Q"	Best Bid Offer Quotation Message Id
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Integer	Unique orderbook identifier.
Best Bid	9	4	Integer	The best buy price. 0x7FFFFFFF (hex) or 2147483647 (dec) indicates there are no limit orders on this side of the book.
Best Bid Size	13	8	Integer	Total quantity at the best buy price.
Best Offer	21	4	Integer	The best sell price. 0x7FFFFFFF (hex) or 2147483647 (dec) indicates there are no limit orders on this side of the book.
Best Offer Size	25	8	Integer	Total quantity at the best sell price.

Table 28 – ITCH News Message [N]

NAME	OFFSET	LEN	VALUE	NOTES
Type	0	1	"N"	News Item message Id.
Timestamp	1	4	Integer	Nanoseconds since last Time Stamp seconds message.
Orderbook	5	4	Integer	Unique orderbook identifier. 0x7FFFFFFF indicates no orderbook identifier is requirement for this news.
NewsId	9	4	Integer	Unique news item identifier.
ParticipantId	13	4	Integer	Participant Id of reference firm.
Title	17	max(80+1)	Null-Terminated Alpha	News Title
Reference		max(255+1)	Null-Terminated Alpha	Reference for news item associated object (e.g. a URL, file pathname)
NewsText		Max(511+1)	Null-Terminated Alpha	News data.

5 Message Kinematics

5.1 Update of Reference Price

An Add Order message with an Order Number and Quantity set to zero, is used to indicate the reference price of an order book.

Add Order Messages are sent after the Orderbook Directory message to indicate the initial reference price.

A manual reference price update will generate an Add Order Message.

Reference price changes due to auctions will not generate an Add Order message.

5.2 Orderbook Trading Action [H]

The Orderbook Trading Action will send the initial Trading State of "V" for all suspended Orderbooks. Orderbooks not included in this first spin are to be assumed "T"rading and reason "N"ormal.

When a group of Orderbooks are suspended/unsuspended in AIX Trading Platform then the Orderbook Trading Action [H] message will be sent for all Orderbooks in the group to indicate a change in Trading State.

The ITCH® System Event [S] to be received with Event Code 'S' is sent after the first spin at the start of Pre-Open session.

5.3 Add Order [A] and Order Executed With Price [C]

During normal trading, when an incoming order matches, Order Executed [E] message is sent for the passive orders that match the incoming order (aggressor). An Order Add message is sent with the outstanding balance for the incoming order; no message sent if fully matched. In the case of IOC incoming order, no message is sent for that order.

At the uncross of an auction, the Order Executed With Price [C] is sent for each executed order.

5.4 Event Message Flow

The ITCH® System Event Message [S] will be sent as a result of trade events at the system group and Orderbook level. This will indicate the start of a scheduled auction.

Cross Type code in ITCH® Indicative Price/Quantity Message [I] will map the auction session.

An ITCH® Trading Action [H] with Reason code with Reason Code 'H' indicates the start of a volatility auction.

The table below shows the possible values of System Event Codes and Cross Type when a transition is triggered or during a particular trading session.

Table 29 – ITCH® Event Message flow

TRANSITION	SYSTEM EVENT MESSAGE [S] SYSTEM EVENT CODE (System or Group or Orderbook Level)	ORDERBOOK TRADING ACTION MESSAGE [H] REASON (Orderbook Level)	INDICATIVE PRICE/QUANTITY [I] CROSS TYPE (Orderbook Level)
	'O' – "Start of Messages" First message sent.		
START_OF_CYCLE	'S' – "Start of System Hours"		
OPEN	'Q' – "Start Of Market Hours"		
During Trading	'V' – "Scheduled Auction Starts"		'O' – "Pre-opening session" 'C' – "Closing Auction"
During Auction	'U' – "Scheduled Auction Closes"		
During Trading			
During Auction		'N' – "Normal Trading"	
CLOSE	'M' – "End Of Market Hours"		
END_OF_CYCLE	'E' – "End of System Hours"		
IPXS-EOM	'C' – "End of Messages" Last message sent.		
IPXS-ENDSESS			