Input Specification

Data Types

All integer fields are big-endian numbers. Messages specify whether integers are signed or unsigned.

Alphanumeric fields are left-justified ASCII fields, and are padded with spaces on the right.

All prices are integer fields with 4 implied decimal places.

Timestamps are unsigned integers that represent nanoseconds since midnight local time.

Message Format

Market data is transmitted to your program via UDP. Each UDP packet starts with a header that contains the sequence number of the packet and the number of bytes in the packet.

Field	Offset	Length	Data Type	Notes
Packet Size	0	2	unsigned	Number of bytes in this packet including this header
Sequence Number	2	4	unsigned	Sequence number of this packet
Data	6	varies	-	Payload

Note that in the source data, there are expected to be no gaps (i.e. no sequence numbers will be missing). However, packets may arrive out of order, or may be duplicated. The first packet processed by your parser should be the packet with sequence number 1.

The payload carried by these packets is made up of zero or more messages. Messages can straddle packet boundaries. Every message begins with a message header which contains just 1 field - the message type.

Field	Offset	Length	Data Type	Notes
Msg Type	0	1	alphanumeric	Type of this message

Message Types

Add Order Message

This message is sent when a new order is added to the book.

Field	Offset	Length	Data Type	Notes
Msg Type	0	1	"A"	Add Order Message
Timestamp	1	8	unsigned	Nanoseconds since midnight
Order Reference Number	9	8	unsigned	Unique reference number assigned to this order
Side	17	1	alphanumeric	"B" - buy order "S" - sell order
Size	18	4	unsigned	Number of shares in this order
Stock Ticker	22	8	alphanumeric	Symbol this order is for
Price	30	4	price	Price of this order

Order Executed Message

This message is sent when an order on the book is partially or fully executed at the price it was added to the book with.

Field	Offset	Length	Data Type	Notes
Msg Type	0	1	"E"	Order Executed Message
Timestamp	1	8	unsigned	Nanoseconds since midnight
Order Reference Number	9	8	unsigned	Unique reference number assigned to the order being executed
Size	17	4	unsigned	Number of shares executed from this order

Order Cancelled Message

This message is sent when some shares are cancelled from an order already on the book.

Field	Offset	Length	Data Type	Notes
Msg Type	0	1	"X"	Order Cancelled Message
Timestamp	1	8	unsigned	Nanoseconds since midnight
Order Reference Number	9	8	unsigned	Unique reference number assigned to the order from which shares are being cancelled
Size	17	4	unsigned	Number of shares cancelled from this order

Order Replaced Message

This message is sent when an order is replaced. All remaining shares from the original order must be removed, and new order details are provided along with a new order reference number. The side and ticker symbol of the order cannot be changed and should be inherited from the original order that is being replaced.

Field	Offset	Length	Data Type	Notes
Msg Type	0	1	"R"	Order Replaced Message
Timestamp	1	8	unsigned	Nanoseconds since midnight
Original Order Reference Number	9	8	unsigned	Unique reference number assigned to the order being replaced
New Order Reference Number	17	8	unsigned	New reference number for this order
Size	25	4	unsigned	Number of shares in the new order
Price	29	4	price	New price for this order

Output Specification

You should translate each input message into an output message based on the mapping below.

Input Message Type	Output Message Type
Add Order	Add Order
Order Executed	Order Executed
Order Cancelled	Order Reduced
Order Replaced	Order Replaced

Data Types

All integer fields are little-endian numbers.

Alphanumeric fields are left-justified ASCII fields, and are padded with nul ('\0') characters on the right.

All prices are 8 byte little-endian floating point fields.

Timestamps are unsigned integers that represent nanoseconds since the Unix epoch.

Message Format

Common Header

Field	Offset	Length	Data Type	Notes
Msg Type	0	2	unsigned	Type of this message
Msg Size	2	2	unsigned	Number of bytes in this message including the header

Message Types

Add Order

Field	Offset	Length	Data Type	Notes
Msg Type	0	2	0x01	Add Order Message
Msg Size	2	2	unsigned	Number of bytes in this message including the header
Stock Ticker	4	8	alphanumeric	Symbol this message is for
Timestamp	12	8	unsigned	Nanoseconds since the unix epoch
Order Reference Number	20	8	unsigned	Unique reference number assigned to this order
Side	28	1	alphanumeric	"B" - buy order "S" - sell order
Padding	29	3	alphanumeric	Reserved for future use - must be filled with 0x00.
Size	32	4	unsigned	Number of shares in this order
Price	36	8	price	Price of this order

Order Executed

Field	Offset	Length	Data Type	Notes
Msg Type	0	2	0x02	Order Executed Message
Msg Size	2	2	unsigned	Number of bytes in this message including the header
Stock Ticker	4	8	alphanumeric	Symbol this message is for
Timestamp	12	8	unsigned	Nanoseconds since the unix epoch
Order Reference Number	20	8	unsigned	Unique reference number assigned to this order
Size	28	4	unsigned	Number of shares executed
Price	32	8	price	Execution price

Order Reduced

Field	Offset	Length	Data Type	Notes

Msg Type	0	2	0x03	Order Reduced Message
Msg Size	2	2	unsigned	Number of bytes in this message including the header
Stock Ticker	4	8	alphanumeric	Symbol this message is for
Timestamp	12	8	unsigned	Nanoseconds since the unix epoch
Order Reference Number	20	8	unsigned	Unique reference number assigned to this order
Size Remaining	28	4	unsigned	Number of shares remaining in this order

Order Replaced

Field	Offset	Length	Data Type	Notes
Msg Type	0	2	0x04	Order Replaced Message
Msg Size	2	2	unsigned	Number of bytes in this message including the header
Stock Ticker	4	8	alphanumeric	Symbol this message is for
Timestamp	12	8	unsigned	Nanoseconds since the unix epoch
Order Reference Number	20	8	unsigned	Unique reference number assigned to this order
New Order Reference Number	28	8	unsigned	New reference number for this order
New Size	36	4	unsigned	Size of the new order
New Price	40	8	price	Price of the new order