US Equity Trade and Quote Guide

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algoseek | the market data company

We provide research market data for machine learning and quantitative trading

CONTACT US

We are here to help you do great things with our market and reference data. For questions, feedback, and other concerns, you may reach our team of experts using the following contact information:

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INTRODUCTION

algoseek Trade and Quote data contain all trades and bid/ask quotes for all listed stocks, ETNs, ETFs, ADRs, and funds from 15+ US exchanges and marketplaces. Trade and Quote data files are organized into a single format feed where events are ordered by the time received with nanosecond timestamps starting from 2016 and millisecond timestamps before. The entire trading session includes early and late hours from 04:00 to 20:00 EST.

SIP DATA FEED

algoseek collects live data from the Securities Information Processor (also known as the "Consolidated Feed") via its co-located ticker plant servers in Equinix NY2 and NY4 data center with 10Gb fiber connection for ultra-low latency.

The Securities Information Processor (SIP) includes Tape A and Tape B covered by the Consolidated Tape Association (CTA) plan and Tape C covered by the Unlisted Trading Privileges (UTP) plan. The SIP links the US markets by processing and consolidating all protected bid/ask quotes and trades from every trading venue into a single and easily consumable data feed.

The idea behind the creation of SIP was to form a national market system where investors and professionals can access real-time price information. Law prohibits exchanges from sending their quotes and trades to direct feeds before sending them to the SIP. In the highly fragmented world of US equities, the SIP is an easy way for people to get a view of the current state of the market. The SIP acts as the benchmark for regulators and others to determine the National Best Bid and Offer (NBBO). It also publishes other important information, such as short sale restrictions and regulatory halts.

DATA DISTRIBUTION AND COLLECTION

There are four major national listing Exchanges in the US: NYSE, NYSE Market (old AMEX), NASDAQ, and BATS - and 14 other national and regional exchanges and market centers. Please refer to Table 4 for a full list of market centers. When a company goes "public" via Initial Public Offering (IPO), Direct Listing, or a merger with SPAC, it is officially listed on a listing exchange and becomes available for trading on multiple other exchanges.

Direct feeds from the exchanges are different and you'll need to connect to all the exchanges to get a full picture of the market liquidity, so it is used by high-frequency / ultra-low latency trading firms with co-located computers.

SIP data provides an alternative way of collecting market data. When subscribing to CTA and UTP plans directly or via a vendor, you are receiving all the trades and top-of-book quotes from all exchanges in a consolidated feed.

CTA Plan

Trades and quotes data for stocks listed on NYSE and AMEX were distributed by the Consolidated Tape Association (CTA). The CTA has two services:

Consolidated Tape System (CTS): an electronic system that collates real-time exchange-listed trade data, such as price and volume

Consolidated Quotation System (CQS): an electronic service that provides quotation information and also includes issues traded by FINRA member firms in the third market

Any market center (exchange, dark pool, etc.) must report any trades for stocks that are officially listed on the NYSE or AMEX to CTA.

To learn more, please visit https://www.ctaplan.com/index.

UTP Plan

NASDAQ listed stocks have their trades and quotes reported through Unlisted Trading Privileges (UTP). Under the UTP Plan, all US exchanges that quote and trade NASDAQ listed securities must provide their data to a centralized SIP for data consolidation and dissemination.

NASDAQ, in its current role as the SIP for the UTP plan, supports the following data feed products:

UTP Quotation Data Feed (UQDF) provides the best bid and offer (BBO) quotes from the UTP participants as well as the consolidated national best bid and offer (NBBO) quotes for securities listed on the NASDAQ Stock Market.

UTP Trade Data Feed (UTDF) provides trade data from the UTP participants for securities listed on the NASDAQ Stock Market.

To learn more, please visit http://www.utpplan.com/overview.

Data Normalization

algoseek collects data from multicast CTS/CQS/UTDF/UQDF feeds, then normalizes and consolidates the data to deliver it in CSV format.

"As-is" Data

Live data from exchanges is not perfect. It is susceptible to issues such as crossed NBBO, bad prices, and bad trades, as well as exchange publishing mistakes such as out-of-sequence packets, but it is the data clients receive in real trading.

In order to provide the most realistic scenarios for clients to work with historical data, by default, we do not modify the data received live from exchanges.

If you need cleaned data, please contact us and specify your needs.

DATA ORGANIZATION AND FILE FORMAT

algoseek provides Equity market data in plain-text CSV files. The first row of the CSV file is a fixed header, and then rows of data corresponding to individual events (see Table 1). By default, data is organized into one file per symbol per trading day. For example, all events for ticker AAPL on Mar 3, 2020, are stored in one CSV file.

Due to the large data size, CSV files are gzip-compressed (having a csv.gz extension) with a compression ratio of about 8:1.

Table 1: Sample Trade and Quote Data

Date	Timestamp	Event Type	Ticker	Price	Quantity	Exchange	Conditions
20200128	09:30:00.004925261	TRADE	AAPL	312.38	58	ARCA	80000401
20200128	09:30:00.005027389	QUOTE BID	AAPL	312.33	100	NASDAQ PSX	00000001
20200128	09:30:00.005027389	QUOTE ASK	AAPL	326.72	100	NASDAQ PSX	00000001
20200128	09:30:00.005027389	QUOTE BID NB	AAPL	312.33	100	NASDAQ PSX	00000001
20200128	09:30:00.005027389	QUOTE ASK NB	AAPL	312.38	100	NASDAQ	00000001
20200128	09:30:00.005417423	QUOTE BID	AAPL	312.1	200	BATS	00000001
20200128	09:30:00.005417423	QUOTE ASK	AAPL	325.1	100	BATS	00000001
20200128	09:30:00.005429507	QUOTE BID	AAPL	312.27	100	EDGX	00000001

Table 2 (below) provides the name, description, and data type for each data field (column) in an Equity TAQ data file.

Table 2: CSV File Fields Schema

Field	Type (Format)	Description
Date	string (yyyymmdd)	Trading date in yyyymmdd format
Timestamp	string (HH:MM:SS.mmm or HH:MM:SS.mmmuuunnn)	Event timestamp in nanoseconds (milliseconds before 2016). Excel Note: Excel displays incorrect timestamps unless the Timestamp column is imported as text.
EventType	string	The type of event
Ticker	string	Symbol name
Price	decimal	The price of Bid, Ask, or Trade. It can be up to 4 decimal places for sub-penny prices.
Quantity	integer	The number of shares. For some event types, this can be 0.
Exchange	string	The exchange or reporting venue
Conditions	hexadecimal (base 16)	Conditions applicable to the trade/quote

Time Range

The TAQ dataset covers the entire trading day from the start of pre-market trading to the end of after-hours trading (EST time):

Pre-Market Hours: 04:00:00 to 09:29:59

Market Hours: 09:30:00 to 16:00:00

Post-Market Hours: 16:00:01 to 20:00:00

Note: Occasionally trade and quote events are recorded several minutes after 20:00.

Market Holidays and Early Closes

The stock market is closed for trading on most US holidays. For reference, algoseek publishes a list of historical holidays which is available at `s3://us-equity-market-holidays/holidays.csv` (direct download link: https://us-equity-market-holidays.s3.amazonaws.com/holidays.csv).

Markets sometimes close early at 13:00:00 on the day before holidays such as Independence Day and Thanksgiving. You can download algoseek's early close date and time list from AWS S3 storage at `s3://us-equity-market-holidays/earlycloses.csv` (or use a direct link us-equity-market-holidays.s3.amazonaws.com/earlycloses.csv).

Timestamp

The event timestamp has a nanosecond resolution, and the time zone is EST. Timestamp field takes the format of HH:MM:SS.mmmuuunnn, for example, 09:31:01.723317846, where

> **HH:** Hour
>
> **MM:** Minute
>
> **SS:** Seconds
>
> **mmm:** Milliseconds
>
> **uuu:** Microseconds
>
> **nnn:** Nanoseconds

Before 2016 events were published with millisecond timestamps (HH:MM:SS.mmm format). For example, 09:32:00.321.

Timestamps in Excel. Excel fails when importing timestamp fields as Excel automatically tries to convert milliseconds and nanoseconds to Excel time format. When importing timestamp, you can import as Text fields instead.

Event Types

Table 3 contains names and descriptions of event types present in data files.

Table 3: Event Types in Equity TAQ Dataset

Event Type	Description
QUOTE BID	Exchange's best bid quote. Change in a market center's best bid
QUOTE BID NB	Bid from an Exchange creating a new best bid quote in the NBBO
QUOTE ASK	Exchange's best ask quote. Change in a market center's best ask
QUOTE ASK NB	Ask from an Exchange creating new best ask quote in the NBBO
TRADE	Trade at the exchange or reported to a market center

TRADE NB	Trade at or within the NBBO
TRADE CANCELLED	Previous trade cancellation (reduce total traded volume by this amount). Trade corrections are constructed as a cancellation of the previous trade with the corrected trade following the cancellation
TRADE NB CANCELLED	Previous NBBO trade cancellation

Note: usually a cancelation event does not immediately follow the trade it cancels and can be published up to a few hours after the trade event occurred.

National Best Bid Offer Events

NB refers to the National Best Bid Offer (NBBO). Please refer to Table 4 to see the example of the Ask quote event becoming NBBO.

Table 4: Change to NBBO

Date	Timestamp	Event Type	Ticker	Price	Quantity	Exchange	Conditions
20200128	09:30:00.015301676	QUOTE ASK	AAPL	312.48	200	NASDAQ	00000001
20200128	09:30:00.015301676	QUOTE BID NB	AAPL	312.33	100	NASDAQ PSX	00000001
20200128	09:30:00.015301676	QUOTE ASK NB	AAPL	312.48	200	NASDAQ	00000001

In the example above, NASDAQ's new Ask changed the NBBO so the new NBBO is displayed as two rows showing the new NBBO. When reading the TAQ file, the QUOTE BID NB and QUOTE ASK NB repeat quotes already published from the market center creating the quote.

The consolidated feed sends the NBBO data as a separate feed from market center quotes. Sometimes you will see a crossed NBBO (e.g. the Bid = Offer). This happens when one side has updated and the other side has not been printed yet. Typically, you will see another NBBO print in the same nanosecond (millisecond) with the correct market.

Trades are not always executed at NBBO prices. Examples of trades that are not at NBBO prices include:

Some FINRA trades: FINRA trades are TRF reports of trades that are not done on the public Exchanges, and are not subject to the regulation of Rule 611.

Late report from the exchange: due to late reporting from a market center.

Extended hours trades: no NBBO in pre/post-market hours.

ISO orders: An Intermarket Sweep Order (ISO) can be executed outside of the NBBO by an exchange.

Other trade-through exemptions

For backtesting with trades, the best practice is to use the Trade NB reports.

Zero Bid and Ask Quote at Close

Exchanges may send Quote Bid/Ask with the price of 0 on the close to indicate that it is the last Quote Bid/Ask of the normal market hours. Please refer to Table 5 for an example.

Table 5: Closing Bid/Ask Events

Date	Timestamp	Event Type	Ticker	Price	Quantity	Exchange	Conditions
20200128	16:00:00.035774951	QUOTE BID	AAPL	0.00	0	NYSE	00000001
20200128	16:00:00.035774951	QUOTE ASK	AAPL	0.00	0	NYSE	00000001

Market Center ID

Table 6 contains all the 19 SIP Market Center IDs (including FINRA).

Table 6: algoseek Value for SIP Market Center IDs

	Exchange Name	SIP Market Center ID	algoseek Value
	NYSE Group of Exchanges		
1	New York Stock Exchange LLC	N	NYSE
2	NYSE Arca, Inc.	P	ARCA
3	NYSE American, LLC	A	AMEX
4	NYSE National, Inc.	C	NSE
5	NYSE Chicago, Inc.	M	CSE
	Nasdaq Group of Exchanges		
6	Nasdaq, Inc.	T (CTS) / Q (UTP)	Nasdaq
7	Nasdaq BX, Inc.	B	Nasdaq BX

8	Nasdaq PHLX LLC	X	NASDAQ PSX
9	Nasdaq ISE, LLC	I	ISE
CBOE Group of Exchanges			
10	Cboe Exchange, Inc.	W	CBOE
11	Cboe BYX Exchange, Inc.	Y	BATS Y
12	Cboe BZX Exchange, Inc.	Z	BATS
13	Cboe EDGA Exchange, Inc.	J	EDGA
14	Cboe EDGX Exchange, Inc.	K	EDGX
Independent Venues			
15	Investors' Exchange LLC (IEX)	V	IEX
16	Long-Term Stock Exchange (LTSE)	L	LTSE
17	MIAX Pearl, LLC (MIAX)	H	MIAX
18	MEMX LLC (MEMX) (Member's Exchange)	U	MEMX
19	Financial Industry Regulatory Authority	D	FINRA
Other Values			
20	Unknown		UNKNOWN
21	Invalid		INVALID

Normalized Condition Flags

algoseek Trade and Quote dataset normalizes the Sales Condition Modifiers from UTP/CTS plans into a 32-bit bitmask. Each flag shows a condition applicable to the trade/quote event. The flag value indicates a bit position of the flag value inside the unsigned 32-bit integer value in the base-16 (hex) format.

Each flag shows a condition applicable to the trade/quote. The flag value indicates a bit position of the flag value inside the unsigned 32-bit integer value in base-16 (hex) format.

Note: the bit position 0 corresponds to the rightmost bit and 31 is the leftmost bit.

Download algoseek's sample python code for converting the Conditions flag value into its text format from https://github.com/aquanyc/algoseek_public/tree/master/utils/flag_decoder

Note: There are *two* sets of condition flags listed below, one for Trades (Table 7) and the other for Bids/Ask Quotes (Table 8).

Table 7: Trade Condition Flags

Bit Mask Position	Flags	Description
Settlement Type		
0	tRegular	A trade made without stated conditions is deemed as a regular way for settlement on the third business day following the transaction date.
1	tCash	A transaction which requires delivery of securities and payment on the same day the trade takes place.
2	tNextDay	A transaction that requires the delivery of securities on the first business day following the trade date.
3	tSeller	A Seller's Option transaction gives the seller the right to deliver the security at any time within a specific period, ranging from not less than two calendar days, to not more than sixty calendar days. A security offered "Seller's Option" may command a lesser price than if offered "Regular Way".
4	tYellowFlag	Market centers will have the ability to identify regular trades being reported during specific events as out of the ordinary by appending a new sale condition code Yellow Flag ("Y") on each transaction reported to the UTP SIP. The new sale condition "Y" will be eligible to update all market centers and consolidated statistics.
Reason for Trade-Through Exemption		
5	tIntermarketSweep	The transaction that constituted the trade-through was the execution of an order identified as an Intermarket Sweep Order.
6	tOpeningPrints	The trade that constituted the trade-through was a single priced opening transaction by the market center.
7	tClosingPrints	The transaction that constituted the trade-through was a single priced closing transaction by the market center.
8	tReOpeningPrints	The trade that constituted the trade-through was a single priced reopening transaction by the market center.
9	tDerivativelyPriced	The transaction that constituted the trade-through was the execution of an order at a price that was not based, directly or indirectly, on the quoted price of the security at the time of execution, and for which the material terms were not reasonably

		determinable at the time the commitment to execute the order was made.
Extended Hours / Sequence Type		
10	tFormT	Trading in extended hours enables investors to react quickly to events that typically occur outside regular market hours such as earnings reports. However, liquidity may be constrained during such FormT trading, resulting in wide bid-ask spreads.
11	tSold	Sold Last is used when a trade prints in sequence but is reported late or printed in conformance to the One- or Two-Point Rule.
12	tStopped	The transaction that constituted the trade-through was the execution by a trading center of an order for which, at the time of receipt of the order, the trading center had guaranteed an execution at no worse than a specified price (a "stopped order"), where: (i) the stopped order was for the account of a customer; (ii) the customer agreed to the specified price on an order-by-order basis; and (iii) the price of the trade-through transaction was for a stopped buy order lower than the National Best Bid in the security at the time of execution, or for a stopped sell order higher than the National Best Offer in the security at the time of execution.
13	tExtendedHours	Identifies a trade that was executed outside of regular primary market hours and is reported as an extended hours trade.
14	tOutOfSequence	Identifies a trade that takes place outside of regular market hours.
Other Types		
15	tSplit	An execution in two markets when the specialist or market maker in the market first receiving the order agrees to execute a portion of it at whatever price is realized in another market to which the balance of the order is forwarded for execution.
16	tAcquisition	A transaction made on the Exchange as a result of an Exchange acquisition.
17	tBunched	A trade representing an aggregate of two or more regular trades in a security occurring at the same price either simultaneously or within the same 60-second period, with no individual trade exceeding 10,000 shares.
18	tStockOption	Stock-Option Trade is used to identify cash equity transactions which are related to options transactions and therefore potentially subject to cancellation if market conditions of the options leg(s) prevent the execution of the stock-option order at the price agreed upon.
19	tDistribution	Sale of a large block of stock in such a manner that the price is not adversely affected.

20	tAveragePrice	A trade where the price reported is based upon an average of the prices for transactions in a security during all or any portion of the trading day.
21	tCross	Indicates that the trade resulted from a market center's crossing session.
22	tPriceVariation	Indicates a regular market session trade transaction that carries a price that is significantly away from the prevailing consolidated or primary market value at the time of the transaction.
23	tRule155	To qualify as a NYSE AMEX Rule 155, from time to time, a specialist may arrange for the sale or purchase of a block of security or other large number of shares of securities at a single "clean-up" price. Generally, such a sale or purchase is outside of the current market. Such sale or trade is designated as a Rule 155 trade.
24	tOfficialClose	Indicates the 'Official' closing value as determined by a market center. This transaction report will contain the market center generated closing price.
25	tPriorReferencePrice	A sale condition that identifies a trade based on a price at a prior point in time, i.e. more than 90 seconds prior to the time of the trade report. The execution time of the trade will be the time of the prior reference price.
26	tOfficialOpen	Indicates the 'Official' opening value as determined by a market center. This transaction report will contain the market center generated opening price.
27	tCapElection	The CAP Election Trade highlights sales as a result of a sweep execution on the NYSE, whereby CAP orders have been elected and executed outside the best price bid or offer and the orders appear as "repeat" trades at subsequent execution prices. This indicator provides additional information to market participants that an automatic sweep transaction has occurred with repeat trades as one continuous electronic transaction.
28	tAutoExecution	A sale condition code that identifies a NYSE trade that has been automatically executed without the potential benefit of price improvement.
29	tTradeThroughExempt	Denotes whether a trade is exempt (Rule 611) and when used jointly with certain Sale Conditions, will more fully describe the characteristics of a trade.
30		Not in use
31	tOddLot	Denotes the trade is an odd lot less than 100 shares.

Table 8: Quote Condition Flags

Bit Mask Position	Flags	Description
0	qRegular	This condition is used for the majority of quotes to indicate a normal trading environment. It is also used by the FINRA Market Makers in place of Quote Condition "O" to indicate the first quote of the day for a particular security. The condition may also be used when a Market Maker re-opens a security during the day.
1	qSlow	This condition is used to indicate that the quote is a Slow Quote on both the Bid and Offer sides due to a Set Slow List that includes High Price securities. While in this mode, auto-execution is not eligible, the quote is then considered Slow on the Bid and Offer sides, and either or both sides can be traded through as per Regulation NMS.
2	qGap	While in this mode, auto-execution is not eligible, the quote is then considered manual and non-firm in the Bid and Offer and either or both sides can be traded through as per Regulation NMS.
3	qClosing	This condition can be disseminated to indicate that this quote was the last quote for a security for that Participant.
4	qNewsDissemination	This regulatory Opening Delay or Trading Halt is used when relevant news influencing the security is being disseminated. Trading is suspended until the primary market determines that an adequate publication or disclosure of information has occurred.
5	qNewsPending	This condition is used to indicate a regulatory Opening Delay or Trading Halt due to an expected news announcement, which may influence the security. An Opening Delay or Trading Halt may be continued once the news has been disseminated.
6	qTradingRangeIndication	The condition is used to denote the probable trading range (bid and offer prices, no sizes) of a security that is not Opening Delayed or Trading Halted. The Trading Range Indication is used prior to or after the opening of a security.
7	qOrderImbalance	This non-regulatory Opening Delay or Trading Halt is used when there is a significant imbalance of buy or sell orders.
8	qClosedMarketMaker	This condition is disseminated by each individual FINRA Market Maker to signify either the last quote of the day or the premature close of an individual Market Maker for the day.
9	qVolatilityTradingPause	This quote condition indicates a regulatory Opening Delay or Trading Halt due to conditions in which a security experiences a 10% or more change in price over a five minute period.
10	qNonFirmQuote	This quote condition suspends a Participant's firm quote obligation for a quote for a security.

11	qOpeningQuote	This condition can be disseminated to indicate that this quote was the opening quote for a security for that Participant.
12	qDueToRelatedSecurity	This non-regulatory Opening Delay or Trading Halt is used when events relating to one security will affect the price and performance of another related security (e.g., a call for redemption of a convertible preferred security or convertible debt security which could affect the related common security). This non-regulatory Opening Delay or Trading Halt is also used when non-regulatory halt reasons such as Order Imbalance, Order Influx and Equipment Changeover are combined with Due to Related Security on CTS.
13	qResume	This quote condition along with zero-filled bid, offer and size fields is used to indicate that trading for a Participant is no longer suspended in a security which had been Opening Delayed or Trading Halted.
14	qInViewOfCommon	This quote condition is used when matters affecting the common stock of a company affect the performance of the non-common associated securities, e.g., warrants, rights, preferred, classes, etc. Those securities, which must be of the same company, are globally Opening Delayed, Trading Halted, or No Open/No Resume for a Participant in view of the common stock.
15	qEquipmentChangeover	This non-regulatory Opening Delay or Trading Halt is used when the ability to trade a security by a Participant is temporarily inhibited due to a systems, equipment or communications facility problem or for other technical reasons.
16	qSubPennyTrading	This non-regulatory Opening Delay or Trading Halt is used to indicate an Opening Delay or Trading Halt for a security whose price may fall below $1.05, possibly leading to a sub-penny execution.
17	qNoOpenNoResume	This quote condition is used to indicate that an Opening Delay or a Trading Halt is to be in effect for the rest of the trading day in a security for a Participant.
18	qLimitUpLimitDownPriceBand	This quote condition is used to indicate that a Limit Up-Limit Down Price Band is applicable for a security.
19	qRepublishedLimitUpLimitDownPriceBand	This quote condition is used to indicate that a Limit Up-Limit Down Price Band that is being disseminated is a 'republication' of the latest Price Band for a security.
NASDAQ Specific		
20	qManual	This indicates that the market participant is in a manual mode on both the Bid and Ask. While in this mode, automated execution is not eligible on the Bid and Ask side and can be traded through pursuant to Regulation NMS requirements.

21	qFastTrading	For extremely active periods of short duration, while in this mode, the UTP participant will enter quotations on a "best efforts" basis.
22	qOrderInflux	A halt condition used when there is a sudden order influx. To prevent a disorderly market, trading is temporarily suspended by the UTP participant.

APPENDIX A. TRADE CONDITION FLAGS EXAMPLES

These are examples of the Trade Condition Flags as opposed to the Quote Flags. Flags are eight-character hexadecimal representations of an unsigned 32-bit integer. The following examples focus on Opening and Closing prices.

Example 1

```
09:30:00.948, TRADE NB, AIZ, 32.42, 700, NASDAQ, 20200040
```

Flag: 20200040

Position: 10987654321098765432109876543210

Binary: 00100000001000000000000001000000

tOpeningPrints 6

tCross 21

tTradeThroughExempt 29

Example 2

```
09:30:00.948, TRADE, AIZ, 32.42, 700, NASDAQ, 04000000
```

Flag: 04000000

Position: 10987654321098765432109876543210

Binary: 00000100000000000000000000000000

tOfficialOpen 26

Example 3

```
09:30:00.555, TRADE NB, INTC, 36.62, 761347, NASDAQ, 20200041
```

Flag: 20200041

Position: 10987654321098765432109876543210

Binary: 00100000001000000000000001000001

tRegular 0

tOpeningPrints 6

tCross 21

tTradeThroughExempt 29

APPENDIX B. FREQUENTLY ASKED QUESTIONS

Why are time-based columns not recognized properly when I try importing data to Excel?

Older versions of Excel will automatically try to convert the "Timestamp" field into an Excel format timestamp but this fails when "Timestamp" is in HH:MM:SS.mmm (millisecond) or HH:MM:SS.mmmuuunnn (nanosecond) format. For timestamp with the nanosecond (millisecond) format, import the data using Excel "From Text" option and set the data type for column "Timestamp" to "Text," so Excel does not automatically try to convert it.