



# TS+ TRADING SYSTEM

GUIDE

09/07/2016  
Version 1.5.0

## Contents

<b>1</b>	<b>Revision History</b>	<b>4</b>
<b>2</b>	<b>Overview</b>	<b>5</b>
<b>3</b>	<b>Integration Considerations</b>	<b>5</b>
3.1	Protocol Support . . . . .	5
3.2	Supported Domains . . . . .	5
3.3	Supported Markets . . . . .	5
3.4	ACS API . . . . .	6
3.5	Portal . . . . .	6
3.6	Drop Copy . . . . .	6
3.7	Resend Behavior . . . . .	6
3.8	ISO . . . . .	6
3.9	Away Trading Notification . . . . .	6
3.10	Hours of Operation . . . . .	7
3.11	Certification . . . . .	7
<b>4</b>	<b>US Equities Markets</b>	<b>7</b>
4.1	NYSE . . . . .	7
4.1.1	Supported Protocol . . . . .	7
4.1.2	Login Details . . . . .	7
4.1.3	Special Considerations: UTPDirect . . . . .	7
4.1.4	Exceptions . . . . .	8
4.2	ARCA . . . . .	9
4.2.1	Supported Protocol . . . . .	9
4.2.2	Login Details . . . . .	9
4.2.3	Special Considerations: ArcaDirect . . . . .	9
4.2.4	Exceptions . . . . .	9
4.3	Nasdaq (INET, BX, PSX) . . . . .	10
4.3.1	Supported Protocols . . . . .	10
4.3.2	Login Details . . . . .	11
4.3.3	Special Considerations: Ouch . . . . .	11
4.3.4	OUCH Exceptions . . . . .	11
4.4	BATS (BZX and BYX) and DirectEdge (EDGA and EDGX) . . . . .	12
4.4.1	Supported Protocols . . . . .	12
4.4.2	Login Details . . . . .	12
4.4.3	Special Considerations: BATS Order Entry . . . . .	13
4.4.4	Exceptions . . . . .	13
<b>5</b>	<b>ISO Requirement</b>	<b>13</b>

---

5.1	Orders . . . . .	14
5.1.1	File Format . . . . .	14
5.1.2	Example . . . . .	15
5.2	Quotes . . . . .	16
5.2.1	File Format . . . . .	16
5.2.2	Example . . . . .	16
<b>A</b>	<b>Exchange Market Identifier Codes (MIC)</b>	<b>18</b>

## 1 Revision History

Revision	Date	Author(s)	Description
1.0.0	06/11/2014	SRT	Initial revision.
1.0.1	06/20/2014	SRT	Some OUCH and ARCA order options are not supported.
1.0.2	08/21/2014	SRT	Add ISO requirement and updated Drop Copy info to be executions-only.
1.0.3	10/03/2014	SRT	Updated ISO section to include account and MIC. Removed IP, Port requirement.
1.0.4	11/12/2014	SRT	Hours of operation changed to 4am - 6:30p ET.
1.0.5	12/19/2014	SRT	Added quote snapshot format for ISO validation.
1.1.0	06/17/2015	SRT	Update ISO orders timestamp to microseconds since Epoch.
1.1.1	06/18/2015	SRT	Add Affirmed column to ISO orders format.
1.2.0	09/01/2015	SRT	Add TimeInForce column to ISO orders format. Added AMEX MIC code.
1.3.0	11/23/2015	SRT	Remove XPRS and add BOEv2 support. Also remove unsupported RASH protocol.
1.4.0	01/08/2016	SKT	Add supplemental order for cross type on OUCH.
1.5.0	09/07/2016	SRT	Add IEX as protected market for ISO.

## 2 Overview

Lime TS+ Trading System is a TCP proxy application that performs complete in-line pre-trade risk and SEC 15c3-5 regulatory checks. Orders that fail validation are rejected and are never forwarded to the market. The client will be integrating directly using the native market protocols with Lime TS+ instead of Lime API or FIX interface. The state of the art design offers an ultra-low latency access to all major US Equities exchanges with an expanded support for order options and other features that the exchanges have to offer.

The primary purpose of this document is to highlight the differences between market functionality and what Lime TS+ trading system offers.

## 3 Integration Considerations

### 3.1 Protocol Support

The Lime TS+ Trading System provides support for binary market protocols only at this time. Though support for FIX protocols is possible, Lime currently has no plans to offer this via this product. Please note that the client will have access to all markets via the Lime TS Trading System. Please refer to Lime FIX manual or API specification for more details.

### 3.2 Supported Domains

Only US Equities trading is supported at this time.

### 3.3 Supported Markets

The Lime Brokerage TS+ trading system will support the following exchanges.

- NYSE
- ARCA
- Nasdaq
- Nasdaq BX
- Nasdaq PSX
- BATS BYX
- BATS BZX
- DirectEdge EDGA

- DirectEdge EDGX

### **3.4 ACS API**

All queries for TS+ information are supported via the ACS API except the route query. Please refer to our ACS API specifications in Client Download site for more details.

### **3.5 Portal**

Portal will provide only view-only support for TS+. Portal users will not be able to place new orders and/or replace/cancel open TS+ orders. The client can request a Lime TS account if manual order entry and/or trade out functionality is desired.

### **3.6 Drop Copy**

Lime will provide only executions in TS+ drop copy. Order and other drops are currently not supported. Please refer to Lime TS+ Drop Copy FIX Specification in the Client Download site for additional details (Available soon!).

### **3.7 Resend Behavior**

Messages resent to the client during resend request processing will not include any rejects that were generated by the Lime TS+ Trading System. The client is advised to handle this in their application by either resubmitting any unacknowledged orders, removing, or simply ignoring them after the resend is complete.

### **3.8 ISO**

TS+ Trading System supports ISO orders but clients are required to provide additional information to validate these orders. Lime Brokerage has employed a 3rd party firm to validate all ISO orders submitted to Lime for RegNMS Compliance. The 3rd party firm requires all ISO orders to be tagged with an ISO Group ID that uniquely identifies the orders participating in a sweep event. In TS+, clients do not have a clear way to specify the ISO Group ID with the order and hence Lime will require the client to provide this information at the End Of Trading Day (by 7pm EST). Please refer to the ISO Requirement section for more details.

### **3.9 Away Trading Notification**

Lime Brokerage is in the process of implementing support for clients to notify Lime of their away trading activity in real-time for inclusion in financial risk checks. Clients will need to code to Lime Away Drop Specification for providing this information. Please refer to the Client Download site for more details (Available soon!).

### 3.10 Hours of Operation

Lime Brokerage regular trading hours are from 4:00 to 18:30 (4 AM to 6:30 PM) ET. The servers do not allow for overnight connections, and Lime Brokerage will disconnect all client sessions at some point after 18:30. Login may begin anytime after 3:50 AM.

### 3.11 Certification

Lime Brokerage highly encourages the client to thoroughly test their application by connecting to Lime test environment prior to production. The Lime test environment will have access to all the market UAT environments. At the completion of testing, the client is required to contact Lime Enhanced Technical Support (ETS) group to schedule certification. A support person will then be assigned to the client for the certification process.

Please contact Lime ETS at (212) 824-5515 or ETS@limebrokerage.com

## 4 US Equities Markets

### 4.1 NYSE

#### 4.1.1 Supported Protocol

UTPDirect version 1.4 (February 25, 2014)

#### 4.1.2 Login Details

Lime will provide the following information for clients to login and trade on a given NYSE market session.

- IPv4 address of TS+ server for connection establishment
- TCP port for connection establishment
- UTPDirect Username for login
- UTPDirect OnBehalfOfCompID value for orders

For eg.,

Connection: 10.10.10.10:10004

Username: XNYS1

OnBehalfOfCompID: LXX

#### 4.1.3 Special Considerations: UTPDirect

Field	Comment
Account	If provided on new order then the value would be included in tag 9050 of executions provided via drop copy

#### 4.1.4 Exceptions

Permitted values are restricted for the following fields.

Field	Permitted Values
Side	'1' Buy
	'2' Sell
	'3' Buy Minus
	'4' Sell Plus
	'5' Sell Short
Order Type	'1' Market
	'2' Limit
	'3' Stop
	'5' Market On Close
	'B' Limit On Close
Order Capacity	'A' Agency
	'P' Principal
	'R' Riskless Principal
Exec Instructions	'M' Mid-Point Peg
Routing Instructions	'A' ALO
	'7' NX
	'D' DNS
	'S' SOC
	'I' ISO
	'C' CO
	'R' RPI
	'1' RTO
	'2' RTNR
'3' RTR	



## 4.2 ARCA

### 4.2.1 Supported Protocol

ArcaDirect 4.1

### 4.2.2 Login Details

Lime will provide the following information for clients to login and trade on a given ARCA market session.

- IPv4 address of TS+ server for connection establishment
- TCP port for connection establishment
- ArcaDirect username for login
- ArcaDirect CompanyGroupId value for orders

For eg.,

Connection: 10.10.10.10:10004

Username: A0001

CompanyGroupId: WALLE

### 4.2.3 Special Considerations: ArcaDirect

Field	Comment
Account	If provided on new order then the value would be included in tag 9050 of executions provided via drop copy

### 4.2.4 Exceptions

- The following features are not supported.
  - Bulk Cancel
  - Fast Cancel Replace
- Permitted values are restricted for the following fields.

Field	Permitted Values
Side	'1' Buy
	'2' Sell
	'5' Sell Short
Order Type	'1' Market
	'2' Limit
	'7' Inside Limit
	'P' Peg
Rule80A	'A' Agency
	'P' Principal
	'R' Riskless Principal
Exec Instructions	'5' Passive Liquidity
	'M' Mid-Point Peg
	'P' Market Peg
	'R' Primary Peg
Extended Exec In-structions	'A'
	'P'

- The following combination of order options are not supported.
  - MaxFloor and ProactiveDisplayIndicator = 1 (Reserve and Random order)

### 4.3 Nasdaq (INET, BX, PSX)

#### 4.3.1 Supported Protocols

Ouch 4.2 (INET)

Ouch 4.2 (BX)

Ouch 4.2 (PSX)

RASHport 1.1 (INET)

RASHport 1.1 (BX)

RASHport 1.1 (PSX)

### 4.3.2 Login Details

Only OUCH is supported at this time but RASH can be supported upon request. Lime will provide the following information for clients to login and trade on a given OUCH market session.

- IPv4 address of TS+ server for connection establishment
- TCP port for connection establishment
- OUCH username for login
- OUCH password for login
- OUCH Firm on orders must be blank-filled

For eg.,

Connection: 10.10.10.10:10004

Username: OUCH1

Password: OUCH

### 4.3.3 Special Considerations: Ouch

Field	Comment
OrderID	If provided on new order then the value would be included in tag 9050 of executions provided via drop copy (embed Account in order token, eg: <account>-<order id>)

### 4.3.4 OUCH Exceptions

- Modify order request is not supported.
- Permitted values are restricted for the following fields.

Field	Permitted Values
Buy Sell Indicator	'B' Buy
	'S' Sell
	'T' Sell Short

*Continued on next page*

Field	Permitted Values
Capacity	'A' Agency
	'P' Principal
	'R' Riskless Principal
Display Type	'A' Attributable Price To Display
	'Y' Anonymous Price To Comply
	'N' Non-Display
	'P' Post-Only
	'I' Imbalance-Only
	'M' Mid-Point Peg
	'W' Mid-Point Peg Post-Only
	'L' Post-Only and Attributable
	'O' Retail Order Type 1
'T' Retail Order Type 2	
	'Q' Retail Price Improvement
Cross Type	'N' Continuous
	'O' Opening
	'C' Closing
	'S' Supplemental
	'R' Retail

## 4.4 BATS (BZX and BYX) and DirectEdge (EDGA and EDGX)

### 4.4.1 Supported Protocols

BATS BZX Order Entry 1.8.13 (August 21, 2015)

BATS BYX Order Entry 1.9.13 (August 21, 2015)

BATS US Equities BOE Specification v2 2.1.7 (October 26, 2015)

### 4.4.2 Login Details

Lime will provide the following information for clients to login and trade on a given BOE market session.

- IPv4 address of TS+ server for connection establishment
- TCP port for connection establishment
- BOE username for login
- BOE password for login

For eg.,

Connection: 10.10.10.10:10004

Username: B001

Password: BATSZ

#### 4.4.3 Special Considerations: BATS Order Entry

Field	Comment
Account	If provided on new order then the value would be included in tag 9050 of executions provided via drop copy

#### 4.4.4 Exceptions

Permitted values are restricted for the following fields.

Field	Permitted Values
Side	'1' Buy
	'2' Sell
	'5' Sell Short
Order Capacity	'A' Agency
	'P' Principal
	'R' Riskless Principal

## 5 ISO Requirement

Clients are required to provide the following in a Comma Separated Values (CSV) files at End of Trading Day for Lime to satisfy regulatory requirement for ISO orders. There are two reports that are required. The first one is the list of all ISO orders submitted that day with the ISO Group ID and the second one is the quote snapshot that corresponds to each ISO event.

This files must be uploaded to Lime provided FTP location soon after trading is complete (by 7PM EST). The FTP details will be provided to the client during the onboarding process.

## 5.1 Orders

The first line must be the heading and should match the Column Name specified below. All entries must be in ASCII. There should be an entry per order, replace, and modify request sent to market irrespective of whether it was accepted or rejected. All fields specified in the table below are mandatory even if the field is not changing for a given replace or modify message.

File naming convention to be followed is <Client Name>-<YYYYMMDD>-iso-orders.csv. For eg., MYCLIENT-20141219-iso-orders.csv.

### 5.1.1 File Format

Column Name	Description
Account	Lime Account name. This would be the account name provided by Lime Brokerage for TS+.
Timestamp	Microsecs since Epoch (UTC) as string. This is the time the order was placed.
ClOrdId	Client Order ID string. Copy the relevant field from the order that represents the ClOrdId.
Symbol	Provide only the base symbol and not the suffix for preferred symbols. For eg., in case of AA.PR, just provide AA
Side	Just provide Buy vs Sell. For eg., Short Sell is just Sell. Map the market side accordingly. Supported Values:
	'1' Buy '2' Sell
Quantity	Copy quantity requested from market message. If the quantity is not changing for replace or modify then copy the quantity specified on the original order.
Price	Provide only for limit orders. For all other order types this should be 0. If the price is not changing for replace or modify then copy the price specified on the original order.

*Continued on next page*

Column Name	Description
ISOGROUPID	Day-unique identifier that is used to correlate orders pertaining to a single sweep operation across all markets. All ISO orders belonging to an intermarket sweep must have the same identifier.
Affirmed	Indicate whether the order is a synthetic ISO order used to satisfy ISO compliance. For eg., client can send an order to BATS using Parallel T strategy to sweep all protected quotes before sending directed ISO orders to take the desired quotes. This BATS order is not a directed ISO order but is required for ISO compliance. We do need to know about these special orders and they should be included with this column set to Y. Specify N for directed ISO orders. Lime compliance approval is required before using this feature. Supported Values: <hr/> 'Y' Not a directed ISO order 'N' Directed ISO order
TimeInForce	Indicate if the order is Day or IOC. Day ISOs are subjected to different validation rules. Supported Values: <hr/> '0' Day '3' IOC
MIC	MIC code of venue where the order was sent. See Appendix for valid MIC codes.

### 5.1.2 Example

```
Account,Timestamp,ClOrdId,Symbol,Side,Quantity,Price,ISOGROUPID,Affirmed,TimeInForce,MIC
LIME123,1428399000208,2B94F3EG8d1J,STRT,1,200,70.51,1,N,3,XNAS
LIME123,1428399000208,2B94F3EG8d1K,STRT,1,200,70.50,1,Y,3,BATS
```

## 5.2 Quotes

One top-of-book quote per RegNMS protected venue is required to be provided for each ISO sweep event.

File naming convention to be followed is <Client Name>-<YYYYMMDD>-iso-quotes.csv  
For eg., MYCLIENT-20141219-iso-quotes.csv.

### 5.2.1 File Format

Column Name	Description
Account	Lime Account name. This would be the account name provided by Lime Brokerage for TS+.
ISOGROUPID	Day-unique identifier that is used to correlate orders pertaining to a single sweep operation across all markets. All ISO orders belonging to an intermarket sweep must have the same identifier.
MIC	MIC code of venue where the quote was received from. See Appendix for valid MIC codes.
Symbol	Provide only the base symbol and not the suffix for preferred symbols. For eg., in case of AA.PR, just provide AA
BidPrice	Top of book bid price
BidSize	Top of book bid size
AskPrice	Top of book ask price
AskSize	Top of book ask size

### 5.2.2 Example

```
Account,ISOGROUPID,MIC,Symbol,BidPrice,BidSize,AskPrice,AskSize
LIME123,1,XNAS,STRT,70.50,100,70.51,200
LIME123,1,ARCX,STRT,70.50,100,70.51,100
LIME123,1,XBOS,STRT,70.51,200,70.52,100
LIME123,1,XPHL,STRT,70.51,100,70.52,100
LIME123,1,BATS,STRT,70.51,100,70.52,100
LIME123,1,BATY,STRT,70.51,100,70.52,100
LIME123,1,XCHI,STRT,0,0,0,0
```



LIME123,1,EDGA,STRT,70.51,100,70.52,100  
LIME123,1,EDGX,STRT,70.51,100,70.52,100  
LIME123,1,XNYS,STRT,70.51,100,70.52,100

**A Exchange Market Identifier Codes (MIC)**

Market	ISO-10383 MIC
NYSE	XNYS
NYSE ARCA	ARCX
NYSE MKT (AMEX)	XASE
Nasdaq	XNAS
Nasdaq OMX BX	XBOS
Nasdaq OMX PSX	XPHL
BATS BZX	BATS
BATS BYX	BATY
Chicago Board Stock Exchange	CBSX
Chicago Stock Exchange	XCHI
DirectEdge EDGA	EDGA
DirectEdge EDGX	EDGX
National Stock Exchange	XCIS
Investors Exchange (IEX)	IEXG