



# Autolink Facility User Guide

Date: June 24, 2016  
Version: 1.6  
CTS/CQS/OPRA  
Automated Retransmissions

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## REVISION HISTORY

| Version | Date     | Description  |
|---------|----------|--|
| 1.1     | 08/27/09 | <ul style="list-style-type: none"> <li>Initial Version Document</li> </ul>   |
| 1.2     | 11/19/09 | <ul style="list-style-type: none"> <li>Section 3.8: Added system for CTS index messages “CTSI Network A&amp;B”</li> </ul>  |
| 1.3     | 01/15/10 | <ul style="list-style-type: none"> <li>Section 2.5 (Page 6): Revised size of packet between Block Length and ETX</li> <li>Section 2.6 (page 8 &amp; 9): Added Block Length Field</li> <li>Section 3.1 (page 11): Added Block Length field description</li> <li>Section 3.4 (page 11): Added a table reflecting the Multicast Line Number range for each “System” and included the CTS/CQS &amp; OPRA website links to the National Market System (NMS) Common IP Multicast Distribution Network Recipient Interface Specification</li> </ul> |
| 1.4     | 07/14/10 | <ul style="list-style-type: none"> <li>Appendix ‘A’ – New Primary/Backup TCP/IP Addresses</li> </ul>   |
| 1.5     | 06/18/13 | <ul style="list-style-type: none"> <li>Section 3.7 (Page 12): Added new Response Code</li> <li>Appendix A, (Page 13): Support for OPRA Binary Retransmission via backup IP address connection</li> </ul>   |
| 1.6     | 4/20/16  | <ul style="list-style-type: none"> <li>Appendix ‘A’ – Added New Primary/Backup TCP/IP Addresses</li> <li>Updated: Reference Material/Resources Information to include OPRA reference information</li> <li>Updated verbiage to: Section 2.1 Overview, Section 2.2 Retransmission Messages and Section 2.5.1.a Functionality-Dual Connections</li> <li>Section 2.7 (Page 10): Updated description for “Maximum number of requests per day</li> </ul>   |

## **REFERENCE MATERIAL**

For CTA Technical Specifications visit [www.ctaplan.com](http://www.ctaplan.com) - and select Tech Specs tab for the following:

- CTS and CQS Multicast Output Specification
- CTS and CQS Input Specification
- Common IP Multicast Distribution Network Specification
- Autolink Facility User Guide

For OPRA Technical Specifications visit [www.opradata.com](http://www.opradata.com) and select Output Specs – BINARY for the following:

- Autolink Facility User Guide
- Common IP Multicast Distribution Network Specification
- OPRA Binary DR Specification

## **FURTHER INFORMATION**

- CTA Announcements including feed enhancements, traffic rates, etc. visit [www.ctaplan.com](http://www.ctaplan.com)
- OPRA Announcements including feed enhancements, traffic rates, etc. visit [www.opradata.com](http://www.opradata.com)

## **FUTURE ENHANCEMENTS**

Future enhancements and/or modifications may require system changes for your firm. Please refer to the CTA Plan website [www.ctaplan.com](http://www.ctaplan.com) to obtain the latest CTA Notifications and Technical Specification documents. To automatically receive these notifications by email, please subscribe at: <https://www.ctaplan.com/subscribe>. For OPRA Notifications and Technical Specification documents they can be located at: [www.opradata.com](http://www.opradata.com). To be added into the OPRA distribution list for receipt of future notifications, please submit either your individual email address or a group email address (preferred) to: [CQS-CTS-OPRA@siac.com](mailto:CQS-CTS-OPRA@siac.com).

## **RELATED RESOURCES**

For customers selecting to initiate Secure Financial Transaction Infrastructure (SFTI) connections:

- Submit a request at: <http://www.nyxdata.com/Connectivity> and logging into the Self Service Portal
- Contact SFTI Sales at: [Sales-SFTI@theice.com](mailto:Sales-SFTI@theice.com) for assistance with facilitating your request
- For supporting SFTI® documentation including Customer and Technical guides visit: [www.nyxdata.com/docs](http://www.nyxdata.com/docs).

## SECTION 1: Introduction

### 1.1 Automated Retransmissions

SIAC supports an Autolink Facility to facilitate automated retransmissions of Consolidated Tape System (CTS), Consolidated Quotation System (CQS), and Options Price Reporting Authority (OPRA) data. Data Recipients who directly receive from SIAC any of the three data feeds can connect to Autolink via the Secure Financial Transaction Infrastructure (SFTI) Communications Network. For information on how to receive CTS, CQS, and OPRA retransmission data, contact SFTI at [SFTI-CustomerEngineeringUS@Theice.com](mailto:SFTI-CustomerEngineeringUS@Theice.com). Data Recipients will be required to provide their source addresses to SFTI to facilitate the required provisioning/entitlement.

In addition to the SFTI provisioning/entitlement requirements, Data Recipients are also required to obtain from SIAC a unique User ID/User Password by sending your request to the CQS-CTS-OPRA Product Management team at, [CQS-CTS-OPRA@siac.com](mailto:CQS-CTS-OPRA@siac.com).

## SECTION 2: Autolink Facility

### 2.1 Overview

The Autolink Facility is designed to provide direct users of CTS, CQS and OPRA data with message retransmissions of stored data (not real-time) from the current trading day in the event the originally transmitted messages were not received. Data Recipients can connect directly through SFTI to the Autolink Facility via TCP/IP Addresses and Ports (see Appendix A).

Data Recipients will be required to enter user ID's and passwords, along with system, line, and sequence number information. Retransmissions will be disseminated over the current dedicated retransmission group multicast feeds.

### 2.2 Retransmission Messages

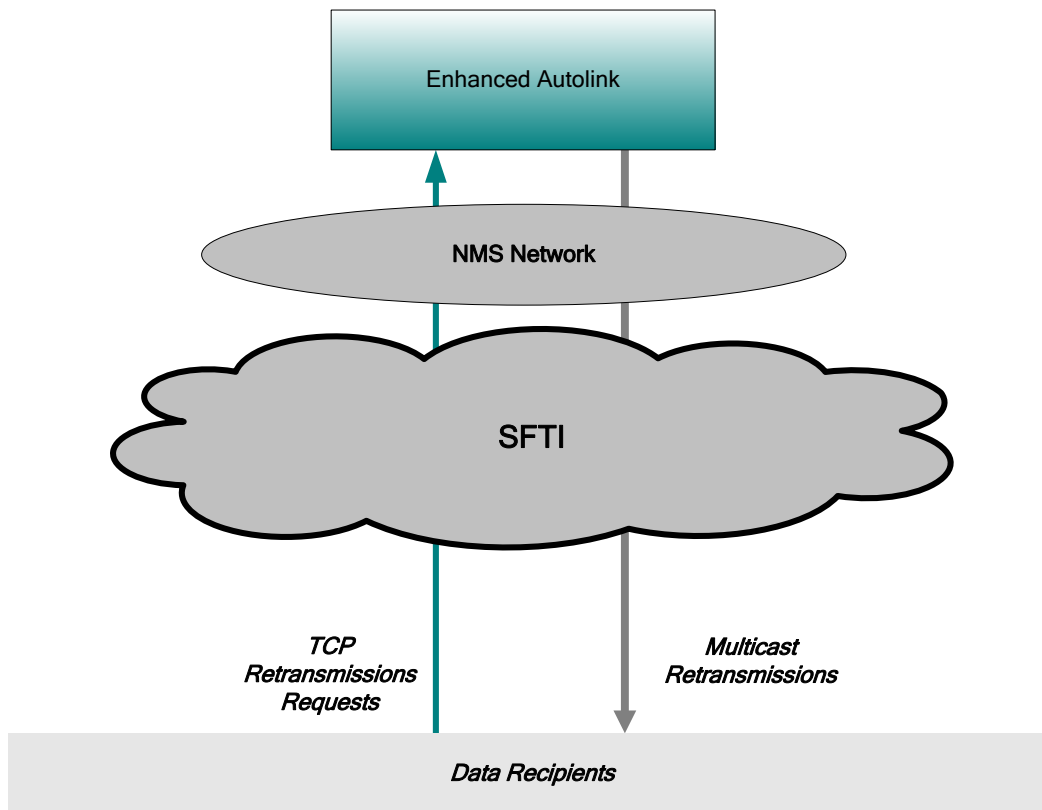
CTS, CQS, and OPRA disseminate redundant production data feeds (A&B Streams). In the event a multicast Data Recipient misses messages on one production data stream, the missing messages are available from the other redundant production stream. If messages are missed from one or both production data streams, retransmissions of the stored data (not real-time) from the current trading day are available from the Autolink Facility. Note: The retransmitted messages will be sent over the retransmission data feeds (single set, no redundant A&B Streams).

For CTS and CQS, originally transmitted messages contain the alphabetic uppercase character 'O', in the Retransmission Requestor field of the Message Header. Originally transmitted OPRA messages contain a 'blank' in the Retransmission Requestor field of the Message Header. All retransmitted CTS, CQS or OPRA messages (sent as a result of a request received by the Autolink Facility) will only contain the alphabetic upper case character 'V' in the Retransmission Requestor field of the Message Header. As such, no other Retransmission Requestor ID will be supported in this new facility.

### 2.3 Why TCP vs. UDP?

1. More control is established over retransmissions (preventing a flood of UDP requests).
2. One connection for each requestor at a time is allowed on each server.
3. Return confirmation is provided to the requestor.
4. Verification of 'user ID' and "password" takes place before allowing a connection to be made.
5. Prevents a connection from being made if the maximum number of retransmission requests is exceeded.

### 2.4 System Diagram



## 2.5 Functionality

### 1. Dual Connections

- a) The Autolink Facility supports two redundant servers per active data center to process retransmission requests of stored data (not real-time). Data Recipients can connect to both servers simultaneously. Each server supports all three systems; CTS, CQS and OPRA. Only one connection per system is allowed on each server. Simultaneous connections for the same system on each server are not supported (e.g., multiple connections cannot be made to <system = CTS> on the same server).
- b) Requests can be made to both servers simultaneously. Simultaneous retransmission requests for the same sequence numbers via both redundant servers are not supported however, one server will process the retransmission request and the redundant server will report the retransmission request as a duplicate request received (reference the Retransmission Threshold section).
- c) Duplicate requests of the same retransmissions being requested at the same time will not be processed.
- d) The option is available to keep a connection established for the entire day
- e) Retransmission requests will be accepted only during defined hours (CTS/CQS: 3:30 AM - 8:30 PM, ET and OPRA Extended Session commencing at 2:30 AM and OPRA Regular Session commencing at 6:10 AM - 6:30 PM, ET)

### 2. Prevention of invalid Data Recipients and Multiple Connections on the same server

- a) When making a connection, each Data Recipient is identified by a unique user ID and password within a defined timeframe. If the user ID and password are not received within the specific timeframe (30 seconds), the connection will close.
- b) The retransmission request contains the Data Recipient's unique user ID and password.
- c) Requests from invalid Data Recipients will not be processed.
- d) Only one connection at a time can be established by a Data Recipient (user ID) on each server.

### 3. Provide Timely Retransmissions

- a) The retransmission request with the highest sequence number (most current) will be transmitted at a higher priority.
- b) A duplicate retransmission request will not be processed (reference the Retransmission Threshold section).
- c) A maximum of 1 million CTS, CQS or OPRA messages per request is allowed. Large requests will be broken down into smaller segments by the Autolink Facility (Smaller requests will be processed in between segments of larger requests).
- d) If more than 1 million messages are required, multiple requests should be generated.
- e) Multiple retransmission requests can be placed in a packet (size of packet between Block Length and ETX is 1,002 bytes).

## Functionality, continued

### 4. Retransmission Request Acknowledgements

Upon receiving a CTS, CQS or OPRA retransmission request from a Data Recipient, the system will send one of the following acknowledgements back to the Data Recipient:

- a) The TCP/IP connection was refused.
- b) The request was processed normally.
- c) The request contained an invalid message size.
- d) A duplicate request was received.
- e) The request was rejected due to invalid system name, line, user ID, or password.
- f) The format of the request was incorrect.
- g) The request exceeded the number of messages per request.
- h) The request exceeded the number of requests per day.
- i) Invalid sequence number request.

### 5. Message Sequence Number Rollover

Although unlikely, in the event of a CTS, CQS or OPRA message sequence number rollover, the Autolink Facility will internally maintain the actual message sequence number (12 bytes). As such, the Data Recipient would be required to request the actual message sequence number.

For example:

If a Data Recipient experienced an OPRA gap before and after a message sequence number rollover from 1,999,999,996 to 0,000,000,003. The Data Recipient would request a retransmission message using the actual message sequence numbers of 001,999,999,996 to 002,000,000,003.

| <b>Autolink Facility Actual Message<br/>Sequence Number<br/>12 Bytes</b> | <b>OPRA<br/>Output Sequence Number<br/>10 Bytes</b> |
|--|---|
| 001,999,999,996  | 1,999,999,996                                       |
| 001,999,999,997  | 1,999,999,997                                       |
| 001,999,999,998  | 1,999,999,998                                       |
| 001,999,999,999  | 1,999,999,999                                       |
| 002,000,000,001 Reset Msg Seq Number                                     | 0,000,000,001 Reset Msg Seq Number                  |
| 002,000,000,002  | 0,000,000,002                                       |
| 002,000,000,003  | 0,000,000,003                                       |



## 2.6 Retransmission Request Procedure

**NOTE: REFERENCE SECTION 3 FOR THE BELOW FIELD DESCRIPTIONS**

### 1) Establish a TCP/IP connection:

- A. A Data Recipient can establish a TCP/IP connection to enter a retransmission request message and upon receipt of the message the Autolink Facility will generate a response back to the Data Recipient, after which the Data Recipient can close the TCP/IP connection or leave the TCP/IP connection up for the remainder of the day.
- B. A Data Recipient also has the option to establish and maintain their TCP/IP connection for the remainder of the day. If a Data Recipient chooses this option, they will be required to send the following login request information upon establishing a TCP/IP connection. If the Data Recipient does **not** send this information within the specific timeframe (30 seconds) the TCP/IP connection will close.

| Block Length | S<br>O<br>H | System | User ID | User Password | U<br>S | ~<br>~<br>~ | E<br>T<br>X |
|--------------|-------------|--------|---------|---------------|--------|-------------|-------------|
| 3            | 1           | 4      | 5       | 5             | 1      |             | 1           |

Example: 016<0x01>CTSA1234554321<0x03>

**Connection Response:** Upon receipt of a Data Recipient’s login (user ID/password), the Autolink Facility will send the following response which includes the original login request message information back to the Data Recipient.

| Block Length | S<br>O<br>H | Responding SIAC System | Response Code | System | User ID | User Password | U<br>S | ~<br>~<br>~ | E<br>T<br>X |
|--------------|-------------|------------------------|---------------|--------|---------|---------------|--------|-------------|-------------|
| 3            | 1           | 4                      | 2             | 4      | 5       | 5             | 1      |             | 1           |

Example: Successful connection (Response Code ‘01’):

022<0x01>CTSA01CTSA1234554321<0x03>

**Retransmission Request Procedure, continued**

2) **Enter a Retransmission Request Message:** A Data Recipient is required to send the following retransmission request information regardless of whether or not they have already established a TCP/IP connection.

| Block Length | S<br>O<br>H | System | Multicast Line Number | Low Message Sequence Number | High Message Sequence Number | User ID | User Password | U<br>S | ~<br>~<br>~ | E<br>T<br>X |
|--------------|-------------|--------|-----------------------|-----------------------------|------------------------------|---------|---------------|--------|-------------|-------------|
| 3            | 1           | 4      | 3                     | 12                          | 12                           | 5       | 5             | 1      |             | 1           |

Example: If a Data Recipient requests an OPRA retransmission for the range of messages with starting sequence number 1 and ending sequence number 5 whose user ID is ‘12345’ and password is ‘54321’, the request would look as follows:

043<0x01>OPRA0010000000000010000000000051234554321<0x03>

**Retransmission Request Message Response:** Upon receipt of a retransmission request message, the Autolink Facility will send the following response which includes the original retransmission request message information back to the Data Recipient.

| Block Length | S<br>O<br>H | Responding SIAC System | Response Code | System | Multicast Line Number | Low Message Sequence Number | High Message Sequence Number | User ID | User Password | U<br>S | ~<br>~<br>~ | E<br>T<br>X |
|--------------|-------------|------------------------|---------------|--------|-----------------------|-----------------------------|------------------------------|---------|---------------|--------|-------------|-------------|
| 3            | 1           | 4                      | 2             | 4      | 3                     | 12                          | 12                           | 5       | 5             | 1      |             | 1           |

Example: Successful Request (Response Code ‘01’):

049<0x01>OPRA01OPRA0010000000000010000000000051234554321<0x03>

**Note:** All retransmitted CTS, CQS or OPRA messages (sent as a result of a request received by the Autolink Facility) will only contain the alphabetic upper case character ‘V’ in the Retransmission Requestor field of the Message Header. As such, no other Retransmission Requestor ID will be supported in this new facility.

## 2.7 Retransmission Thresholds

| <b>Capability</b>  | <b>Description</b>  | <b>Threshold</b> |
|--|---|------------------|
| User Authorization   | Requests with valid user ID's/passwords will be processed. Incoming requests from Data Recipients that are not in the enabled user ID list will not be processed. | N/A              |
| Priority   | The higher sequence number retransmission request will take precedence.   | N/A              |
| Maximum number of messages per request                           | A limit on the number of messages per request will be imposed. Note: If >1,000,000 the Data Recipient must generate multiple TCP requests.                        | 1,000,000        |
| Smaller requests not penalized at the expense of larger requests | Large requests will be broken down into smaller segments (smaller requests will be processed in between segments of larger requests).                             | 100,000          |
| Maximum number of requests per day                               | A limit on the number of retransmission requests per system multicast line per day will be imposed per Data Recipient.  | 500              |
| Duplicate requests   | Requests of the same range or within the same range received within a defined time frame, will be considered a duplicate, and will not be processed.              | 2 Minutes        |

## SECTION 3: FIELD DESCRIPTIONS

### 3.1 Block Length

**3 bytes**, Numeric, Right Justified, Zero Filled. Indicates the total length of the message from the Start of Header (SOH) to the End of Text (ETX).

### 3.2 High Message Sequence Number

**12 bytes**, Numeric, Right Justified, Zero Filled. Identifies the end of the retransmission request message range.

### 3.3 Low Message Sequence Number

**12 bytes**, Numeric, Right Justified, Zero Filled. Identifies the start of the retransmission request message range.

### 3.4 Multicast Line Number

**3 bytes**, Numeric, Right Justified, Zero Filled. Indicates the multicast line number over which the retransmission should be generated.

| System | Description       | Multicast Line Number |
|--------|-------------------|-----------------------|
| CTSA   | Network A         | 001-012               |
| CTSB   | Network B         | 001-012               |
| CTSI   | Index Network A&B | 001-002               |
| CQSE   | Network E         | 001-012               |
| CQSF   | Network F         | 001-012               |
| OPRA   | OPRA              | 001-024               |

*Note: Reference the latest National Market System (NMS) Common IP Multicast Distribution Network Recipient Interface Specification for the CTS/CQS/OPRA Network and Multicast Line breakdown using the following links.*

CTS/CQS Link: <https://ctaplan.com> and select the Tech Specs option.

OPRA Link: [http://www.opradata.com/specs/common\\_ip\\_multicast\\_distribution.pdf](http://www.opradata.com/specs/common_ip_multicast_distribution.pdf)

### 3.5 SOH AND ETX (CTS and CQS Only)

**1 byte**, The Start of Header (SOH) control character (0x01) indicates the beginning of the block, whereas an End of Text (ETX) control character (0x03) signifies the end of the block.

### 3.6 US (CTS and CQS Only)

**1 byte**, The Unit Separator (US) control character (0x1F) is needed in multiple message blocks to signify the end of the preceding message but not the end of the block. An ETX control character delimits the last message.

## SECTION 3: FIELD DESCRIPTIONS, continued

### 3.7 Response Code

**2 bytes**, Numeric. Indicates one of the following response codes:

- 00 – Connection refused
- 01 – Successful connection/request
- 02 – Invalid size
- 03 – Invalid system, line, user ID, or password
- 04 – Duplicate request
- 05 – Incorrect format
- 06 – Exceeded maximum retransmission request size
- 07 – Exceeded maximum number of retransmission requests
- 08 – Invalid message sequence number
- 99 – Temporary Internal Error

### 3.8 System / Responding SIAC System

**4 bytes**, Alphabetic, Right Justified. Indicates one of the following system names for both the System the request is being sent to by the Data Recipient and the Responding SIAC System.

| <u>System</u> | <u>Description</u>    |
|---------------|-----------------------|
| 1) CTSA       | Network A             |
| 2) CTSB       | Network B             |
| 3) CTSI       | Index - Network A & B |
| 4) CQSE       | Network E             |
| 5) CQSF       | Network F             |
| 6) OPRA       | OPRA                  |

### 3.9 User ID

**5 bytes**, Alpha Numeric, Right Justified. A unique identifier for each Data Recipient (provided by SIAC).

### 3.10 User Password

**5 bytes**, Alpha Numeric, Right Justified. A unique password for each Data Recipient (provided by SIAC).

## Appendix A – TCP/IP Addresses/Ports

### Current IP Addresses

| Primary Data Center |                 |
|---------------------|-----------------|
| TCP/IP              | Mask            |
| 159.125.61.177      | 255.255.255.248 |
| 159.125.62.177      | 255.255.255.248 |
| Backup Data Center  |                 |
| TCP/IP              | Mask            |
| 198.140.41.177      | 255.255.255.248 |
| 198.140.42.177      | 255.255.255.248 |

### Port Numbers:

| System | Port Number |
|--------|-------------|
| **OPRA | **30901     |
| CTS    | 30903       |
| CQS    | 30905       |

\*\*OPRA – Port will be deactivated on the Current IP Addresses by end- of-day August 5, 2016.

### New IP Addresses

| Primary Data Center |                 |
|---------------------|-----------------|
| TCP/IP              | Mask            |
| 159.125.39.193      | 255.255.255.192 |
| 159.125.38.193      | 255.255.255.192 |
| Backup Data Center  |                 |
| TCP/IP              | Mask            |
| 198.140.39.193      | 255.255.255.192 |
| 198.140.38.193      | 255.255.255.192 |

### Port Numbers:

| System | Port Number |
|--------|-------------|
| OPRA   | 30901       |

**Note:** The highlighted Primary and Backup Data Center TCP/IP Addresses will be activated for OPRA commencing Monday August 8, 2016. CTS and CQS ports activated at later date.