

Interoperable Interface Control Document ICD-02: Tag Validation List

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SOFTWARE RELEASE

Date	Software Revision	Description of Modifications
January 2007	1.0	<p>New Subscribers and Service Providers as of January 1, 2007 must:</p> <ol style="list-style-type: none">1. Standardize date and time fields as GMT:<ol style="list-style-type: none">a. YYYYMMDD is the GMT date where YYYY is the year in four-digit format (i.e. 2007), MM is the month in numerical format (i.e. October would be 10) and DD is the day of the month.¹b. HH24MISS is the GMT time where HH24 is the 2-digit hour in 24-hour format, MI are the minutes, and SS are the seconds. The time used to create this external file name is the GMT time.2. Checksums shall be calculated and incorporated in the files transferred. <p>Previous IOPHub software versions shall be supported until further notice.</p>

¹ Dates and times are expressed in Greenwich Mean Time (GMT) to facilitate date/time processing unaffected by daylight savings time changes, or time zone differences.

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1 Introduction

1.1 Purpose

This Interoperable Interface Control Document (ICD) describes the general file structure used by interoperable authorities to construct files that are exchanged between other authorized Service Providers and authorized Subscribers by means of the IOPHub system.

This interoperable ICD defines the format and content of the physical files transferred between authorized Service Providers or authorized Subscribers and authorized Service Providers via the IOPHub system to exchange Tag status and vehicle license plate information. In addition, this ICD describes the Tag Validation List Acknowledgement File returned to the sending Service Provider and the naming conventions for the files used in this exchange are also described.

1.2 Definitions, Acronyms and Abbreviations

A comprehensive glossary of terms is being maintained for the entire Interoperability project. The terms, acronyms and abbreviations used in this document will be contained in the Interoperable Project Glossary.

For easy reference, the following terms are provided.

Table 1.2: Definitions, Acronyms, and Abbreviations²

Term	Description
Home Authority (HA)	An Authority that issues transponders to patrons, owns and manages accounts associated with those transponders, and posts transactions to those accounts.
Service Providers (SP)	An Authority that operates and maintains a customer service center that issues AVI transponders for electronic payment of AVI transactions, such as toll road fees and parking fees. For this document, the Service Provider shall be defined as an authority that sends transponder transactions and toll variance transactions to the IOPHub system for reconciliation.
Subscriber	An authority that employs a Service Provider to conduct customer service center operations. These types of authorities do not maintain their own customer accounts, or operate a customer service center.
Tag Validation List (TVL)	A comprehensive list of transponders issued by each interoperable Authority..
Tag Validation List Update	A list of Tag Validation List (TVL) changes since the last TVL Update or TVL..
Visited Authority (VA)	Any Authority, or its designated representative, that is not the customer's Home Authority.

1.3 References

The following items are referenced in this document:

² Note: If changes are made to this table, please verify against the IOPHub Project Glossary.

- *Interoperability Business Requirements Document*
- *Interoperable -ICD-01: File Transfer*
- *Interoperable -ICD-03: Transactions File*
- *IOPHub Data Security Guidelines*
- *IOPHub Project Glossary*

1.4 Overview

The IOPHub system uses a standard set of data exchange protocols that provide Interoperable functionality between one or more authorized Service Providers and Subscribers to communicate and exchange data.

This document contains the specification for the format of the Interoperable Tag Validation List and Tag Validation List Acknowledgement. The exact structure of the file and the layout of the individual components are detailed in the remaining sections of this document. Security related issues and processing guidelines are also addressed.

The exchange of data (transactions and tag statuses) is governed by the requirements as set forth in the *Interoperability Business Requirements document*. The ICD-01 File Transfer defines the general format of the files used to exchange interoperable transactions and Tag Validation List Specification.

2 Tag Validation List File Specification

2.1 Type

This specification defines the general structure of Interoperable Tag Validation List. The Tag Validation List is an ASCII text file. The file contains records with comma-delimited fields, terminated by Carriage Return & Line Feed characters.

2.2 Security

The data files will be written with no special security considerations. The contents of the files are viewable in a standard text editor. The files contain no security-sensitive information.

The IOPHub utilizes a firewall scheme that will prevent unauthorized access by authorized or unauthorized users. Captive accounts or similar accounts shall be used to prevent unauthorized user from accessing other areas of the IOPHub system and Service Providers' computer systems.

Each Service Provider shall utilize a firewall scheme that will prevent access by unauthorized users. Captive accounts or similar accounts shall be used to prevent an unauthorized user from accessing other areas of the Service Providers and Subscribers computer systems.

The IOPHub Data Security Guidelines provides documentation on the minimum and desired security standards.

2.3 Processing Guidelines

Files will be exchanged between Service Providers and Subscribers via the IOPHub utilizing the protocol described in the *Interoperable-ICD-01: File Transfer*. Subscribers will receive TVL files, but will not send TVL files. The file transfer protocol verifies the size of the file, checksum, record count and validates the file format.

An interoperable authorized Service Provider shall create a Tag Validation List for the Tags owned by the Authority. This specification requires that the status file contain a record for every Tag owned by the Authority. Additionally, partial Tag Validation List updates are created on an "as required" basis. Once the Tag Validation List is created, it is transmitted to the other Service Providers and Subscribers via the IOPHub.

The Tag Validation List requires acknowledgement from the receiving Service Providers and Subscribers. The format of this acknowledgement file is described in **Section 3.5**. If the originating Authority does not receive an acknowledgement after a reasonable delay, an attempt should be made to retransmit the Tag Validation List. It is the Sender's responsibility to repeat this failure processing before halting further file transfer attempts. Sender shall contact the IOPHub Support Team to resolve the issues that can not be resolved by the Sender. Each Sender can decide the number of attempts and the duration criteria for resending / repackaging files.

The Tag Validation List must be named and constructed according to the following naming convention:

IOP_{Originating-Authority}_{Destination-Authority}_YYYYMMDD_HH24MISS_{XXXXXX}.STA

The Tag Validation List naming convention description:

- "IOP" is the designation abbreviation for Interoperability files.

- {Origination-Authority} is name of the Authority creating the file. The Authority can be Service Provider, Subscriber or IOPHub.
- {Destination-Authority} is name of the Authority receiving the file. The Authority can be Service Provider, Subscriber or IOPHub.
- YYYYMMDD is the GMT date where YYYY is the year in four-digit format (i.e. 2007), MM is the month in numerical format (i.e. October would be 10) and DD is the day of the month.³
- HH24MISS is the GMT time where HH24 is the 2-digit hour in 24-hour format, MI are the minutes, and SS are the seconds. The time used to create this external file name is the GMT time.
- {XXXXXXXXXX} is an arbitrary region of up to 9 characters to be used by the Origination Authority to allow unique file names to be generated. Any combinations of alphanumeric characters are allowed in this portion of the name.
- "STA" is the file extension appended to the file name. This extension helps serve to identify the content type of the file.

Note: The Data File name and ZIP file name are both in upper case, including the file extension.

For example, a file created and sent from NTTA to IOPHUB on March 13, 2007 at 5pm GMT might be named:

IOP_NTTA_IOPHUB_20070313_170000_000002222.STA

Once zipped, the file name of the zipped file would be named:

\$IOP_NTTA_IOPHUB_20070313_170000_000002222.ZIP

³ Dates and times are expressed in Greenwich Mean Time (GMT) to facilitate date/time processing unaffected by daylight savings time changes, or time zone differences.

2.4 File Format

The file format conforms to the general structure described in the document *Interoperable-ICD-01: File Transfer* (see Figure 1). The files are in ASCII format, comprised of a file header and record header, followed by data records. The file header is described in *Interoperable-ICD-01 File Transfer*. This portion of the file is shown in gray in the figure below.

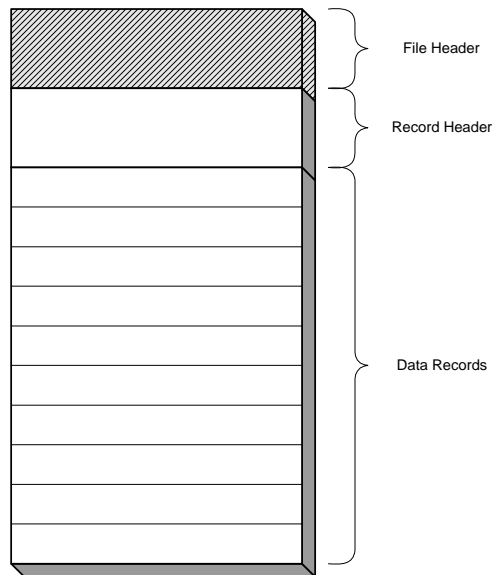


Figure 1. Interoperable File Structure.

The record header and data records are created by the Sender's system. The record header, as well as each data record, will be terminated by a Carriage Return & Line Feed (hex '0D 0A') character combination. Fields in a record header and data records are variable length and comma-delimited. Section 2.5 describes the format of the record header and data records.

2.5 Record Formats

The first portion of all record types is similar. Each record begins with a record code composed of a two-digit alpha code and a two-digit version code. The remaining fields in the record vary based upon the record type. All fields are ASCII alphanumeric characters, variable length and comma-delimited.

2.5.1 Tag Validation List Record Header Format

The Record Header contains information about the originating Service Provider, time of creation and record count. The batch ID serves as identification in the acknowledgement returned to the file's originator. This field is sufficiently large to allow Service Provider to create unique batch IDs for a reasonable period of time. This would be the amount of time required to allow a receiving Service Providers and Subscribers to post the file's contents with the safest of margins (e.g., 60-90 days).

Tag Validation List Record Header Format					
Description	Type	Max Length	Delimiter	Req'd	Comment
Record Code	Character	4	,	Y	This field will always be "SH01"
Originating Authority	Character	8	,	Y	Operating Authorities <ul style="list-style-type: none"> • CTRMA – Central Texas Regional Mobility Authority • HCTRA - Harris County Toll Road Authority • IOPHub • NTTA - North Texas Toll Authority • TXDOT – Texas Department of Transportation
Date-Time Created	Character	15	,	Y	GMT Date-time file was created. 'YYYYMMDD-HH24MISS'
Record Count	Number	10	,	Y	Number of records not including the header record to follow in this file.
Batch ID	Number	10	,	Y	Batch ID for the file. This field is a number between 0 and 4,294,967,295.
Update Type	Character	10	,	Y	Status update type: <ul style="list-style-type: none"> ▪ "FULL" = Complete list of all owned tags. ▪ "INCR" = Incremental list of tags, a periodic update.
File Name	Character	60	CR&LF	N	Original file name for this file as created by the originator.

2.5.2 Tag Validation List Record Format

The Tag Validation List Record (Record Code "ST01") contains information about the individual Tags owned by a Service Provider.

Tag Status Validation Record Format					
Description	Type	Max Length	Delimiter	Req'd	Comment
Record Code	Character	4	,	Y	This field will always be "ST01"
Tag ID	Character	20	,	Y	Complete Tag ID, i.e. 'DNT.12345678.....\$'
Tag Status	Character	1	,	Y	Current tag status recorded at HIA: G – Good B – Low Balance I – Invalid L – Lost N – Negative Balance R – Returned S – Stolen
Tag Vehicle Classification	Numeric	3	,	Y	Classification of the vehicle based on the axle count, listed on the tag record. 2 – Two axle vehicle 3 – Three axle vehicle 4 – Four axle vehicle 5 – Five axle vehicle 6 – Six plus axle vehicle (other)
Revenue Type	Numeric	1	,	Y	1 = full-fare 2 = non-revenue
License Plate State	Character	3	,	N	Three characters indicate the state code.
License Plate Number	Character	15	,	N	License Plate Number associated with the Tag
Alternate License Plate ⁴ State	Character	3	,	N	Three characters indicate the state code.
Alternate License Plate Number	Character	15	,	N	Alternate License Plate Number associated with the Tag
Attribute_1	Character	15	,	N	This field will have additional Authority specific data, if necessary
Attribute_2	Character	15	,	N	This field will have additional Authority specific data, if necessary
Attribute_3	Character	50	,	N	This field will have additional Authority specific data, if necessary
Attribute_4	Character	50	,	Y	TVL Home Authority <ul style="list-style-type: none"> • CTRMA – Central Texas Regional Mobility Authority • HCTRA - Harris County Toll Road Authority • NTTA - North Texas Toll Authority • TXDOT – Texas Department of Transportation
Attribute_5	Character	50	CR&LF	N	Home Authority Account ID

⁴ Alternate License Plate State and Plate Number shall be implemented in later release. Until then, these fields shall be blank.

2.6 Sample Data

Three sample TVL files are shown below. Each TVL file contains a record header and tag validation list records. The Carriage Return & Line Feed characters are shown as a “¶”.

a) TVL File from NTTA to IOPHUB

```
FFFFFFFF,000078602478¶  
SH01,NTTA,20070617-070010,1460597,204973,FULL,IOP_NTTA_IOPHUB_20070617_070010_000119035.STA¶  
ST01,DNT.00030438.....$,G,2,1,TX,017FPXX,,,,,148375¶  
ST01,DNT.00170632.....$,I,2,1,TX,V50YDJ,,,,,127048¶  
ST01,DNT.00000919.....$,I,2,1,TX,AMTECH,,,,,1075¶  
ST01,DNT.00176184.....$,G,2,1,TX,773HBJ,,,,,134014¶  
ST01,DNT.00204131.....$,L,2,1,TX,1HDN31,,,,,170866¶  
ST01,DNT.00121336.....$,G,2,1,TX,P73NZZ,,,,,96346¶  
ST01,DNT.00044144.....$,G,2,1,TX,264WMG,,,,,847895¶
```

b) TVL File from IOPHUB to CTRMA

```
B77A0658,000085891811¶  
SH01,IOPHUB,20070617-074418,1460597,24326,FULL,IOP_IOPHUB_CTRMA_20070617_074418_000024326.STA¶  
ST01,DNT.00275246.....$,B,2,1,TX,1ZVZ33,,,,,NTTA,89128¶  
ST01,DNT.01035664.....$,G,2,1,TX,7RGJ74,,,,,NTTA,270062¶  
ST01,DNT.00610515.....$,I,2,1,TX,D97TGS,,,,,NTTA,422432¶  
ST01,DNT.01125692.....$,G,2,1,TX,J61XBD,,,,,NTTA,193171¶  
ST01,DNT.00840360.....$,G,2,1,TX,O2YKC3,,,,,NTTA,531509¶  
ST01,DNT.00080081.....$,G,2,1,TX,295PYW,,,,,NTTA,51247¶  
ST01,DNT.00443331.....$,G,2,1,TX,185DJW,,,,,NTTA,309112¶
```

c) TVL File from IOPHUB to HCTRA

```
FFFFFFFF,000082970617¶  
SH01,IOPHUB,20070617-081110,1460597,24326,FULL,IOP_IOPHUB_HCTRA_20070617_081110_000024326.STA¶  
ST01,DNT.00275246.....$,B,2,1,TX,1ZVZ33,,,,,NTTA,89128¶  
ST01,DNT.01035664.....$,G,2,1,TX,7RGJ74,,,,,NTTA,270062¶  
ST01,DNT.00610515.....$,I,2,1,TX,D97TGS,,,,,NTTA,422432¶  
ST01,DNT.01125692.....$,G,2,1,TX,J61XBD,,,,,NTTA,193171¶  
ST01,DNT.00840360.....$,G,2,1,TX,O2YKC3,,,,,NTTA,531509¶  
ST01,DNT.00080081.....$,G,2,1,TX,295PYW,,,,,NTTA,51247¶
```



Interoperable-ICD-02:
Tag Validation List

ST01,DNT.00443331.....\$,G,2,1,TX,185DJW,,,,NTTA,309112¶

2.7 Availability

IOPHub shall be available 24 hours a day, 7 days a week for the file exchanges. Exceptions will be for scheduled maintenance activities. All Service Providers and Subscribers should be notified in advance of scheduled maintenance activities and extended downtime periods. When IOPHub is down, the agencies should stop pushing and pulling files. File transfer may continue after the IOPHub is back up and operational.

Bulk Tag Validation Lists are transferred to receiving Service Providers and Subscribers by 6:00 am (CDT). The actual time is based on the Authority obtaining their response to account re-bills before distributing a new list.

Tag validation lists are updated by sending incremental files, referred to Tag Validation List updates. Incremental files are typically distributed once an hour. Since these lists contain only those tags whose status has changed, the updated lists may not be generated hourly.

3 Tag Validation List Acknowledgement File Specification

3.1 Type

This specification defines the general structure of Interoperable Tag Validation List Acknowledgement. The Tag Validation List is an ASCII text file. The file contains records with comma-delimited fields, terminated by Carriage Return & Line Feed characters.

3.2 Security

The data files will be written with no special security considerations. The contents of the files are viewable in a standard text editor. The files contain no security-sensitive information.

The IOPHub shall utilize a firewall scheme that will prevent unauthorized access by authorized or unauthorized users. Captive accounts or similar accounts shall be used to prevent unauthorized user from accessing other areas of the IOPHub system and Service Providers and Subscribers computer systems.

Each Service Provider and Subscriber shall utilize a firewall scheme that will prevent access by unauthorized users. Captive accounts or similar accounts shall be used to prevent unauthorized user from accessing other areas of the Service Providers and Subscribers computer systems.

The IOPHub Data Security Guidelines document should be reviewed and implemented where appropriate.

3.3 Processing Guidelines

Files will be exchanged between IOPHub and Service Providers and Subscribers utilizing the protocol described in the document *Interoperable-ICD-01: File Transfer*. The file transfer protocol verifies the size of the file, record count, checksum, and validates the file format.

When a Tag Validation List Acknowledgement File arrives from a Service Provider, Subscriber or IOPHub, the file size and the header record is examined in order to perform a simple data integrity check. The header contains the number of records in the file and checksum. Additionally the file format is verified to be correct based on the type of file. All four (4) checks must be verified correct before posting of the file occurs. If any one of the four (4) checks fails, the entire file should not be used.

A file noted as incorrect based on the file size, record count, checksum, or file format should be flagged as damaged and notification sent to the appropriate personnel for manual intervention.

If the file size, record count, checksum, and file format are all correct, file processing continues by the receiving Service Provider or Subscriber. As the status file is processed, the receiving Service Provider or Subscriber may encounter an error with a single data record. This specification calls for the receiving Authority to ignore the errant record and continue processing the remaining records of the

file. An indication of the number of exceptions is noted in the acknowledgement transmitted back to the originating Service Provider.

The receiving Service Providers and Subscribers must note the time of file receipt and the activation time of the Tag Validation List. The determination of "activation time" is Service Provider or Subscriber-specific, based upon internal system implementations. The Interoperability Business Requirements for computing activation time must be agreed upon among all Service Providers and Subscribers and are beyond the scope of this document.

The Tag Validation List Acknowledgement File must be named by the receiving Service Providers and Subscribers. File names will be constructed according to the following convention:

IOP_{Originating-Authority}_{Destination-Authority}_YYYYMMDD_HH24MISS_{XXXXXXXXXX}.STA_ACK

The Tag Validation List naming convention description:

- "IOP" is the designation abbreviation for Interoperability files.
- {Origination-Authority} is name of the Authority creating the file. The Authority can be Service Provider, Subscriber or IOPHub.
- {Destination-Authority} is name of the Authority receiving the file. The Authority can be Service Provider, Subscriber or IOPHub.
- YYYYMMDD is the GMT date where YYYY is the year in four-digit format (i.e. 2002), MM is the month in numerical format (i.e. October would be 10) and DD is the day of the month.
- HH24MISS is the GMT time where HH24 is the 2-digit hour in 24-hour format, MI are the minutes, and SS are the seconds. The time used to create this external file name is the GMT time.
- {XXXXXXXXXX} is an arbitrary region of up to 9 characters to be used by the Origination Authority to allow unique file names to be generated. Any combination of alphanumeric characters is allowed in this portion of the name.
- "STA_ACK" is the file extension appended to the file name. This extension helps serve to identify the content type of the file.

For example, a file created and sent from NTTA to IOPHUB on March 13, 2003 at 5pm GMT might be named:

IOP_NTTA_IOPHUB_20070313_170000_002222.STA_ACK

Once zipped, the file name of the zipped file would be named:

\$IOP_NTTA_IOPHUB_20070313_170000_002222.ZIP

3.4 File Format

The file format conforms to the general structure described in the document *Interoperable-ICD-01: File Transfer*. The files are in ASCII format, comprised of a file header and record header, followed by data records. The file header is constructed at the Sender's system as described in *Interoperable-ICD-01: File Transfer*. This portion of the file is shown in gray in the figure below.

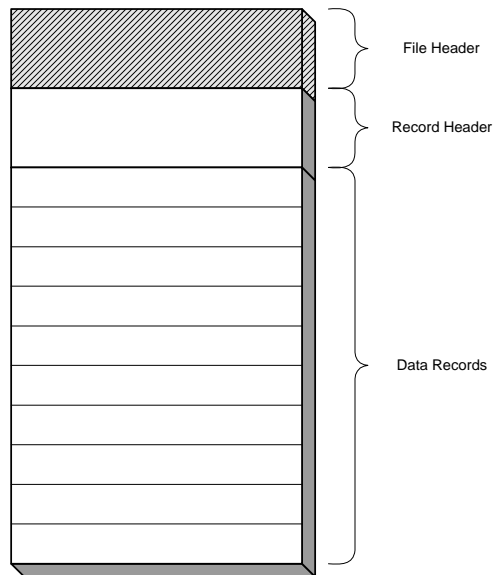


Figure 2. Interoperable File Structure.

The record header and data records are created by the Sender's system. The record header, as well as each data record, will be terminated by a Carriage Return & Line Feed (hex '0D 0A') character combination. Fields in a record header and data records are variable length and comma-delimited. Section 2.5 describes the format of the record header and data records.

The Tag Validation List Acknowledgement File consists of a single Record Header and may or may not contain Data Records. It will contain Data Records when there are TVL Rejected Records.

The structure of the Record Header is contained in the following section.

3.5 Record Formats

The first portion of all record types is similar. Each record begins with a record code composed of a two-digit alpha code and a two-digit version code. The remaining fields in the record vary based upon the record type. All fields are ASCII alphanumeric characters, variable length and comma-delimited.

3.5.1 Tag Validation List Acknowledgement Record Header Format

The Record Header contains information about the acknowledging Authority and time of creation. This record serves as an acknowledgement of a Tag Validation List received from a Service Provider.

Record Header Format					
Description	Type	Max Length	Delimiter	Req'd	Comment
Record Code	Character	4	,	Y	This field will always be "SA01"
Acknowledging Authority	Character	8	,	Y	Abbreviation for the Authority generating the acknowledgement file. <ul style="list-style-type: none"> • CTRMA – Central Texas Regional Mobility Authority • HCTRA - Harris County Toll Road Authority • IOPHub • NTTA - North Texas Toll Authority • TXDOT – Texas Department of Transportation
Date-Time Created	Character	15	,	Y	GMT Date-time acknowledgement file was created. 'YYYYMMDD-HH24MISS'
Record Count	Number	10	,	Y	Number of records, not including the header record, to follow in this file.
Original-Batch ID	Number	10	,	Y	Batch ID for the file received. This field is a number between 0 and 4,294,967,295.
Processing Status	Character	1	,	Y	Processing status of file received: <ul style="list-style-type: none"> ▪ "A" – All records processed successfully ▪ "R" – Processing failed, bad record count ▪ "X" – Processed with exceptions, not all records valid. ▪ "B" - File Header invalid ▪ "C" - Bad Record Header (Other)
Date-Time Received	Character	15	,	Y	GMT Date-time Authority received file 'YYYYMMDD-HH24MISS'.
Date-Time Activated	Character	15	,	Y	GMT Date-time Authority activated the status file received 'YYYYMMDD-HH24MISS'.
Valid Record Count	Number	10	,	Y	Count of valid records processed in the status file received.
Invalid Record Count	Number	10	CR&LF	Y	Count of records with exceptions in the status file received.

3.5.2 Tag Validation List Rejected Record Format

Rejected tag status records are currently only sent to Service Providers and Subscribers requesting this report.

Tag Status Rejected Record Format					
Description	Type	Max Length	Delimiter	Req'd	Comment
Record Code	Character	4	,	Y	This field will always be "SR01"
Original Tag ID	Character	20	,	Y	The values received in the original Tag Validation List Record are repeated here in the Tag Validation List Rejected Record.
Original Tag Status	Character	1	,	Y	
Original Tag Vehicle Classification	Numeric	3	,	Y	
Original Revenue Type	Numeric	1	,	Y	
Original License Plate State	Character	3	,	N	
Original License Plate Number	Character	15	,	N	
Original Alternate License Plate State	Character	3	,	N	
Original Alternate License Plate Number	Character	15	,	N	The reason the original validation record was rejected: A – Tag blocked by receiving Authority D – Invalid Data Record
Reject Reason Code	Character	2	CR&LF	Y	

3.6 Sample Data

Three sample TVL ACK file is shown below. These are the acknowledgement files created for the TVL files contained in Section 2.6. The Carriage Return & Line Feed characters are shown as a "¶".

a) TVL-ACK File from IOPHUB to NTTA

FFFFFFFF,000000000103¶

SA01,IOPHUB,20070617-074416,0,204973,A,20070617-070010,20070617-074416,1460597,0¶

b) TVL-ACK File from CTRMA to IOPHUB

A9A28CFE,000000000330¶

SA01,CTRMA,20070617-083710,5,24326,A,20070617-083218,20070617-083710,1460597,5¶

SR01,DNT.00178572.....\$,G,2,1,TX,WSY07P,,,A¶

SR01,DNT.00055391.....\$,G,2,1,TX,X18VSY,,,A¶

SR01,DNT.00040870.....\$,G,2,1,TX,WHT38J,,,A¶

SR01,DNT.00595869.....\$,G,2,1,TX,Y96TSS,,,D¶

SR01,DNT.00386142.....\$,S,2,1,TX,WQG68,,,A¶

c) TVL-ACK File from HCTRA to IOPHUB

FFFFFFFF,000000000101¶

SA01,HCTRA,20070617-093636,0,24326,A,20070617-084136,20070617-093636,1460597,0¶

3.7 Availability

IOPHub shall be available 24 hours a day, 7 days a week for the file exchanges. Exceptions will be for scheduled maintenance activities. All Service Providers and Subscribers should be notified in advance of scheduled maintenance activities and extended downtime periods. When IOPHub is down, the agencies should stop pushing and pulling files. File transfer may continue after the IOPHub is back up and operational.