InterSystems®
Ensemble

Ensemble ASTM Development Guide

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About This Book

This book describes how to add ASTM routing interfaces to an Ensemble production. It contains the following sections:

- Introduction
- Available Tools
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- Additional Steps
- Reference for Settings

For a detailed outline, see the table of contents.

The following books provide related information:

- *Ensemble Best Practices* describes best practices for organizing and developing Ensemble productions.
- *Developing Ensemble Productions* explains how to perform the development tasks related to creating an Ensemble production.
- *Configuring Ensemble Productions* describes how to configure Ensemble productions, business hosts, and settings. It also provides reference information on settings not discussed in this book.
- *Ensemble Virtual Documents* describes the concept of Ensemble virtual documents and provides generic information on working with them.

For general information, see the *InterSystems Documentation Guide*.

1

Introduction

This chapter introduces ASTM and Ensemble support for ASTM. It contains the following sections:

- Introduction to ASTM
- Ensemble Support for ASTM Documents
- ASTM Communication Details
- Connecting to a Device Using ASTM Over TCP
- Testing an ASTM Interface Without a Device

1.1 Introduction to ASTM

The American Society for Testing and Materials (ASTM) established standards for transferring information between clinical instruments and computer systems. Specification ASTM E1394–97 covers the two-way digital transmission of remote requests and results between clinical instruments and computer systems. It specifies the conventions for structuring the content of the document and for representing the data elements contained within those structures. It does not specify conventions for low-level communications protocols and data transfer requirements. A separate specification, ASTM E1381–02 details a standard for low-level data transfer communications. The Ensemble ASTM package supports both of these standards. For further details, see the web site `http://www.astm.org/`.

ASTM has since transferred the responsibility for maintaining these standards to the Clinical and Laboratory Standards Institute (CLSI). You can find more information on these standards at the web site `http://www.clsi.org`. Ensemble supports the following listed standards from both organizations.

The originating standards from ASTM:

- *ASTM E1381-02 Standard Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems (Withdrawn 2002)*
- *ASTM E1394-97 Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems (Withdrawn 2002)*

The successor standards from CLSI:

- *LIS01-A2 Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems;Approved Standard - Second Edition*
- *LIS02-A2 Specification for Transferring Information Between Clinical Instruments and Computer Systems; Approved Standard- Second Edition*

Note: For simplicity, the remainder of this book uses the term *ASTM* to refer to all forms of the supported standards.

1.2 Ensemble Support for ASTM Documents

Ensemble supports ASTM documents as virtual documents. A *virtual document* is a kind of message that Ensemble parses only partially. This kind of message has the standard Ensemble message header and the standard message properties such as ID, Priority, and SessionId. The data in the message, however, is not available as message properties; instead it is stored directly in an internal-use global, for greater processing speed.

Ensemble provide tools so that you can access values in virtual documents, for use in data transformations, business rules, and searching and filtering messages. For background information, see *Ensemble Virtual Documents*.

1.3 ASTM Communication Details

ASTM uses half-duplex, asynchronous communication, similar to a citizen's band radio. Only one party can communicate over the line at a time, but either party can initiate communication over that line. As an exchange begins, if there is contention, the parties negotiate to decide which should send data first. Generally the laboratory device goes first. A device that uses ASTM uses a single TCP socket to communicate with an Ensemble business service. This single TCP socket is used for communication in both directions between Ensemble and the device.

For all of these reasons, an ASTM business service must be able to do both of the following:

* Receive transmissions (and send their associated replies) over TCP

* Initiate transmissions (and receive their associated replies) over TCP

This is a departure from the architectural role of an Ensemble business service, which is *only* to receive documents and return the associated replies. The Ensemble architecture prohibits a business service from initiating transmissions outside Ensemble. Replies to received documents are fine, but there is no provision for a business service to initiate an exchange with an entity outside Ensemble.

To adapt this restriction to ASTM conventions, Ensemble provides a special-purpose business operation for use with ASTM business services. This business operation identifies the incoming ASTM business service as its *partner service*. Whenever any member of the Ensemble production needs to initiate communication to the external device, it invokes this business operation, which sends the transmission out via its partner service. This preserves the Ensemble conventions for internal messaging (a business service may send messages to a business process or business operation only) while leaving room for ASTM conventions (there is only one TCP socket available on the device, and at the other end of this TCP connection is an Ensemble business service).

The following sections describe how these conventions for business services and business operations work in two situations. Both are useful as you work with ASTM and Ensemble:

* Connecting to a Device Using ASTM Over TCP

* Testing an ASTM Interface Without a Device

1.4 Connecting to a Device Using ASTM Over TCP

Ensemble can communicate via TCP with a device that uses the ASTM protocol in scenarios like the following (all of which can occur in the same production):

- Scenario 1: Receiving and replying to an incoming transmission. This scenario requires a business service and a business process.

  An incoming document arrives from the device and enters Ensemble via a **TCPServiceTwoWay** business service. The business service forwards the document to its configured business process, **WorkAndRouteProcess**. As in other business productions, the business process may invoke routing rules, data transformations, business operations, or other business processes. Eventually, as a result of this work a response comes to the business process. **WorkAndRouteProcess** relays this response to the **TCPServiceTwoWay** business service, which in turn relays it to the device.

  It is possible to set up the production so that the business service does not wait for the response to return from the business process as shown in this scenario. Instead, the request from **TCPServiceTwoWay** to **WorkAndRouteProcess** could be asynchronous and both configuration items could be free to do other work while the activities triggered by **WorkAndRouteProcess** take place. When a reply is finally ready as a result of these activities, **WorkAndRouteProcess** could initiate communication as described in scenario 3 to return the response document to the device.

- Scenario 2: Archiving the received documents as external files. This scenario requires a business service and a business operation.

  Ensemble automatically archives all incoming and outgoing message data, but sometimes, especially for testing purposes, it can useful to capture the documents as external files, outside Ensemble. A **TCPServiceTwoWay** business service could send incoming documents to the **FileOperationArchive** business operation over a simple pass-through interface. The **FileOperationArchive** would then store the documents as files in its configured directory on the local system. This scenario could easily coexist with either or both of the other scenarios described in this list.

- Scenario 3: Sending an outgoing transmission to the device and receiving a reply. This scenario requires a business service, a business process, and a business operation.

  Depending on the conventions expected by the device, it might be important for Ensemble, rather than the device, to initiate a connection and send the device data before the device can formulate a transmission. Suppose the logic for initiating the message begins at a business process, **WorkAndRouteProcess**. This configuration item sends an internal Ensemble message to the TCP business operation, **TCPOperationInitiate**, which uses its partner service, **TCPServiceTwoWay**, to send the payload document from this message to the device. If there is a reply from the device, it arrives via **TCPServiceTwoWay**, which directs the reply appropriately. One possibility is that the reply might trigger further activities by the **WorkAndRouteProcess**, but the details are up to the developer.

1.5 Testing an ASTM Interface Without a Device

You can test ASTM interfaces without having a device connected. You would need to save some of the ASTM documents that you expect to flow to and from your device as text files. Then you can use them to test throughput as follows:

- To simulate a document arriving from the device (and to test a TCP business service), you can use a file business service and a TCP business operation.

  This business service should look for a text file in its configured inbound directory and forward that to the TCP business operation. Then the TCP business operation can send the message to the TCP business service.

- To simulate processing the document, you can use a business service (**TCPServiceListen**) to receive the incoming ASTM document. This configuration item should send the document to a business process (**GenerateReplyProcess**).

Because this test is a simulation, the business process can be an ordinary BPL business process that uses simple statements to generate a generic ASTM reply document. The business process then returns that response to the business service.

- To simulate a reply to the device, you can use a business service (**TCPServiceListen**) to send replies to a business operation (**TCPServiceConnect**, representing the device). Because this is a test and we want to see the results clearly, **TCPServiceConnect** forwards the reply to a file business operation for output to a text file in its configured outbound directory.

2

Available Tools

This chapter provides an overview of the Ensemble tools that you can use to work with ASTM schemas and documents. It contains the following sections:

- Using the ASTM Schema Structures Page
- Using the ASTM Document Viewer Page
- ASTM Classes

2.1 Using the ASTM Schema Structures Page

The **ASTM Schemas** page enables you to import and view ASTM schema specifications.

To display this page, click **Ensemble** > **Interoperate** > **ASTM** > **ASTM Schema Structures**.

For general information on using this page, see "Using the Schema Structures Page" in *Ensemble Virtual Documents*.

For information on creating custom schema categories, see "Creating Custom Schema Categories" in *Ensemble Virtual Documents*.

2.2 Using the ASTM Document Viewer Page

The **ASTM Document** page enables you to display ASTM documents, parsing them in different ways, so that you can determine which DocType to use. You can also test transformations. The documents can be external files or documents from the Ensemble message archives.

To display this page, click **Ensemble** > **Interoperate** > **ASTM** > **ASTM Document Viewer**.

For general information on using this page, see "Using the Document Viewer Page" in *Ensemble Virtual Documents*.

2.3 ASTM Classes

For reference, this section lists the classes that Ensemble provides to enable you to work with ASTM documents.

Item	Classes	Notes
Business services	• EnsLib.EDI.ASTM.Service.FileService • EnsLib.EDI.ASTM.Service.TCPService	Each of these ASTM business service classes uses a different adapter, as indicated by the class name.
Business processes		Ensemble provides a couple of sample business processes.
Business operations	• EnsLib.EDI.ASTM.Operation.FileOperation • EnsLib.EDI.ASTM.Operation.FTPOperation • EnsLib.EDI.ASTM.Operation.TCPOperation	Each of these ASTM business operation classes uses a different adapter, as indicated by the class name.
Message class	EnsLib.EDI.ASTM.Document	This is a specialized message class to carry ASTM documents as Ensemble virtual documents.
Search tables	EnsLib.EDI.ASTM.SearchTable	This is a specialized search table class for ASTM documents.

You can also create and use subclasses of these classes.

The business host classes include configurable targets. The following diagram shows some of them:
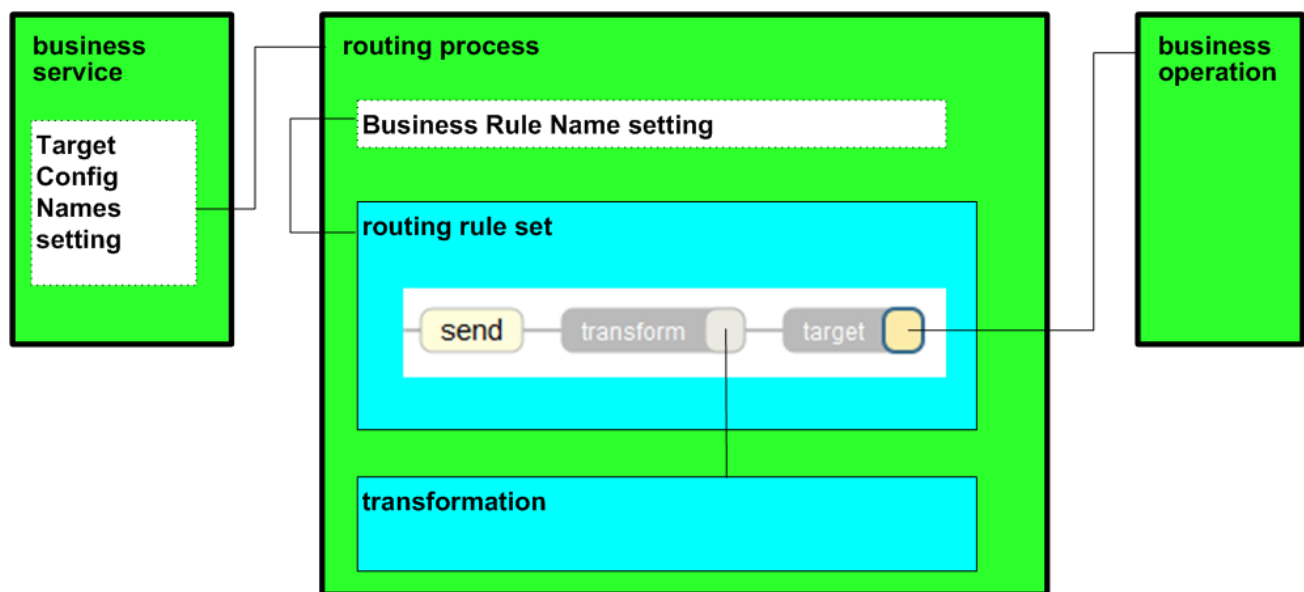
For information on other configurable targets, see "Reference for Settings."

3

Configuring the Production

This chapter describes how to configure a production to include an ASTM routing interface. It discusses the following topics:

- Adding ASTM Business Services
- Adding ASTM Business Processes
- Adding ASTM Business Operations
- Connecting the Business Hosts
- Configuring the Business Hosts

This chapter discusses tasks that you perform on the **Production Configuration** page. The following chapter describes additional tasks.

3.1 Adding ASTM Business Services

Add one ASTM business service for each document type that the production will receive. If this document type arrives via multiple communication modes (for example, via FTP in addition to files), you will need a business service for each communication mode.

To add an ASTM business service to a production, use the Business Service Wizard as usual; see *Configuring Ensemble Productions*. Select one of the following classes from the **Service Class** list:

- EnsLib.EDI.ASTM.Service.FileService
- EnsLib.EDI.ASTM.Service.TCPService

3.1.1 Business Service Variation (EOTOPTIONAL)

Ensemble also supports a mode in which it receives consecutive ASTM E1394 messages not separated by ENQ/EOT control characters but just run together on the wire over a TCP connection. To enable this mode, create a subclass of one of the preceding business service classes, and add the following to your subclass:

```
Parameter EOTOPTIONAL = 1;
```

Then use this subclass in your production.

3.2 Adding ASTM Business Processes

The ASTM device interface described in the first chapter uses a business process called **WorkAndRouteProcess**. A business process like this one inherits from EnsLib.MsgRouter.VDocRoutingEngine, just like the business processes that you would use for documents in the X12 format. For instructions to create one, see "Adding an X12 Business Process" in the *Ensemble X12 Development Guide*. Instructions for the routing rules and data transformations that might be required to support such a business process are also available in the same chapter.

The ASTM testing interface described in the first chapter uses a BPL business process called **GenerateReplyProcess** as its business process. The purpose of this business process is to generate an appropriate ASTM reply document, without actually connecting with a device. The source code for the sample BPL business process is as follows:

```
Class Test.ASTM.GenerateReplyProcess Extends Ens.BusinessProcessBPL
{

/// BPL Definition
XData BPL [ XMLNamespace = "http://www.intersystems.com/bpl" ]
{
<process language='objectscript'
         request='Ens.Request' response='Ens.Response'
         height='2000' width='2000' >
  <sequence xend='550' yend='300' >
    <assign name='CreateResponse' property='response'
            value='..%Process.NewResponse(request)' action='set'
            xpos='550' ypos='200' />
  </sequence>
</process>
}

Method NewResponse(pDocIn As EnsLib.EDI.ASTM.Document)
       As EnsLib.EDI.ASTM.Document
{
 Do {
  Set tDocOut=pDocIn.NewReplyDocument(,,.tSC)  Quit:$$$ISERR(tSC)
  #; Create correct number of blank segment objects in the output document
  For i=1:1:4 {
   Set tSC=tDocOut.SetSegmentAt(##class(EnsLib.EDI.ASTM.Segment).%New(),i)
   Quit:$$$ISERR(tSC)
  } Quit:$$$ISERR(tSC)
 Set tSC=tDocOut.SetValueAt("H|\^&|||",1)
 Set tSC=tDocOut.SetValueAt("P|1|315186|SH3F040230||ARNOUTS^A||19261201|W|",2)
 Set tSC=tDocOut.SetValueAt("O|1|0058224303||^^^BH05|R||||||A|||||||||||||Q",3)
 Set tSC=tDocOut.SetValueAt("L|1|F",4)
 } While 0
 If $$$ISERR(tSC) $$$LOGSTATUS(tSC)  Quit $$$NULLOREF
 Quit tDocOut
}

}
```

3.3 Adding ASTM Business Operations

Add an ASTM business operation for each output destination. You might also want to add a business operation to handle bad messages.

To add an ASTM business operation to a production, use the Business Operation Wizard as usual; see *Configuring Ensemble Productions*. Select one of the following classes from the **Operation Class** list:

- EnsLib.EDI.ASTM.Operation.FileOperation

- EnsLib.EDI.ASTM.Operation.FTPOperation

- EnsLib.EDI.ASTM.Operation.TCPOperation

3.4 Connecting the ASTM Business Hosts

After you add the ASTM business hosts, connect these items as follows:

- For each ASTM business service, specify the Target Config Names setting as the name of the ASTM business process.

- Create a routing rule set that contains the desired logic. See the next chapter.

  For the routing rule set, make sure that the **Target** field is the ASTM business operation.

- For the ASTM business process, specify the **Business Rule Name** setting. Use the full name of the new routing rule set.

3.5 Configuring the Business Hosts

You should examine all the settings listed in "Reference for Settings" and set them as needed.

A couple of key settings for an ASTM business service are as follows:

- Doc Schema Category — Specifies the schema category to assign to the inbound documents. Ensemble requires this information for validation and for search table indexing.

- Search Table Class — Specifies the class to use to index virtual properties in the inbound documents.

- For a File business service, also consider whether you need to configure the Reply Target Config Names setting.

- (Optional) For a TCP business service, prepare the business service to initiate outgoing transmissions:

  Configure Out Separators and Response Timeout.

When ASTM is the protocol, a business operation needs a partner business service before it can initiate an outbound transmission to the device. The basic integration tasks are as follows:

- (For the TCP business operation) Configure the Separators settings.

- (For a partner TCP business service) Configure the **Partner Service** setting. Specify this is as the configuration name of the TCP business operation that sends documents to the device.

4

Additional Steps

This chapter discusses the additional steps needed to add ASTM routing interfaces to a production. It includes the following topics:

- Loading ASTM Schemas into Ensemble (required)
- Defining Routing Rule Sets for ASTM
- Defining DTL Data Transformations for ASTM
- Defining ASTM Search Tables

Be sure to perform these tasks in the same namespace that contains your production. When you create rule sets, transformations, and search tables, do not use reserved package names; see "Reserved Package Names" in *Developing Ensemble Productions*.

4.1 Loading ASTM Schemas into Ensemble

To load an ASTM schema into Ensemble, use the ASTM Schema Structures page, described in the chapter "Available Tools."

For information on creating custom schema categories, see "Creating Custom Schema Categories" in *Ensemble Virtual Documents*.

4.2 Defining Routing Rule Sets for ASTM

Depending on the business process that you create, you may need to create a routing rule set.

For general information on defining business rules, see *Developing Business Rules*.

When you create a routing rule set for an ASTM routing interface:

- On the **general** tab, **Rule Type** should be **Virtual Document Message Routing Rule**. This choice sets the following options:
  - **Rule Assist Class** should be EnsLib.MsgRouter.VDocRuleAssist
  - **Context Class** should be EnsLib.MsgRouter.VDocRouting Engine

- In the **constraint** for a rule, specify **Message Class** as EnsLib.EDI.ASTM.Document.

4.3 Defining DTL Data Transformations for ASTM

Your routing rules might need one or more data transformations.

For general information on defining DTL data transformations, see *Developing DTL Transformations*.

When you create a DTL data transformation for ASTM documents:

- On the **Transform** tab, **Source Class** and **Target Class** should both be EnsLib.EDI.ASTM.Document.
- **Source Doc Type** should match the schema category name assigned by the business service.
- **Target Doc Type** should be the name of the target schema category. This must match a schema category name that you have loaded into Ensemble.

Use the ASTM Document Viewer Page to test your transformations, as described in the chapter "Available Tools."

To integrate the DTL data transformation in the production, enter its full package and class name in the **Transform** field of a routing rule set.

4.4 Defining ASTM Search Tables

The ASTM search table class, EnsLib.EDI.ASTM.SearchTable, automatically indexes the ASTM document ID, which it gives the name Identifier.

If you need more items to search, you can create a subclass. The subclass inherits the Identifier property, plus the infrastructure that makes search tables work. For details, see "Defining a Search Table Class" in *Ensemble Virtual Documents*.

For ASTM, Ensemble supports an additional value for PropType. You can use DateTime:HL7 in addition to the types listed in *Ensemble Virtual Documents*.

Reference for Settings

This section provides the following reference information:

- Settings for ASTM Business Services

- Settings for ASTM Business Operations

- ASTM Escape Sequences

Settings for ASTM Business Services

Provides reference information for settings for ASTM business services.

Summary

ASTM business services provide the following settings:

Group	Settings	See
Basic Settings	Target Config Names, Doc Schema Category	"Settings for Business Services" in *Ensemble Virtual Documents*
Additional Settings	Search Table Class	"Settings for Business Services" in *Ensemble Virtual Documents*
	Reply Target Config Names, Response Timeout, Out Separators, Local Application ID, Reply Mode, Get Reply	*sections in this topic*

The remaining settings are either common to all business services or are determined by the type of adapter. For information, see:

- "Settings for All Business Services" in *Configuring Ensemble Productions*

- "Settings for the File Inbound Adapter" in *Using File Adapters with Ensemble*

- "Settings for the FTP Inbound Adapter" in *Using FTP Adapters with Ensemble*

  The EnsLib.EDI.ASTM.Adapter.TCPAdapter adapter also provides the Out Separators and Response Timeout settings that Ensemble needs when it sends outgoing messages. EnsLib.EDI.ASTM.Adapter.TCPAdapter also has the following adapter properties configured appropriately for ASTM by default:

  – **Port** has a default of 10001.

  – **Terminators** is set to the line feed character (ASCII 10). This property is not configurable in the Management Portal.

Get Reply

(TCP Only) Typically the external ASTM system provides an ACK reply to the ASTM TCP service and operation. If the external ASTM system does not provide an ACK reply, clear the **Get Reply** check box on the ASTM TCP business service. The ASTM TCP business operation uses the setting of its **Partner Service** business service.

The default value is true.

Local Application ID

Colon-separated *LocalID:Qualifier* code that represents the facility and application that receive ASTM documents via this business service. These are used to create reply document headers. The @ (at sign) character represents using the corresponding field from the incoming document. If your ID must contain a literal @ symbol, escape it with backslash: \@

The default value is:

```
ASTMService:ENS
```

Out Separators

(TCP only) When configuring an ASTM business service, you have the option of specifying **Out Separators** for outgoing ASTM documents. The fact that an ASTM business *service* can initiate communication from within Ensemble is an architectural variation that is necessary to support ASTM communication conventions.

For details, see "Separator" in " Settings for ASTM Business Operations." That section discusses a similar setting called **Separators**.

If you do not specify a value for **Out Separators**, the business service uses a default that consists of the four-character string `Flex`. Ensemble does not use the `Flex` characters as separators but interprets this value as follows:

- If the outgoing document is a reply to a previously received inbound document, copy the separators from the inbound document.

- If the outgoing document initiates communication from within Ensemble, use the native separators of the outbound message (do not change separators to transmit the message).

Reply Mode

An ASTM routing interface is a two-way interface; the business service can send outbound documents on it using its partnered business operation. However if your target configuration item wishes to return an immediate response, you can enable this by configuring a **Reply Mode** value of `Application`. Specify one of the following values:

- `Never` — Do not send back any reply. This is the default.

- `Application` — Wait for a response from the target configuration item and relay the response back when it arrives.

Reply Target Config Names

(**File** only) Allows you to specify a comma-separated list of configuration items within the production to which the business service should relay any ASTM *reply* documents that it receives. Usually the list contains one item, but it can be longer. The list can include business processes or business operations, or a combination of both.

Compare to Target Config Names.

Response Timeout

(TCP only) Number of seconds to wait for a response to begin arriving back from the remote system after sending a request. Setting the timeout to `-1` means wait forever.

If the response does not arrive in the **Response Timeout** value for the request, the ASTM adapter generates and logs an `<Ens>ErrTCPReadTimeoutExpired` error, then returns to listening for new inbound messages and waiting for new outbound messages.

Settings for ASTM Business Operations

Provides reference information for settings for ASTM business operations.

Summary

ASTM business operations provide the following settings:

Group	Settings	See
Basic Settings	File Name	*section in this topic*
Additional Settings	Search Table Class	"Settings for Business Operations" in *Ensemble Virtual Documents*
	Partner Service, Separators	*sections in this topic*

The remaining settings are common to all business operations. See "Settings for All Business Operations" in *Configuring Ensemble Productions*.

File Name

(**File** only) The target file name. The **File Path** adapter setting determines the path for this file; **File Name** determines the name. **File Name** can include Ensemble time stamp specifiers. If you leave this setting blank, the default uses the time stamp specifier %f_%Q where:

- %f is the name of the data source, in this case the input filename

- _ is the literal underscore character, which will appear in the output filename

- %Q indicates ODBC format date and time

In substituting a value for the format code %f, Ensemble strips out any of the characters |,?,\,/,:,[,],<,>,&,,,,;,NUL,BEL,TAB,CR,LF, replacing spaces with underscores (_), slashes (/) with hyphens (-), and colons (:) with dots (.).

For details, see "Time Stamp Specifications for Filenames" in *Configuring Ensemble Productions*.

Partner Service

(**TCP** only) The configured **Name** of the TCP business service that is paired with this business operation to send ASTM documents out over the TCP socket. For details, see the overview of ASTM interfaces in "Ensemble Support for ASTM."

The **Production Configuration** page does not display the connection to this business operation.

Separators

A string of four characters which Ensemble assigns to ASTM separators in left to right order: FS, RS, CS, ESC.

An ASTM message uses special characters to organize its raw contents. These characters may vary from one clinical application to another. There are four characters, as follows:

1. Field separator (FS)

2. Repetition separator (RS)

3. Component separator (CS)

4. Escape character (ESC)

The specific character that plays each role may vary from one clinical application to another.

When configuring an ASTM business service, you have the option of specifying a set of **Out Separators** for outgoing ASTM documents. The fact that an ASTM business *service* can initiate communication from within Ensemble is an architectural variation that is necessary to support ASTM communication conventions. For details about these conventions, see the chapter "Introduction."

There is a similar setting called Out Separators for ASTM business services.

For either setting, you must supply a string of four characters which Ensemble assigns to ASTM separators in left to right order: FS, RS, CS, ESC, as described in the previous list.

If you do not specify a value for **Separators**, the default is:

`|\^&`

ASTM Escape Sequences

Provides reference information for ASTM escape sequences.

Details

When separator characters need to appear within the data contents of an ASTM message, ASTM provides escape sequences to replace the separator characters.

Thus, within the ASTM data stream you might see certain characters replaced by an escape sequence, such as `&E&` replacing `&` in the following samples:

```
Parker &E& Sons
XR CHEST PA&E&LAT
```

The following table lists the four standard ASTM escape sequences and their meanings. ASTM escape sequences begin and end with the defined escape character, as described in "Separators." ASTM escape sequences are case-sensitive, and they use the specific characters F S R or E as shown in the table. In the examples shown, the `&` (ampersand) is the escape character.

This character sequence...	If found within ASTM data, indicates...	For example...
`&.br&`*	Carriage return	
`&F&`	Field separator character	|
`&S&`	Component separator character	\\
`&R&`	Repetition separator character	^
`&E&`	Escape character	`&`
`&X0A&`	Line feed	
`&X0D&`	Carriage return	

* Only used for unescaping.