

MIS ICS

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MIS WG

Abstract

This CIP4 JDF Interoperability Conformance Specification (ICS) defines the interoperability requirements related to the communication between MIS and production equipment. It describes requirements that are generic for all stages of the production process (pre-press, press and post-press). It focuses on the main JDF structure and the way Workers communicate status information back to the MIS.

This version applies to interactions using [JDF1.5].



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Table of Contents

1	Introduction	7
2	Color Shading Conventions	7
3	Glossary	8
4	Conformance Levels	11
5	Conformance Rules – Values and Extensions	12
6	Conformance Tables – JDF Instances.....	12
6.1	JDF Node.....	12
6.2	Comment – Manager Created.....	16
6.3	Comment – Worker Created.....	17
6.4	List of Resources	18
6.5	List of Audit Elements.....	18
6.5.1	Created.....	19
Table 9:	Created	19
6.5.2	Modified	19
Table 10:	Modified.....	19
6.5.3	PhaseTime.....	20
6.5.4	Activity	22
6.5.5	ModulePhase.....	22
6.5.6	ProcessRun	23
6.5.7	ResourceAudit	23
7	Conformance Tables – Abstract Resources.....	25
7.1	Abstract Consumable Resource	25
7.2	ResourceLink and ResourceLink/AmountPool/PartAmount	26
7.2.1	AmountPool.....	28
7.2.2	Lot.....	28
8	Conformance Tables – Resources	29
8.1	Company.....	29
8.2	Component.....	29
8.3	Contact.....	30
8.4	CustomerInfo	30
8.5	Device.....	31
8.6	Employee.....	31
8.6.1	Employee – CSR.....	31
8.6.2	Employee – Operator.....	32
8.6.3	Employee – Resource (Synchronization).....	32
8.7	Media.....	33
8.7.1	Media – Resource (Synchronization).....	33
8.7.1.1	GeneralID	34
8.8	MISDetails.....	34
8.9	NodeInfo.....	35
8.10	Person	36
9	Conformance Tables – JMF Messages.....	36
9.1	NewJDF.....	39
9.1.1	Query – NewJDF	39
9.1.1.1	NewJDFQuParams.....	39
9.1.2	Response – NewJDF Query	40
9.1.2.1	IDInfo	40
9.2	Notification.....	41
9.2.1	Signal – Notification.....	41
9.2.1.1	Notification	41
9.2.1.2	Milestone	42
9.3	Resource	42
9.3.1	Command – Resource (NodeInfo).....	42
9.3.1.1	ResourceCmdParams (NodeInfo).....	43

9.3.2	Command – Resource (Synchronization)	44
9.3.2.1	ResourceCmdParams (Synchronization)	44
9.3.3	Query – Resource (Consumption)	45
9.3.3.1	ResourceQuParams (Consumption)	46
9.3.3.2	Subscription	47
9.3.4	Query – Resource (Synchronization)	48
9.3.4.1	ResourceQuParams (Synchronization)	48
9.3.5	Response – Resource (Signal)	49
9.3.6	Response – Resource (Push Synchronization)	49
9.3.6.1	ResourceInfo (Push Synchronization)	50
9.3.7	Response – Resource (Pull Synchronization)	51
9.3.7.1	ResourceInfo (Pull Synchronization)	51
9.3.8	Response	52
9.3.9	Registration – Resource	52
9.3.9.1	ResourceCmdParams (Registration)	53
9.3.10	Signal – Resource	53
9.3.10.1	ResourceInfo (Signal)	54
9.3.10.2	ResourceQuParams (Signal)	55
9.4	Status	56
9.4.1	Query – Status	56
9.4.1.1	StatusQuParams	56
9.4.2	Response – Status	57
9.4.3	Signal – Status	57
9.4.3.1	DeviceInfo	58
9.4.3.2	JobPhase	60
9.4.3.3	JobPhase/@Status and PhaseTime/@Status	62
9.4.3.4	ModuleStatus	62
10	Conformance Rules – Job Submission	63
10.1	JDF Instance Structure	63
11	Conformance Rules – JMF Messages	63
11.1	Goals	63
11.1.1	Job Tracking	63
11.1.2	Job Costing	63
11.1.3	Device Monitoring and Analysis	64
11.1.4	Resource Consumption	64
11.2	When to Send a Status Signal	64
11.2.1.1	Financial Period Costing / Analysis	64
12	Conformance Rules – Job Completion	65
12.1	AuditPool in JDF Elements Returned to the MIS	65
12.1.1	When to Close Audits	65
13	References	65
13.1	Normative References	65
Appendix A:	Changes Between Versions 1.4 and 1.5	66

Tables

Table 1: Color Shading Conventions.....	7
Table 2: Glossary.....	8
Table 3: Conformance Levels.....	11
Table 4: JDF Node.....	12
Table 5: Comment – Manager Created.....	16
Table 6: Comment – Worker Created.....	17
Table 7: List of Resources.....	18
Table 8: List of Audit Elements.....	18
Table 9: Created.....	19
Table 10: Modified.....	19
Table 11: PhaseTime.....	20
Table 12: Activity.....	22
Table 13: ModulePhase.....	23
Table 14: ProcessRun.....	23
Table 15: ResourceAudit.....	24
Table 16: Abstract Consumable Resource.....	25
Table 17: ResourceLink and ResourceLink/AmountPool/PartAmount.....	26
Table 18: AmountPool.....	28
Table 19: Lot.....	28
Table 20: Company.....	29
Table 21: Component.....	29
Table 22: Contact.....	30
Table 23: CustomerInfo.....	30
Table 24: Device.....	31
Table 25: Employee – CSR.....	31
Table 26: Employee – Operator.....	32
Table 27: Employee – Resource (Synchronization).....	32
Table 28: Media – Resource (Synchronization).....	33
Table 29: GeneralID.....	34
Table 30: MISDetails.....	34
Table 31: NodeInfo.....	35
Table 32: Person.....	36
Table 33: List of JMF Messages.....	37
Table 34: Query – NewJDF.....	39
Table 35: NewJDFQuParams.....	39
Table 36: Response – NewJDF.....	40
Table 37: IDInfo.....	40
Table 38: Signal – Notification.....	41
Table 39: Notification.....	41
Table 40: Milestone.....	42
Table 41: Command – Resource (NodeInfo).....	42
Table 42: ResourceCmdParams (NodeInfo).....	43
Table 43: Command – Resource (Synchronization).....	44
Table 44: ResourceCmdParams (Synchronization).....	44
Table 45: Query – Resource (Consumption).....	45
Table 46: ResourceQuParams (Consumption).....	46
Table 47: Subscription.....	47
Table 48: Query – Resource (Synchronization).....	48
Table 49: ResourceQuParams (Synchronization).....	48
Table 50: Response – Resource (Signal).....	49
Table 51: Response – Resource (Push Synchronization).....	50
Table 52: ResourceInfo (Push Synchronization).....	50
Table 53: Response – Resource (Pull Synchronization).....	51
Table 54: ResourceInfo (Pull Synchronization).....	51

Table 55: Response.....	52
Table 56: Registration – Resource.....	52
Table 57: ResourceCmdParams (Registration).....	53
Table 58: Signal – Resource.....	53
Table 59: ResourceInfo (Signal).....	54
Table 60: ResourceQuParams (Signal).....	55
Table 61: Query – Status.....	56
Table 62: StatusQuParams.....	56
Table 63: Response – Status.....	57
Table 64: Signal – Status.....	57
Table 65: DeviceInfo.....	58
Table 66: JobPhase.....	60
Table 67: JobPhase/@ <i>Status</i> and PhaseTime/@ <i>Status</i>	62
Table 68: ModuleStatus.....	62
Table 69: Changes from MIS ICS 1.4.....	66

1 Introduction

The MIS plays a central role in a MIS-managed print shop. The MIS normally is the conduit between the print shop’s customers and the print shop’s production facilities (and sub-contractors). As a result, an MIS supports two major interfaces:

- One with the print shop’s customers – primarily JDF Product Intent.
- Another with the print shop’s production facilities – primarily JDF Process definitions, and specified in the [MIS-ICS] (i.e. this document).

JDF plays a major role in both interfaces.

Note: in this document, terms identified with *bold-italics* are defined in the [Base-ICS] if their definition does not appear immediately in this document.

Using [Base-ICS] terminology, the [MIS-ICS] specifies the generic parts of the *Manager Interface* (in an MIS) when it communicates with the *Worker Interface* (in production Workflow Components, such as Controllers and Devices). It also specifies the corresponding generic parts of the *Worker Interface* (in a Controller or Device) when it communicates with a *Manager Interface* (in an MIS).

This ICS includes:

- Specifications of JDF Elements that are not specific to any one of Prepress, Press or Postpress,
- AuditPool Elements for Job costing, and
- Specifications of JMF Messages used for @JobPartID and Resource synchronization, Job Tracking/Costing and Device utilization statistics.

Definitions that are specific to only one of Prepress, Press or Postpress are described in separate domain ICS documents.

This ICS describes the data flow in a print shop in a MIS-managed environment. However, this data flow does not necessarily also apply to non-MIS-managed environments.

Starting with ICS documents for [JDF1.5], the tables also include any attributes and elements that are required by [JDF1.5] and other ICS documents, so it is no longer necessary to read multiple documents to find all required attributes.

2 Color Shading Conventions

Color shading is used to indicate whether the text and tables have been copied from another ICS or are new to this ICS. The table below describes the meaning of each of the shadings.

Table 1: Color Shading Conventions

Name or Value	Manager			Worker			Description
	Level →	1	2	1	2	3	
<i>DeviceStatus</i>	r?			w			This shading is for an attribute or element defined in this ICS. Note if this shading appears in a table from another ICS, this item is new to this ICS.
<i>Unknown</i>	r?			w←			This shading is for a value defined in this ICS. Note if this shading appears in a table from

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							another ICS, this value is new to this ICS.
<i>Exact</i>		w?			r		This shading is for an attribute or element in a table that is copied from [Base-ICS].
<i>false</i>		w←			r		This shading is for a value in a table that is copied from [Base-ICS].
<i>Exact</i>		w?			r		This shading is for an attribute or element in a table that is copied from [JMF-ICS].
<i>false</i>		w←			r		This shading is for a value in a table that is copied from [JMF-ICS].

3 Glossary

This section defines terminology used throughout this document. References to other documents are indicated with square brackets, e.g. [JDF1.5]. Table 2 also includes the Glossary tables in [Base-ICS], [JMF-ICS] and [MIS-ICS].

This section contains MIS-related terms that pertain to this ICS:

Table 2: Glossary
From: [JDF1.5] Table 1-7

Term	Definition
<i>Abstract Element</i>	An <i>Element</i> that is a placeholder for other <i>Elements</i> and may describe Traits that are common to other <i>Elements</i> . Such other <i>Elements</i> are said to be derived from the <i>Abstract Element</i> . For example, Audit is an <i>Abstract Element</i> . The Created <i>Element</i> and Modified <i>Element</i> are both derived from the Audit <i>Abstract Element</i> . An <i>Abstract Element</i> does not appear in a <i>JDF Instance</i> .
<i>Agent</i>	See [JDF1.5] Section 1.4 “Glossary” and see <i>Producer</i> in this Table.
<i>Attribute</i>	See [JDF1.5] Section 1.4 “Glossary”.
<i>Attribute Value</i>	The value of an <i>Attribute</i> .
<i>Conformance Level</i>	Defines a subset of <i>Conformance Requirements</i> for an <i>ICS</i> . Level-1 <i>Conformance Requirements</i> from a subset of Level-2 <i>Conformance Requirements</i> , and so on for higher levels.
<i>Conformance Requirement</i>	A single requirement that a conforming JDF-enabled Product SHALL meet. An <i>ICS</i> specifies a set of <i>Conformance Requirements</i> that a conforming JDF-enabled Product SHALL meet in order to achieve interoperability with other conforming JDF-enabled Products that meet the same <i>Conformance Requirements</i> .
<i>Conformance Table</i>	Describes the <i>Conformance Requirements</i> for a single <i>Element</i> of a <i>JDF Instance</i> or <i>JMF Message</i> . Each row of a <i>Conformance Table</i> contains a single Trait of the <i>Element</i> . Each such Trait is subject to two <i>Conformance Requirements</i> , one that applies to a conforming <i>Manager</i> and another that applies to a conforming Worker.
<i>Consumer</i>	A <i>Manager</i> or Worker in a role where it consumes a <i>JDF Instance</i> or <i>JMF</i>

Term	Definition
	<i>Message</i> , i.e. reads and processes a JDF Instance or <i>JMF Message</i> . See Producer in this section. See also “ JDF Consumer ” in [JDF1.5] Section 1.4 “Glossary”.
<i>Controller</i>	See [JDF1.5] Section 1.4 “Glossary”.
<i>Derived Element</i>	An Element that is based on some <i>Abstract Element</i> See <i>Abstract Element</i> for an example.
<i>Device</i>	See [JDF1.5] Section 1.4 “Glossary”.
<i>Device Worker</i>	The Worker part of a <i>Device</i> .
<i>Element</i>	See [JDF1.5] Section 1.4 “Glossary”.
<i>Gray Box</i>	<p>A <i>Gray Box</i> specifies a loose combination of several Processes with a specific goal. A <i>Gray Box</i> does not specify all Processes or all Resources – except for Output Resources.</p> <p>When an <i>MIS</i> (acting as a Manager) uses <i>Gray Boxes</i>, it specifies only the Processes and Resources that are of real interest to the <i>MIS</i>, that is, everything it needs to track the produced Output Resources. When a Worker receives a <i>Gray Box</i>, it fills in the details. For more details, see [JDF1.5] Section 3.4.2.1 "Use of the Types Attribute in Process Group Nodes – Gray Boxes", and [JDF1.5] Table 3-4 "JDF Node", row for @Types Attribute.</p>
<i>Hot Folder</i>	A folder that is watched by the Worker, so that when the <i>Manager</i> writes a file into the <i>Hot Folder</i> , the Worker interprets that action as a Job submission and attempts to perform the actions specified in the <i>JDF Instance</i> or <i>JMF Message</i> contained in the file.
<i>Interoperability Conformance Specification (ICS)</i>	A specification developed by a CIP4 WG and approved by the CIP4 Technical Steering Committee (TSC). An ICS specifies the <i>Manager Conformance Requirements</i> for an interface that a conforming JDF-enabled Product SHALL meet in order to achieve interoperability with other conforming JDF-enabled Products that meet the corresponding Worker <i>Conformance Requirements</i> .
<i>JDF</i>	See [JDF1.5] Section 1.4 “Glossary”.
<i>JDF Instance</i>	An XML document that is a valid JDF Node according to [JDF1.5]. The JDF Node describes a print Job or some portion thereof.
<i>JDF Instance File</i>	A file that contains a <i>JDF Instance</i> only.
<i>JDF MIME Instance</i>	A MIME Multipart/Related data stream [RFC 2387] whose first body part is a <i>JDF Instance</i> and each remaining body part is identified by a <i>Content-ID Header</i> [RFC 2392] and is referenced from the <i>JDF Instance</i> body part using a "cid" URL [RFC 2392].
<i>JDF MIME File</i>	A file that contains a <i>JDF MIME Instance</i> .
<i>JMF</i>	See [JDF1.5] Section 1.4 “Glossary”.
<i>JMF Message</i>	An XML document that is a valid JMF <i>Element</i> according to the JDF Schema.
<i>Manager</i>	The software that implements the <i>Manager Interface</i> .
<i>Manager Interface</i>	The interface that sends <i>JDF Instances</i> , <i>JMF Messages</i> and other data (possibly via the network) to a Worker in a <i>Device</i> or <i>Controller</i> in the hierarchy below (see [JDF1.5] Figure 2.1 “Example of JDF and JMF workflow interactions”) and may receive information back (possibly via the network) from a Worker in a <i>Device</i> or

Term	Definition
	<i>Controller</i> .
MAY	See [JDF1.5] Section 1.4.1 Conformance Terminology”.
MIS	See [JDF1.5] Section 1.4 “Glossary”.
MIS Manager	The <i>Manager Interface</i> of the <i>MIS</i> .
NEED NOT	Indicates an action that is not required for conformance, but MAY be performed. See [JDF1.5] Section 1.4.1 Conformance Terminology”.
Node	See [JDF1.5] Section 1.4 “Glossary”.
Process	See [JDF1.5] Section 1.4 “Glossary”.
Producer	A <i>Manager</i> or <i>Worker</i> in a role where it produces or modifies either a <i>JDF Instance</i> or <i>JMF Message</i> , i.e. writes or updates a <i>JDF Instance</i> or <i>JMF Message</i> . See <i>Agent</i> and <i>Consumer</i> in this section.
Product-Sector ICS	An <i>ICS</i> that specifies the <i>Conformance Requirements</i> for a JDF-enabled Product in a specific Product sector. For example, an <i>ICS</i> for a Product sector that includes binding is likely to have a requirement for a <i>Stitching Process</i> .
Referenced File	A file that is referenced via a URI from a <i>JDF Instance</i> or a <i>JMF Message</i> . For example, a PDF file could be a Referenced File.
Root Node	The root Node, i.e. the Node at the top level.
SHALL, SHALL NOT	See [JDF1.5] Section 1.4.1 “Conformance Terminology”.
SHOULD	See [JDF1.5] Section 1.4.1 “Conformance Terminology”.
Signaler	A <i>Manager</i> or <i>Worker</i> in a role where it consumes a subscription request, i.e. reads and processes a Query or Registration containing a Subscription Element.
Subelement	An <i>Element</i> that is a child of another <i>Element</i> .
Subnode	A Node that is below the Root Node, i.e. a Node that is not a Root Node.
Subscriber	A <i>Manager</i> or <i>Worker</i> in a role where it writes a Query or Registration that includes a Subscription Element.
Support	See [JDF1.5] Section 1.4 “Glossary”.
Trait	In the context of an <i>Element</i> , a single Subelement of it, a single <i>Attribute</i> of it or a single <i>Attribute Value</i> of one of its <i>Attributes</i> . In the context of the [JDF1.5] , a table for an <i>Element</i> contains all Traits of the <i>Element</i> .
Worker Interface	The interface that receives <i>JDF Instances</i> , <i>JMF Messages</i> and other data (possibly via the network) from a <i>Manager</i> in a <i>Controller</i> or <i>MIS</i> in the hierarchy above (see [JDF1.5] Figure 2-1 “Example of JDF and JMF workflow interactions”) and may send information back (possibly via the network) to a <i>Manager</i> in a <i>Controller</i> or <i>MIS</i> .
Worker	The software that implements the Worker Interface.

4 Conformance Levels

This ICS specifies three *Conformance Levels* of Conformance Requirements. These levels differ mainly in the type of communication between the *Manager* (in the *MIS*) and the *Worker* (in the Controller or Device).

See Appendix A “*How to Read ICS Documents*” in [Base-ICS] for an explanation of Conformance Tables.

To be conformant to a level of this ICS specified in the first column of Table 3, an *MIS* SHALL conform to the Manager part and a Controller or Device SHALL conform to the Worker part of the ICSs and levels specified in Table 3 below.

Table 3: Conformance Levels

Level of this ICS	[Base-ICS]	[JMF-ICS]	[MIS-ICS]	Description
1	1	-	-	<p>This combination of ICS levels includes:</p> <ul style="list-style-type: none"> • Job Submission using a Hot Folder. • This combination of levels does not require the Worker to implement an HTTP server.
2	2	1	1	<p>This combination of ICS levels includes:</p> <ul style="list-style-type: none"> • All the functionality of the previous combination of ICS levels; • Job Submission using the JMF SubmitQueueEntry Message; • @JobPartID synchronization with NewJDF Query with Subscription using stand alone JMF Messages; • Costing using the AuditPool in the JDF returned to the MIS using the JMF ReturnQueueEntry Message; • Status reporting via JMF Signals creating persistent channels using Query with Subscription using stand alone JMF Messages; • Resource synchronization using Query using stand alone JMF Messages. • Other JMF Messages required by JMF level 1. <p>This combination of levels does require the Worker to implement a HTTP server.</p>
3	2	1	2	<p>This combination of ICS levels includes:</p> <ul style="list-style-type: none"> • All the functionality of the previous combination of ICS levels; • Costing using Reliable Persistent Channels for JMF Status and Resource Signals. • Registration Messages for Resource (NodeInfo) Command Messages. • Resource (NodeInfo) Command Messages to update the job scheduling attributes in the NodeInfo.

5 Conformance Rules – Values and Extensions

See [Base-ICS] Section 5.

6 Conformance Tables – JDF Instances

This ICS specifies the JDF Elements that are not specific to any one of prepress, press or post-press. These Elements include the JDF Root Node and a number of Elements close to the root. This ICS also includes guidelines (rules) on the use of certain Attributes in these and other Elements.

6.1 JDF Node

Table 4 specifies the *Conformance Requirements* for *Attributes* and *Elements* for a JDF *Node* whether it is a *Root Node* or a *Subnode*. Most of the *Attributes* and *Elements* have the *same Conformance Requirements* whether the *Node* is a *Root Node* or a *Subnode*. Those that differ are marked with “w←” and the Description column specifies the conditions.

When Manager (in a MIS) submits a JDF Instance to a Worker (in a Controller or Device), all JDF Nodes contained within this JDF Instance SHALL conform to these conformance requirements. When a Worker returns a JDF Instance to a Manager, all JDF Nodes contained within this JDF Instance SHALL conform to these conformance requirements.

If the JDF Node is a *Gray Box*, it SHALL NOT be spawned by Partition. See [JDF1.5] Section 4.4.3 “Case 3: Parallel Spawning and Merging of Partitioned Resources”.

For more details, see Section 10 “Conformance Rules – Job Submission”.

Some Attributes and Elements are specified only for a Root Node and are so noted in the first line of the Description.

Table 4: JDF Node
From: [JDF1.5] Table 3-4
Root Node of: JDF Instance
Referenced by: JDF Node

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Category</i>	w←			r?			When the Node is a <i>Gray Box</i> defined by an ICS, the Manager SHALL supply @ <i>Category</i> with the following syntax. <ICSShortName>.<rest of Gray Box name> For example, the [MISPRE] defines the <i>Gray Box</i> name: "MISPRE.PrePressPreparation". The Manager MAY supply @ <i>Category</i> for any other Node type.
<i>all values</i>	w←			r?			

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>CommentURL</i>	w?			r?			Links to a human readable description of the Job in any format. This <i>ICS</i> makes no statement about Supported formats or how a Worker should deal with the data referenced by the URL. The Job description referenced by this URL does NOT affect the value of any Attributes in the JDF Node, even when there is an apparent name similarity. If the scheme is not " <i>cid</i> ", the <i>Manager</i> SHALL keep the Comment available for the Worker to retrieve at least until the Worker completes or aborts the Job.
<i>file:...</i>	w←			r			URL whose scheme is " <i>file</i> ".
<i>http:...</i>		w←			r		URL whose scheme is " <i>http</i> ".
<i>https:...</i>		w?			r?		URL whose scheme is " <i>https</i> ".
<i>cid:...</i>		w←			r		URL whose scheme is " <i>cid</i> ".
<i>all remaining values</i>	!w			r?			
<i>DescriptiveName</i>	w←			r?			SHALL occur in Root Node, indicating a single line Job Title; SHOULD occur in <i>Subnodes</i> with other values. If the Worker identifies the Node to an operator, it SHOULD include the <i>@DescriptiveName</i> in any such identification. Note: many <i>Devices</i> have limited possibilities to display the Job description. The string value SHOULD be as short as possible.
<i>ICSVersions</i>	w←			r?			SHALL appear in the Root Node and MAY appear in Subnodes. For example " <i>Base_L1-1.5 MIS_L1-1.5</i> ".
<i>MIS_L1-1.5</i>	w			r?			Specifies that the JDF Instance conforms to [MIS-ICS] level 1.
<i>MIS_L2-1.5</i>		w		r?			Specifies that the JDF Instance conforms to [MIS-ICS] level 2.
<i>MIS_L3-1.5</i>			w	r?			Specifies that the JDF Instance conforms to [MIS-ICS] level 3.
<i>JMF_L1-1.5</i>	w			r?			Specifies that the JMF Element conforms to [JMF-ICS] level 1.
<i>Base_L1-1.5</i>	w			r?			Specifies that the JDF Node conforms to [Base-ICS] level 1.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Base_L2-1.5</i>		w		r?			Specifies that the JDF Node conforms to [Base-ICS] level 2.
<i>all remaining values</i>	w←			r?			Values specified in other ICSs.
<i>ID</i>	w r?			r? w←			Required in [JDF1.5] Table 3-4 JDF Node. SHALL be supplied if a new Node is created. SHALL NOT be modified.
<i>JobID</i>	w←			r			SHALL occur in Root Node, MAY occur in <i>Subnodes</i> . r-Test: Worker SHALL preserve @ <i>JobID</i> values, and SHALL use this value when sending Messages that require the Node's @ <i>JobID</i> and SHALL use this value to identify Jobs that are specified in received Messages.
<i>JobPartID</i>	w r?			r w←			Each JDF Node (Product, Process Group, Combined Process, and Process) SHALL have a @ <i>JobPartID</i> and its value SHALL be unique within the context of all JDF Instances that have the same @ <i>JobID</i> in the print shop's workflow. When creating a JDF <i>Subnode</i> , a Worker SHALL generate the new @ <i>JobPartID</i> by adding a suffix to the parent JDF Node's @ <i>JobPartID</i> . Each suffix SHALL start with a period "." and SHALL NOT exceed 3 characters including the <i>period</i> . The resulting @ <i>JobPartID</i> SHALL NOT exceed 63 characters. Note: @ <i>JobPartID</i> is required even at the root level. r-Test: Worker SHALL preserve @ <i>JobPartID</i> values and SHALL use this value when sending Messages that require the Node's @ <i>JobPartID</i> and SHALL use this value to identify Nodes that are specified in received Messages.
<i>MaxVersion</i>	w←			r			SHALL be in Root Node, MAY be in <i>Subnodes</i> . r-Test: Returned JDF Node contains no Elements or Attributes from newer versions of JDF than specified version.
<i>1.5</i>	w			r			A value higher than 1.5 MAY be specified.
<i>ProjectID</i>	w?			r?			SHALL NOT be specified in <i>Subnodes</i> . An ID assigned by the MIS for grouping multiple Jobs into one "Customer Order".
<i>RelatedJobID</i>	w←			r?			SHALL be present if @ <i>RelatedJobPartID</i> is present. SHALL be present if the Node parameters are

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							the same as the Node parameters of the @RelatedJobID.
RelatedJobPartID	w?			r?			MAY be present if the Node parameters are the same as the Node parameters of the @RelatedJobPartID.
Status	w			r			Required in [JDF1.5] Table 3-4 JDF Node. See [JDF1.5] Sections 3.2 “JDF Node” and 4.3 “Execution Model”, and this document (Base ICS) Section A.1 “Interfaces for Conformance Requirements” of this document. r-Test: A Worker SHALL NOT execute Nodes whose status is "Completed" or "Aborted".
<i>all values</i>	w←			r			
Type	w			r			Required in [JDF1.5] Table 3-4 JDF Node. Worker conformance is further defined in domain ICSs.
Product	w←			r?			Specifies that this Node describes a final or Partial Product and it MAY have nested JDF Subnodes.
ProcessGroup	w←			r?			Specifies that this Node describes multiple Processes and that it may take several Devices to process them, possibly with spawning.
Combined	w←			r?			Specifies that this Node describes multiple Processes (specified by the @Types Attribute).
<Process Name>	w←			r?			Specifies that this Node describes a single Process (specified by the value of this Attribute).
Types	w←			r?			SHALL be specified if @Type="Combined".
<i>all values</i>	w?			r?			The Product-Sector ICSs specify particular values.
Version	w←			r?			SHALL be in Root Node, MAY be in Subnodes. See [JDF1.5] Section 3.13 “JDF Versioning” for information about versioning.
1.5	w			r?			
xmlns	w←			r?			SHALL be in Root Node, MAY be in Subnodes. The namespace for JDF MAY be the default namespace or any prefixed namespace.
http://www.CIP4.org/JDFSchema_1_1	w			r?			Note: that for all 1.x versions of [JDF1.5], the namespace URI is the same.
xmlns:xsi	w←			r?			SHALL be in Root Node, MAY be in Subnodes.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<code>http://www.w3.org/2001/XMLSchema-instance</code>	w			r?			
<code>xsi:type</code>	w			r?			Helps JDF Schema aware implementations to identify specific Node types.
AuditPool	w r?	wr		r? w			r-Test: Manager SHALL record actual processing time retrieved from PhaseTime Elements against the Job. See Table 8: List of Audit Elements, and see [Base-ICS] Table 11 AuditPool and [Base-ICS] Table 13 List of Audit Elements.
Comment	w?			r?			The Manager MAY supply one or more Comment Elements with information for the Worker. See Table 5: Comment – Manager Created.
Comment	r?			w?			The Worker MAY supply one or more additional Comment Elements with information for the Manager. See Table 6: Comment – Worker Created.
JDF	w?			r			Child JDF Nodes. r-Test: Worker SHALL be able to read and process child Nodes. See Table 4: JDF Node.
ResourcePool	w←			r			The Product-Sector ICSs specify particular Resource children of this Element. See Table 7: List of Resources.

6.2 Comment – Manager Created

Table 5: Comment – Manager Created

From: [JDF1.5] Table 3-5

Referenced by: JDF Node

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<code>AgentName</code>	w			r?			
<code>AgentVersion</code>	w			r?			
<code>Name</code>	w			r			r-Test: Worker SHALL read and display the content of the Comment if it has a graphical display.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Description</i>	w←			r?			For a comment that describes the Node. It SHALL only be in a JDF Subnode.
<i>Instruction</i>	w←			r?			For instructions to the operator. It SHALL only be a JDF Node that is a Process Group Node (e.g. <i>Gray Box</i>), Combined Process Node or Process Node.
<i>JobDescription</i>	w←			r?			For a comment that describes the overall Job. It SHALL only be in a JDF Root Node or in the AncestorPool/Ancestor of a spawned Job.
<i>all remaining values</i>	w?			r?			
<content of Element>	w			r←			The Worker SHALL retain any white space and newline characters in the content of the Element when rendering it. Worker SHALL read and display the comment if it has a graphical display.

6.3 Comment – Worker Created

Table 6: Comment – Worker Created

From: [JDF1.5] Table 3-5

Referenced by: DeviceInfo, JDF Node, JobPhase, PhaseTime, ResourceInfo (Signal)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>AgentName</i>	w			r?			
<i>AgentVersion</i>	w			r?			
<i>Name</i>	r			w			r-Test: Manager SHALL store the Comment in its database and allow retrieval and display via the user interface.
<i>OperatorText</i>	r			w←			For comments created by the operator to be placed in the JDF Root Node or Subnode that is returned to the <i>MIS</i> .
<i>all remaining values</i>	r?			w?			
<content of Element>	r			w			The Manager SHALL retain any white space and newline characters in the content of the Element when rendering it.

6.4 List of Resources

Table 7: List of Resources

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Component	w?			r?			Conformance is further defined in domain ICSs. See Table 21: Component.
ConsumableResource	w?			r?			Conformance is further defined in domain ICSs. See Table 16: Abstract Consumable Resource.
CustomerInfo	w←			r?			The Root Node SHALL have a CustomerInfo Resource linked as an Input. Other Nodes in the same JDF Instance MAY link to the same CustomerInfo Resource but SHALL NOT link to a different CustomerInfo Resource. See Table 23: CustomerInfo.
NodeInfo	w← r			r w←			The Root Node SHALL have a NodeInfo Resource linked as an Input. Other Nodes MAY be required to have a NodeInfo Resource linked as an Input. See Table 31: NodeInfo.

6.5 List of Audit Elements

When a Worker returns a JDF Instance to its Manager, the Worker SHALL return the same JDF Instance that it received from the Manager except for certain parts of the JDF Instance that a Worker MAY modify. In particular, the Worker SHALL add information into the AuditPool of the Process Node that was executed.

For more details, see Section 12 “Conformance Rules – Job Completion”.

Table 8: List of Audit Elements

From: [JDF1.5] Table 3-31

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Created	w r?			r? w←			If the Worker creates the Node, it SHALL write the Created Audit Element. See Table 9: Created and [JDF1.5].
Modified	r?			w?			SHOULD supply if significantly modifying the JDF. Modified Audit Elements have no required Traits other than those defined in Abstract Audit. See Table 10: Modified.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
PhaseTime		r			w		See Table 11: PhaseTime.
ProcessRun	r?			w			SHALL be supplied once, as the last Audit Element relating to each execution of the Node, i.e. just before a ReturnQueueEntry Message is sent for the Node. See Table 14: ProcessRun.
ResourceAudit		r			w←		The domain ICS for the Worker specifies the types of Consumable Resources for which consumption SHALL be reported and for which this Element SHALL be supplied. See Table 15: ResourceAudit.

6.5.1 Created

Table 9: Created

From: [Base-ICS] Table 12 Abstract Audit

Referenced by: List of Audit Elements

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>AgentName</i>	w r?			r? w			
<i>AgentVersion</i>	w r?			r? w			
<i>ID</i>	w r?			r? w			
<i>TimeStamp</i>	w r?			r? w			Required in [JDF1.5] Abstract Audit Table 30.

6.5.2 Modified

Table 10: Modified

From: [Base-ICS] Table 12 Abstract Audit

Referenced by: List of Audit Elements

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>AgentName</i>	r?			w			

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>AgentVersion</i>	r?			w			
<i>ID</i>	r?			w			
<i>TimeStamp</i>	r?			w			Required in [JDF1.5] Abstract Audit Table 30.

6.5.3 PhaseTime

The following paragraphs discuss overlapping PhaseTime Elements versus overlapping ModulePhase Elements.

Starting with JDF 1.4, there is a single method to supply Audit Elements for Devices with Modules, namely Audit Elements with overlapping PhaseTime Elements.

Starting with "JDF 1.4", remove reference to 1.5

The PhaseTime Elements MAY overlap only if each PhaseTime separately contains one or more non-identical ModulePhase Elements. The ModulePhase Elements indicate which modules were used during the entire PhaseTime. @Status and duration (@Start and @End) Attributes of the PhaseTime Element indicate the status and duration of the phase for all modules specified by ModulePhase Subelements.

Table 11: PhaseTime

From: [JDF1.5] Table 3-37

Referenced by: List of Audit Elements

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>AgentName</i>		r?			w		
<i>AgentVersion</i>		r?			w		
<i>End</i>		r			w		Required in [JDF1.5] Table 3-37 PhaseTime. r-Test: The Manager SHALL create Job costing based on the PhaseTime Elements, calculating the duration specified by @Start and @End.
<i>ID</i>		r			w		Optional in [JDF1.5] Table 3-30 Abstract Audit. Any Audit supplied by a Worker SHALL have an @ID Attribute whose value SHALL be unique within the context of all Audit Elements in all JDF Instances that have the same @JobID in the print shop's workflow. r-Test: Manager SHALL NOT create costing data from the same Audit more than once.
<i>refID</i>		r			w←		Optional in [JDF1.5] Table 3-30 Abstract Audit. Once an Audit is supplied, it SHALL NOT be modified. The only exception to this is that a

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							<p>Worker may “close” an “open” PhaseTime Audit Element by supplying the <i>@End</i> Attribute. If the Worker determines that a previously supplied Audit is incorrect, it SHALL supply another Audit with the correct data, and specify the incorrect Audit Element’s <i>@ID</i> value in this <i>@refID</i> Attribute.</p> <p>r-Test: If an Audit references another Audit via <i>@refID</i>, the Manager SHALL replace any costing data in the referenced Audit with the costing data in the Audit with the <i>@refID</i>.</p>
<i>Start</i>		r			w		<p>Required in [JDF1.5] Table 3-37 PhaseTime.</p> <p>r-Test: See <i>@End</i>.</p>
<i>Status</i>		r			w		<p>Required in [JDF1.5] Table 3-37 PhaseTime.</p> <p>r-Test: The Manager SHALL show actual duration for the sum of all values of <i>@Status</i> or for individual values of <i>@Status</i>. The duration for <i>@Status = "Suspended"</i> SHALL be excluded from the costing. The duration for <i>@Status = "Stopped"</i> MAY be excluded from the costing.</p> <p>For values, see Table 67: JobPhase/@Status and PhaseTime/@Status.</p>
<i>TimeStamp</i>		r			w		Required in [JDF1.5] Abstract Audit Table 30.
<i>Activity</i>		r?			w?		See Table 12: Activity,
<i>Comment</i>		r?			w?		See Table 6: Comment – Worker Created.
Device		r			w?		See Table 24: Device.
Employee		r?			w?		See Table 26: Employee – Operator.
MISDetails		r			w←		SHALL be supplied if known to the Worker, either via the NodeInfo or by operator input. See Table 30: MISDetails.
<i>ModulePhase</i>		r?			w?		See Table 13: ModulePhase.
<i>Part</i>		r?			w←		<p>If this Audit Element doesn’t describe all parts of a Process, then the Worker SHALL supply this Part Element and it SHALL specify the parts of a Process that this Audit Element belongs to.</p> <p>See [JDF1.5].</p>

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
ResourceLink (Output)		r?			w?		This ResourceLink is a copy of the ResourceLink that references the Resources that were produced during the execution of this PhaseTime. Resource production SHOULD be recorded using ResourceAudit Elements (Table 15). See Table 17 (as ResourceLink) and see [Base-ICS].
ResourceLink (Input)		r?			w?		This ResourceLink is a copy of the ResourceLink that references the Resources that were consumed during the execution of this PhaseTime. Resource consumption SHALL be recorded using ResourceAudit Elements. See Table 15: ResourceAudit. See Table 17 (as ResourceLink).

6.5.4 Activity

The Activities allow the specification of the Device and Operator tasks. One use case is to specify the group of operators that is assigned to the Device and/or Job, were each operator performs a different task (for example machine operator and assistants).

Table 12: Activity

From: [JDF1.5] Table 3-38

Referenced by: DeviceInfo, JobPhase, PhaseTime

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ActivityID</i>		r←			w←		ID of the Activity being performed. This ID is unique, site specific and internal to the MIS. Constraint note: At least one of @ActivityID and @ActivityName SHALL be specified.
<i>ActivityName</i>		r←			w←		At least one of @ActivityID and @ActivityName SHALL be specified.
<i>PersonalID</i>		r			w←		SHALL be written if an operator was involved in this phase
<i>StartTime</i>		r			w		

6.5.5 ModulePhase

See Section 6.5.3 PhaseTime above for a discussion about overlapping PhaseTime Elements versus overlapping ModulePhase Elements.

Table 13: ModulePhase
From: [JDF1.5] Table 3-39
Referenced by: PhaseTime

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>DeviceID</i>		r?			w		Required in [JDF1.5] Table 3-39 ModulePhase.
<i>DeviceStatus</i>		r?			w←		
<i>ModuleType</i>		r?			w		
<i>all values</i>		r?			w←		

6.5.6 ProcessRun

Table 14: ProcessRun
From: [JDF1.5] Table 3-40
Referenced by: List of Audit Elements

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>AgentName</i>		r?			w		
<i>AgentVersion</i>		r?			w		
<i>Duration</i>		r?			w		
<i>End</i>		r?			w		Required in [JDF1.5] Table 3-40 ProcessRun.
<i>EndStatus</i>		r?			w		Required in [JDF1.5] Table 3-40 ProcessRun.
<i>all values</i>		r?			w←		
<i>ID</i>		r?			w		
<i>Start</i>		r?			w		Required in [JDF1.5] Table 3-40 ProcessRun.
<i>TimeStamp</i>		r			w		Required in [JDF1.5] Abstract Audit Table 30.
<i>Part</i>		r?			w←		If this Audit Element doesn't describe all parts of a Process, then the Worker SHALL supply this Part Element and it SHALL specify the parts of a Process that this Audit Element belongs to. See [JDF1.5].

6.5.7 ResourceAudit

ResourceAudit Elements SHALL be supplied for consumption of a **Resource** by the Worker.

Table 15: ResourceAudit
From: [JDF1.5] Table 3-41
Referenced by: List of Audit Elements

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>AgentName</i>		r?			w		
<i>AgentVersion</i>		r?			w		
<i>ID</i>		r			w		Any Audit supplied by a Worker SHALL have an @ <i>ID</i> Attribute whose value SHALL be unique within the context of all Audit Elements in all JDF Instances that have the same @ <i>JobID</i> in the print shop's workflow. r-Test: Manager SHALL NOT create costing data from the same Audit more than once.
<i>refID</i>		r			w←		Once an Audit is supplied, it SHALL NOT be modified. The only exception to this is that a Worker may "close" an "open" PhaseTime Audit Element by supplying the @ <i>End</i> Attribute. If the Worker determines that a previously supplied Audit is incorrect, it SHALL supply another Audit with the correct data, and specify the incorrect Audit Element's @ <i>ID</i> value in this @ <i>refID</i> Attribute. r-Test: If an Audit references another Audit via @ <i>refID</i> , the Manager SHALL update any costing data in the referenced Audit with the costing data in the Audit with the @ <i>refID</i> .
<i>NodeStatus</i>		r?			w?		
<i>Reason</i>		r			w?		r-Test: The Manager SHALL NOT create costing entries for ResourceAudit Elements with @ <i>Reason</i> = " <i>PlanChange</i> ".
<i>ProcessResult</i>		r			w		
<i>all remaining values</i>		r?			w?		
<i>TimeStamp</i>		r			w		Required in [JDF1.5] Abstract Audit Table 30.
<i>Part</i>		r?			w←		SHALL be supplied if a Part was executed. See [JDF1.5].

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
ResourceLink		r			w		Required in [JDF1.5] Table 3-41 ResourceAudit. This ResourceLink is a copy of the ResourceLink that references a Resource that was consumed or modified during the execution of the Node. See Table 17 (as ResourceLink) and see [Base-ICS].

7 Conformance Tables – Abstract Resources

7.1 Abstract Consumable Resource

Table 16: Abstract Consumable Resource

From: [JDF1.5] Table 3-10

Referenced by: List of Resources

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Class</i>	w			r			Required in [JDF1.5] Table 3-10 Abstract Resource.
<i>Consumable</i>	w			r			
<i>DescriptiveName</i>	w			r←			r-Test: If the Worker identifies this Consumable Resource to the operator, the Worker SHALL display this value.
<i>ID</i>	w			r?			Required in [JDF1.5] Table 3-10 Abstract Resource.
<i>LotControl</i>			w?			r←	Domain ICS documents specify for which type of Resource lot control is required. r-Test: If @LotControl = "Controlled", the appropriate LOT Elements SHALL be included in the returned JDF Instance and JMF Messages.
<i>Controlled</i>			w←			r	Lots are controlled.
<i>NotControlled</i>			w←			r?	
<i>ProductID</i>	w←			r			SHALL be supplied if known by the MIS. r-Test: If the Manager supplies this Attribute and the Worker identifies this Consumable Resource to the operator, the Worker SHALL include this value in the display.
<i>Status</i>	w			r			Required in [JDF1.5] Table 3-10 Abstract

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							Resource.
<i>Available</i>	w←			r			
<i>Unavailable</i>	w←			r			
<i>all remaining values</i>	w?			r			

7.2 ResourceLink and ResourceLink/AmountPool/PartAmount

Table 17: ResourceLink and ResourceLink/AmountPool/PartAmount

From: [JDF1.5] Tables 3-16 and 3-19

Referenced by: PhaseTime (for ResourceLink), ResourceAudit (for ResourceLink), AmountPool (for ResourceLink/AmountPool/PartAmount)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ActualAmount</i>	r?	r		w?	w		A Worker SHOULD update the @ <i>ActualAmount</i> of any Physical Resource that it produces or consumes. See [JDF1.5] Section 3.10.4 “Resource Amount” for details. Domain ICS’s may specify additional requirements for updating @ <i>ActualAmount</i> for any specific kind of PhysicalResource. SHALL NOT be supplied if AmountPool exists. r-Test: The Manager SHALL create costing entries for quantity specified in this Attribute.
<i>MinStatus</i>	r?			w←			If a Worker adds a new ResourceLink, it SHALL write this value. r-Test: Worker SHALL NOT execute <i>Nodes</i> that have input Resources where the Resource’s @ <i>Status</i> Attribute has a value “lower” than the value specified in @ <i>MinStatus</i> , as defined in [JDF1.5] Table 3-10 in Section 3.8.3 “Abstract Resource”.
<i>ProcessUsage</i>	r			w←			If multiple Resources of the same type are used by a Process, @ <i>ProcessUsage</i> SHALL be used to distinguish them as defined in [JDF1.5] Chapter 6 “Processes”. r-Test: The Manager and Worker SHALL conform to read requirements for the linked Resource as specified in other ICS’s.
<i>rRef</i>	w			r			If a Worker adds a new ResourceLink, it

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
	r			w←			SHALL write this value. This Attribute SHALL reference a Resource that is a direct child of a ResourcePool. r-Test: The <i>Manager</i> and <i>Worker</i> SHALL conform to read requirements for the linked Resource as specified in other ICS's.
Usage	w r			r w←			If a <i>Worker</i> adds a new ResourceLink, it SHALL write this value. r-Test: The <i>Manager</i> and <i>Worker</i> SHALL conform to read requirements for the linked Resources as specified in other ICS's, and SHALL update Output ResourceLink Elements as specified in other ICS's. See [JDF1.5].
Input		r←			w←		
Output		r←			w←		
AmountPool	r?	r?		w?	w		SHALL NOT be specified in PartAmount. Worker MAY create the AmountPool, if it does not exist, before it returns the ticket to the <i>Manager</i> . If the Worker creates the AmountPool, the Worker SHALL move the @ActualAmount, @Amount, @MaxAmount and @MinAmount Attributes to the AmountPool and assume that amounts on the Link need to go into the Good Partition. See Table 18: AmountPool (from ResourceLink).
Lot			r			w←	SHALL be specified if Resource is lot controlled. SHALL NOT be supplied if AmountPool exists. r-Test: The Manager SHALL create costing entries based on the specified LOT. See Table 19: Lot.
Part	r?	r		w←	w←		If the Part Element is part of the PartAmount Element, Part SHALL be specified. A <i>Worker</i> SHALL read and Support ResourceLink Elements that reference one or more Partitions of a Resource. r-Test: The <i>Worker</i> SHALL conform to read requirements for the linked Resource as specified in other ICS's. See [JDF1.5].

Name or Value	Manager			Worker			Description
Level →	1	2	3	1	2	3	
							See Table 19 Part [Base-ICS].

7.2.1 AmountPool

Table 18: AmountPool
From: [JDF1.5] Table 3-18
Referenced by: ResourceLink

Name or Value	Manager			Worker			Description
Level →	1	2	3	1	2	3	
PartAmount		r			w		See Table 17 (as ResourceLink/AmountPool/PartAmount).

7.2.2 Lot

Table 19: Lot
From: [JDF1.5] Table 3-20
Referenced by: ResourceLink and ResourceLink/AmountPool/PartAmount

Name or Value	Manager			Worker			Description
Level →	1	2	3	1	2	3	
<i>ActualAmount</i>			r			w	r-Test: see @ActualAmount in Table 17.
<i>LotID</i>			r			w	Required in [JDF1.5] Table 3-20 Lot. r-Test: The Manager SHALL create costing entries based on the specified Lot.
<i>Consumption</i>			r?			w	
<i>Full</i>			r?			w←	
<i>Partial</i>			r?			w←	

8 Conformance Tables – Resources

8.1 Company

Table 20: Company
From: [JDF1.5] Table 8-44
Referenced by: **Contact**

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>OrganizationName</i>	w			r?			Required in [JDF1.5] Table 8-44 Company. Name of the customer's organization.
<i>ProductID</i>	w			r?			

8.2 Component

Each Product Node’s ResourceLinkPool SHALL contain at least one output ComponentLink (which, of course, links to a **Component**). To put it more succinctly, each Product Node SHALL link to at least one output **Component**. If a root Product Node links to an output **Component**, the **Component** is the Final Product. If any other Product Node links to an Output **Component**, the **Component** is a Partial Product. Table 21 shows the Conformance Requirements for such Output **Component** Resources.

Table 21: Component
From: [JDF1.5] Table 9-4
Referenced by: List of Resources

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ComponentType</i>	w			r?			Required in [JDF1.5] Table 9-4 Component.
<i>FinalProduct</i>	w←			r?			SHALL be the value of @ComponentType for a Component that represents the single finished Product that the customer ordered.
<i>all remaining values</i>	w?			r?			
<i>Dimensions</i>	w←			r?			SHALL be supplied if (contains(@ComponentType,"FinalProduct")).
<i>ProductType</i>	w←			r?			The Manager SHALL supply this Attribute for a Partial Product so that prepress systems can take special action based on the type of Product.
<i>BackCover</i>	w←			r?			
<i>Body</i>	w←			r?			For non-cover sections of bound Products and self-cover Products.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Cover</i>	w←			r?			For covers of bound Products.
<i>Flatwork</i>	w←			r?			For non-bound, non-folded Products or Products that only have packaging folds.
<i>Folded</i>	w←			r?			For non-bound folded Products
<i>FrontCover</i>	w←			r?			
<i>Insert</i>	w←			r?			For parts in a bound product that require independent page numbering.
<i>all remaining values</i>	w?			r?			

8.3 Contact

Table 22: Contact

From: [JDF1.5] Table 8-45

Referenced by: **CustomerInfo**, ResourceCmdParams (Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ContactTypes</i>	w			r?			Required in [JDF1.5] Table 8-45 Contact.
<i>Customer</i>	w			r?			
<i>Administrator</i>	w			r?			
<i>all remaining values</i>	w?			r?			
<i>ProductID</i>	w			r?			
Company	w←			r?			See Table 20: Company.
Person	w			r?			See Table 32: Person.

8.4 CustomerInfo

Table 23: CustomerInfo

From: [JDF1.5] Table 8-55

Referenced by: List of Resources

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>CustomerID</i>	w			r?			

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>CustomerJobName</i>	w←			r?			A specific Job name that is present if the customer provides it.
<i>CustomerOrderID</i>	w←			r?			
<i>CustomerProjectID</i>	w?			r?			An ID provided by the customer for grouping multiple Jobs into one “Customer Order”.
Contact	w			r?			The contact person for the customer. See Table 22: Contact.

8.5 Device

Table 24: Device

From: [JDF1.5] Table 9-6

Referenced by: PhaseTime

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>DeviceClass</i>		r?			w?		SHOULD be provided if known.
<i>all values</i>		r?			w?		
<i>DeviceID</i>		r			w		r-Test: When costing a Job based on hours, the Manager SHALL select the cost rate using the @ <i>DeviceID</i> .

8.6 Employee

8.6.1 Employee – CSR

Table 25: Employee – CSR

From: [JDF1.5] Table 8-78

Referenced by: NodeInfo

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>PersonalID</i>	w			r?			SHALL have same value as @ <i>ProductID</i> .
<i>ProductID</i>	w			r?			SHALL have same value as @ <i>PersonalID</i> .
<i>Roles</i>	w			r?			
<i>CSR</i>	w			r?			Customer Service Representative.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>all remaining values</i>	w?			r?			

8.6.2 Employee – Operator

Table 26: Employee – Operator

From: [JDF1.5] Table 8-78

Referenced by: DeviceInfo, PhaseTime

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>PersonalID</i>		r			w		r-Test: The Worker SHALL retain the identification of the operator that is specified by <i>@PersonalID</i> . SHALL have same value as <i>@ProductID</i> .
<i>ProductID</i>		r?			w		SHALL have same value as <i>@PersonalID</i> .
<i>Roles</i>		r			w		r-Test: The Worker SHALL at least retain the identification of the Employee with <i>@Roles</i> = "Operator".
<i>Operator</i>		r			w←		
<i>Assistant</i>		r?			w?		"Assistant" means assistant operator.
<i>all remaining values</i>		r?			w?		

8.6.3 Employee – Resource (Synchronization)

Table 27: Employee – Resource (Synchronization)

From: [JDF1.5] Table 8-78

Referenced by: ResourceCmdParams (Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>PersonalID</i>		w			r		SHALL have same value as <i>@ProductID</i>
<i>Roles</i>		w			r?		
<i>CSR</i>		w←			r		
<i>Operator</i>		w←			r		
<i>Assistant</i>		w←			r		
<i>all remaining values</i>		w?			r?		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ProductID</i>		w			r		SHALL have same value as @ <i>PersonIID</i>
Person		w			r		See Table 32: Person.

8.7 Media

8.7.1 Media – Resource (Synchronization)

r-Test: For all Attributes with a Worker “read” requirement, the Worker SHALL include the value in its media catalog. For all Attributes with a Manager “read” requirement, the Manager SHALL include the value in its database.

Table 28: Media – Resource (Synchronization)

From: [JDF1.5] Table 9-13

Referenced by: ResourceCmdParams (Synchronization), ResourceInfo (Pull Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Brand</i>		w r			r w		
<i>DescriptiveName</i>		w r			r w		
<i>Dimension</i>		w r			r w		
<i>Grade</i>		w? r			r w?		
<i>ISOPaperSubstrate</i>		w? r?			r? w?		This attribute will replace @ <i>Grade</i> in future.
<i>MediaQuality</i>		w? r			r w?		
<i>MediaType</i>		w r			r w		
<i>Paper</i>		w r			r w		Only @ <i>MediaType</i> of " <i>Paper</i> " SHALL be supported for Synchronization
<i>all remaining values</i>		w? r?			r? w?		
<i>ProductID</i>		w r?			r w?		
<i>Thickness</i>		w? r			r w?		
<i>Weight</i>		w			r		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
		r			w		
GeneralID		r?			w←		SHALL be supplied by Worker that has a Paper Catalog with Worker specific IDs. See Table 29: GeneralID.

8.7.1.1 GeneralID

Table 29: GeneralID

From: [JDF1.5] Table 3-6

Referenced by: **Media** – Resource (Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>IDUsage</i>		r			w		Required in [JDF1.5] Table 3-6 GeneralID.
<i>DeviceProductID</i>		r			w←		
<i>IDValue</i>		r			w		Required in [JDF1.5] Table 3-6 GeneralID. The ID that the Media has in the Device Media Catalog

8.8 MISDetails

Table 30: MISDetails

From: [JDF1.5] Table 10-31

Referenced by: JobPhase, ResourceInfo, PhaseTime

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>CostType</i>		r			w?		r-Test: Manager SHALL store the @ <i>CostType</i> against the actual hours.
<i>all values</i>		r			w←		
<i>DeviceOperationMode</i>		r			w←		The Worker SHALL supply this Attribute for an attended Device. The Worker MAY supply it for an unattended Device. r-Test: The Manager SHALL only create costing entries with @ <i>DeviceOperationMode</i> = " <i>Productive</i> ".
<i>all values</i>		r			w←		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>WorkType</i>		r			w?		r-Test: Manager SHALL store the <i>WorkType</i> against the actual hours.
<i>all values</i>		r			w←		

8.9 NodeInfo

This table specifies the conformance requirements for Attributes and Elements for the **NodeInfo** Resource, whether it is linked to a JDF Root Node or a JDF Subnode.

Table 31: NodeInfo

From: [JDF1.5] Table 8-165

Referenced by: List of Resources. ResourceCmdParams

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>End</i>			w?			r?	To specify scheduling information the <i>@Start</i> and <i>@End</i> attributes SHALL be used. Other ICSs MAY define further requirements for these attributes.
<i>NodeStatus</i>		w←			r←		SHALL be written and evaluated if and only if JDF/ <i>@Status</i> = " <i>Part</i> ". r-Test: Workers SHALL NOT execute Node Partitions whose status is " <i>Completed</i> " or " <i>Aborted</i> ".
<i>Start</i>			w?			r?	
<i>BusinessInfo</i>		!w			r?		See [JDF1.5].
Employee		w←			r?		SHALL appear in the Root Node and MAY appear in Subnodes. The employee is an internal customer service representative. See Table 25: Employee – CSR.

8.10 Person

Table 32: Person

From: [JDF1.5] Table 10-34

Referenced by: **Contact**, Employee – Resource (Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>FamilyName</i>	w←			r←			If the family name is known, it SHALL be specified. SHALL be read when Person is in Response to a Resource Query for Resource Synchronization.
<i>FirstName</i>	w←			r←			If the first name is known, it SHALL be specified. SHALL be read when Person is in Response to a Resource Query for Resource Synchronization.
<i>DescriptiveName</i>	w			r←			The full name SHALL be specified in the @ <i>DescriptiveName</i> Attribute. SHALL be read when Person is in Response to a Resource Query for Resource Synchronization.
<i>ProductID</i>	w			r←			SHALL be read when Person is in Response to a Resource Query for Resource Synchronization.

9 Conformance Tables – JMF Messages

This ICS describes how JMF Messages are used to:

- Provide information about Device utilization and Job progress.
- Provide information about actual production from a Worker in a production Controller or Device to a Manager in an MIS.
- Synchronize @*JobPartID* values.

This ICS describes the conformance requirements for:

- Query Messages with Subscription Element to create a Persistent Channel for Status, Resource and NewJDF.
- Signal Messages for Status, Resource, Notification and NewJDF.

Note: the “w?” and “r?” values for Response Messages in Table 33 below emphasize that Query Elements with Subscription are an optional way to activate Signal Messages in Level 2.

For more details, see Section 11 “Conformance Rules – JMF Messages”.

Table 33: List of JMF Messages

From: [JDF1.5] Table 5-35

Message Type	Family	Manager			Worker			Description
		Level →	1	2	3	1	2	
NewJDF	Query		w			r←		SHALL be supported by Workers that can create new jobs without receiving a SubmitQueueEntry from the Manager. See Table 34: Query – NewJDF.
NewJDF	Response		r			w←		SHALL be supported by Workers that can create new jobs without receiving a SubmitQueueEntry from the Manager. See Table 36: Response – NewJDF.
Notification	Signal		w←			r?		If the Manager can detect the completion of production stages, it SHALL send a Signal Message after the completion of each stage. See Table 38: Signal – Notification.
Resource	Command		w			r		Command to Synchronize Resource information. See Table 43: Command – Resource (Synchronization).
Resource	Query		w			r		For Resource Consumption. See Table 45: Query – Resource (Consumption).
Resource	Query		w			r		Query to Synchronize Resource information. See The Worker requirement in this table applies only to a Worker that has a Paper Catalog with Worker specific IDs. Table 48: Query – Resource (Synchronization).
Resource	Response			w			r	Manager Response to Resource Signal over a Reliable Channel. This section contains the Manager Response to a Resource Signal transmitted over a Reliable Channel. Table 50: Response – Resource.
Resource	Response		r?			w		Response to Command to Synchronize Resource information. This section contains the Worker Response to the Resource

Message Type	Family	Manager			Worker			Description
		Level →	1	2	3	1	2	
								Command used by the Manager to push Resource synchronization information to the Worker. Table 51: Response – Resource (Push Synchronization).
Resource	Response		r?			w		Response to Query to Synchronize Resource information. See Table 53: Response – Resource (Pull Synchronization).
Resource	Response			r?			w?	A Response from: <ul style="list-style-type: none"> Command – Resource (NodeInfo) See Table 55: Response. Table 53: Response – Resource (Pull Synchronization)
Resource	Response		r			w		A Response from: <ul style="list-style-type: none"> Query – Resource (Consumption) See Table 55: Response.
Resource	Registration			w			r	See Table 56: Registration – Resource.
Resource	Response			r			w	A Response from a Registration Message. See Table 55: Response. Table 53: Response – Resource (Pull Synchronization)
Resource	Signal		r			w		See Table 58: Signal – Resource.
ResubmitQueueEntry	Command	w?			r?			See Table 47: Command – ResubmitQueueEntry in [JMF-ICS].
ResubmitQueueEntry	Response	r?				w?		See Table 49: Response – ResubmitQueueEntry in [JMF-ICS].
ReturnQueueEntry	Command	r			w			See Table 54: Command – ReturnQueueEntry in [JMF-ICS].
ReturnQueueEntry	Response	w			r			See Table 56: Response – ReturnQueueEntry in [JMF-ICS].
ReturnQueueEntry	Acknowledge	w?			r?			See Table 57: Acknowledge – ReturnQueueEntry in [JMF-ICS].
Status	Query		w			r		See Table 61: Query – Status.
Status	Response			w			r	See Table 63: Response – Status.
Status	Response		r			w		See Table 55: Response.

Message Type	Family	Manager			Worker			Description
		Level →	1	2	3	1	2	
Status	Signal		r			w		See Table 64: Signal – Status.
SubmitQueueEntry	Command	w			r			See Table 70: Command – SubmitQueueEntry in [JMF-ICS].
SubmitQueueEntry	Response	r			w			See Table 72: Response – SubmitQueueEntry SubmitQueueEntry in [JMF-ICS].
SubmitQueueEntry	Acknowledge	r			w?			See Table 73: Acknowledge – SubmitQueueEntry SubmitQueueEntry in [JMF-ICS].

9.1 NewJDF

9.1.1 Query – NewJDF

Table 34: Query – NewJDF
 From: [JDF1.5] Tables 5-2, 5-4, 5-44

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>		w			r		
<i>NewJDF</i>		w			r		
<i>xsi:type</i>		w			r?		
<i>QueryNewJDF</i>		w			r?		
NewJDFQuParams		w			r		See Table 35: NewJDFQuParams.

9.1.1.1 NewJDFQuParams

Table 35: NewJDFQuParams
 From: [JDF1.5] Table 5-45
 Referenced by: Query – NewJDF

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobID</i>		w			r		r-Test: Worker SHALL respond with information for the JDF Node with this @ <i>JobID</i> .

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobPartID</i>		w			r		r-Test: Worker SHALL respond with information for the JDF Node with this <i>@JobPartID</i> .

9.1.2 Response – NewJDF Query

Table 36: Response – NewJDF
 From: [JDF1.5] Tables 5-2, 5-5, 5-44

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>		r			w		
<i>NewJDF</i>		r			w		
<i>xsi:type</i>		r?			w		
<i>ResponseNewJDF</i>		r?			w		
IDInfo		r			w		See Table 37: IDInfo.

9.1.2.1 IDInfo

Table 37: IDInfo
 From: [JDF1.5] Table 5-48
 Referenced by: Response – NewJDF

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobID</i>		r?			w		The <i>@JobID</i> of the JDF Instance containing the new JDF Node.
<i>JobPartID</i>		r?			w		The <i>@JobPartID</i> of the new JDF Node.
<i>Type</i>		r?			w		
<i>Types</i>		r?			w←		SHALL be supplied if JDF Node has a <i>@Types</i> Attribute.

9.2 Notification

9.2.1 Signal – Notification

When a Job is completed and delivered to the customer, the various components are able to do housekeeping, archiving and cleanup of the Job’s assets. Because the final completion of the Job can be much later than the completion of the execution of a Process on a Device, all Devices need to be informed of the final completion of the Job when it happens. The *MIS* uses a JMF Signal Message of @Type= "Notification" for this purpose. See [JDF1.5] Section 5.8.7 Notification.

The Manager (*MIS*) sends the Notification Signal Message described in this section to all workflow components after the total completion of a Job. The Manager sends these Signal Messages to the Worker without the need for the Worker to subscribe or the Manager being able to accept Query Messages and subscriptions. The *MIS* SHALL send the Signal Messages for a Job to all Workers that the *MIS* has submitted the JDF Instance to.

Table 38: Signal – Notification
From: [JDF1.5] Tables 5-2, 5-6, 5-25

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>refID</i>		w←			r?		If a Query causes the creation of a Subscription, the Worker SHALL supply the ID of the Subscription Query.
<i>Type</i>		w			r		
<i>Notification</i>		w			r		
<i>xsi:type</i>		w			r?		
<i>SignalNotification</i>		w			r?		
Notification		w			r		See Table 39: Notification. Modification note: starting with JDF 1.5, this element changes from optional to zero or more occurrences.

9.2.1.1 Notification

Table 39: Notification
From: [JDF1.5] Table 3-36
Referenced by: Signal – Notification

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Class</i>		w			r		
<i>Event</i>		w←			r		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobID</i>		w			r		r-Test: Worker SHALL apply this notification to the specified @ <i>JobID</i> .
<i>Type</i>		w			r		
<i>Milestone</i>		w←			r		
Milestone		w←			r		SHALL be supplied if @ <i>Type</i> = " <i>Milestone</i> ". See Table 40: Milestone.

9.2.1.2 Milestone

Table 40: Milestone
From: [JDF1.5] Table C-19
Referenced by: Notification

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>MilestoneType</i>		w			r		r-Test: Worker SHALL mark Job as completed.
<i>JobCompletedSuccessfully</i>		w	w←		r		SHALL always be the last Milestone for a Job.
<i>PostPressCompleted</i>			w←			r?	
<i>PrePressCompleted</i>			w←			r?	
<i>PressCompleted</i>			w←			r?	
<i>ShippingCompleted</i>			w←			r?	

9.3 Resource

9.3.1 Command – Resource (NodeInfo)

Table 41: Command – Resource (NodeInfo)
From: [JDF1.5] Tables 5-2, 5-9, 5-51

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>			w			r	

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Resource</i>			w			r	
<i>xsi:type</i>			w			r?	
<i>CommandResource</i>			w			r?	
ResourceCmdParams			w			r	See Table 42: ResourceCmdParams (NodeInfo).

9.3.1.1 ResourceCmdParams (NodeInfo)

Table 42: ResourceCmdParams (NodeInfo)

From: [JDF1.5] Table 5-52

In: Command – Resource (NodeInfo)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobID</i>			w			r	
<i>JobPartID</i>			w			r	
<i>ResourceName</i>			w			r	
<i>NodeInfo</i>			w			r	This ICS only requires support for Commands to update NodeInfo Resources.
<i>UpdateMethod</i>							
<i>Incremental</i>			w			r	The Resource SHALL NOT be replaced, only the <i>@Start</i> and <i>@End</i> Attribute MAY be updated. r-Test: The new values for the <i>@Start</i> and <i>@End</i> scheduling attributes are shown in the Worker user interface.
Part			w←			r	SHALL be supplied if NodeInfo Resource is partitioned and only part of the Resource needs to be modified. r-Test: Only the selected Partition is updated. The non-selected Partitions remain unchanged.
NodeInfo			w			r	See Table 31: NodeInfo.

9.3.2 Command – Resource (Synchronization)

Table 43: Command – Resource (Synchronization)

From: [JDF1.5] Tables 5-2, 5-9, 5-51

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>		w			r		
<i>Resource</i>		w			r		
<i>xsi:type</i>		w			r?		
<i>CommandResource</i>		w			r?		
ResourceCmdParams		w			r		See Table 44: ResourceCmdParams (Synchronization).

9.3.2.1 ResourceCmdParams (Synchronization)

Table 44: ResourceCmdParams (Synchronization)

From: [JDF1.5] Table 5-52

Referenced by: Command – Resource (Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Exact</i>		w			r		
<i>false</i>		w			r		The Response Message SHALL NOT return the requested JDF Resource.
<i>JobID</i>		!w			r?		
<i>JobPartID</i>		!w			r?		
<i>QueueEntryID</i>		!w			r?		
<i>ResourceName</i>		w			w r		The Worker SHALL synchronize Resources by using @ResourceName. The domain ICS for the Worker specifies the types of Resources for which synchronization SHALL be supported. r-Test: The Worker SHALL respond according to the filters as specified in this Element.
<i>Contact</i>		w			r←		SHALL be supported by Worker Devices that have registered users/logins.
<i>Employee</i>		w			r		SHALL be supported by Worker Devices that are operated in attended mode.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Media</i>		w			r		SHALL be supported by Worker Devices that consume <i>Media/@MediaType = "Paper"</i> . Only Media of <i>@MediaType = "Paper"</i> SHALL be returned by the Manager.
<i>UpdateMethod</i>		w			r		r-Test: See <i>@ResourceName</i> .
<i>Incremental</i>		w←			r		The Resource has been modified at the sender side.
<i>Remove</i>		w←			r?		The Resource has been deleted at the sender side
Contact		w←			r		The Contact details that need to be supplied in JDF are the same as the details that need to be synchronized. This synchronization is from Manager to Worker only. See Table 22: Contact.
Employee		w←			r		This synchronization is from Manager to Worker only. See Table 27: Employee – Resource (Synchronization.
Media (Paper)		w←			r←		This synchronization is from Manager to Worker only. The Worker “read” requirement applies only to a Worker that consumes Media with <i>@MediaType = "Paper"</i> . See Table 28: Media – Resource (Synchronization.
Part		!w			r?		

9.3.3 Query – Resource (Consumption)

Table 45: Query – Resource (Consumption)

From: [JDF1.5] Tables 5-2, 5-4, 5-49

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>		w			r		
<i>Resource</i>		w			r		
<i>xsi:type</i>		w			r?		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>QueryResource</i>		w			r?		
ResourceQuParams		w			r		See Table 46: ResourceQuParams (Consumption)
Subscription		w			r		See Table 47: Subscription.

9.3.3.1 ResourceQuParams (Consumption)

Table 46: ResourceQuParams (Consumption)

From: [JDF1.5] Table 5-50

Referenced by: Query – Resource (Consumption)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Classes</i>		w			r		r-Test: The Worker SHALL respond or create a persistent channel according to the filters specified in this Element.
<i>Consumable</i>		w←			r←		The Manager requests all Consumable Resources for the Worker's Device. The domain ICS for the Worker specifies the types of Consumable Resources for which consumption SHALL be reported.
<i>Handling</i>		w←			r		The Manager requests all Handling Resources from the Worker's Device.
<i>Context</i>		w			r		
<i>Job</i>		w			r		
<i>Exact</i>		w?			r		r-Test: If <i>@Exact</i> = "false", the Signals SHALL NOT include a copy of the Resources. If <i>@Exact</i> = "true", the Signals SHALL include a complete copy of the Resources that meet the filter.
<i>false</i>		w←			r		
<i>true</i>		w←			r		
<i>JobID</i>		w?			r?		The Worker is NOT required to maintain Subscriptions for an individual <i>@JobID</i> , <i>@JobPartID</i> , <i>@QueueEntryID</i> or <i>@ResourceID</i> . Therefore the Manager SHALL create a Persistent Channel without a <i>@JobID</i> , <i>@JobPartID</i> , <i>@QueueEntryID</i> or <i>@ResourceID</i> . Note: The Attributes mentioned above are not

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							marked with a “! w” so that a Manager can Subscribe to an individual @JobID, @JobPartID, @QueueEntryID or @ResourceID and still be conformant.
JobPartID		w?			r?		See @JobID.
QueueEntryID		w?			r?		See @JobID.
ResourceID		w?			r?		See @JobID.
ResourceName		w?			r		r-Test: See @Classes.

9.3.3.2 Subscription

This Element causes the Worker to create a Persistent Channel and to send Signal Messages to a specified *URL*.

Table 47: Subscription

From: [JDF1.5] Table 5-12

Referenced by: Query – Resource (Consumption), Query – Status

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
ChannelMode			w			r	
FireAndForget			!w			r?	
Reliable			w			r	r-Test: Manager SHALL send a Response Element in the HTTP response to a Signal. Worker SHALL repeat Messages for which no Response Element was received.
MinDelayTime	w?			r			r-Test: Signals related to this Subscription are not sent any more frequently than this interval. Reliable signals SHALL NOT be retried more frequently than the interval specified by @MinDelayTime.
RepeatTime	w?			r			@RepeatTime SHALL NOT be less than @MinDelayTime. r-Test: Signals are generated at the interval specified (+/- 10%). From: Subscription - Subscription – Query.
RetryPolicy			w			r	
DiscardAtNextSignal			w←			r?	The Worker MAY only discard messages that were created as a result of the elapse of the @RepeatTime. The Worker SHALL repeat Messages (as for "RetryForever") created as a result of a Status transition as described in

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							Section 11.2 “When to Send a Status Signal”.
<i>RetryForever</i>			w←			r	" <i>RetryForever</i> " SHALL be interpreted as no less than 72 hours. The JMF retry SHALL survive reboot of the Worker, but results after a power failure of the Worker are implementation dependent.
<i>URL</i>	w			r			r-Test: Signals are delivered to the specified URL. From: Subscription – Query.

9.3.4 Query – Resource (Synchronization)

The Worker requirement in this table applies only to a Worker that has a Paper Catalog with Worker specific IDs.

Table 48: Query – Resource (Synchronization)

From: [JDF1.5] Tables 5-2, 5-4, 5-49

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>		w			r		
<i>Resource</i>		w			r		
<i>xsi:type</i>		w			r?		
<i>QueryResource</i>		w			r?		
<i>ResourceQuParams</i>		w			r		See Table 49: ResourceQuParams (Synchronization).

9.3.4.1 ResourceQuParams (Synchronization)

Table 49: ResourceQuParams (Synchronization)

From: [JDF1.5] Table 5-50

Referenced by: Query – Resource (Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Context</i>		w			r		
<i>Global</i>		w			r		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobID</i>		!w			r?		Note: The Worker “read” requirement in this table applies only to a Worker that has a Paper Catalog with Worker specific IDs.
<i>JobPartID</i>		!w			r?		
<i>QueueEntryID</i>		!w			r?		
<i>ResourceDetails</i>		w			r		
<i>Brief</i>		w←			r		
<i>Full</i>		w←			r		
<i>ResourceName</i>		w			r		Other ICSs MAY define further requirements for these attributes.
<i>Media</i>		w←			r		For paper media.
<i>Scope</i>		w			r		
<i>Allowed</i>		w←			r		
<i>Present</i>		w←			r		
<i>Part</i>		!w			r?		

9.3.5 Response – Resource (Signal)

This section contains the Manager Response to a Resource Signal transmitted over a Reliable Channel.

Table 50: Response – Resource (Signal)

From: [JDF1.5] Tables 5-2, 5-5, 5-51

Referenced by: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Acknowledged</i>			!w			r?	Responses to reliable Signals SHALL NOT be Acknowledged.

9.3.6 Response – Resource (Push Synchronization)

This section contains the Worker Response to the Resource Command used by the Manager to push Resource synchronization information to the Worker.

Table 51: Response – Resource (Push Synchronization)

From: [JDF1.5] Tables 5-2, 5-5, 5-49

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>		r			w		
<i>Resource</i>		r			w		
<i>xsi:type</i>		r?			w		
<i>ResponseResource</i>		r?			w		
<i>ResourceInfo</i>		r			w		The Response SHALL contain one ResourceInfo per Resource that is included in the Command. See Table 52: ResourceInfo (Push Synchronization).

9.3.6.1 ResourceInfo (Push Synchronization)

Table 52: ResourceInfo (Push Synchronization)

From: [JDF1.5] Table 5-53

Referenced by: Response – Resource (Push Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>CommandResult</i>		r			w		
<i>New</i>		r			w		
<i>Merged</i>		r			w		
<i>Rejected</i>		r			w		
<i>Removed</i>		r			w		
<i>Replaced</i>		r			w		
<i>ProductID</i>		r			w		
<i>ResourceName</i>		r			w		

9.3.7 Response – Resource (Pull Synchronization)

This section contains the Worker Response to the Resource Query used by the Manager to pull Resource synchronization information from the Worker. The Worker’s “write” requirement applies only to a Worker that has a Paper Catalog with Worker specific IDs.

Table 53: Response – Resource (Pull Synchronization)

From: [JDF1.5] Tables 5-2, 5-5, 5-49

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>		r			w		Note: The Worker write requirement in this table only applies to a Worker that has a Paper Catalog with Worker specific IDs.
<i>Resource</i>		r			w		
<i>xsi:type</i>		r?			w		
<i>ResponseResource</i>		r?			w		
ResourceInfo		r			w		See Table 54: ResourceInfo (Pull Synchronization).

9.3.7.1 ResourceInfo (Pull Synchronization)

Table 54: ResourceInfo (Pull Synchronization)

From: [JDF1.5] Table 5-53

Referenced by: Response – Resource (Pull Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Media		r			w←		This synchronization is from Manager to Worker and Worker to Manager. The Worker “write” requirement applies only to a Worker that has a Paper Catalog with Worker specific IDs. See Table 28: Media – Resource (Synchronization).

9.3.8 Response

In Table 55, the Producer is the producer of the Response and the Consumer is the consumer of the original Response. Thus the roles have been exchanged with respect to the original Command or Query tables.

Table 55: Response
From: [JDF1.5] Table 5-5
From: [JMF-ICS] Table 7 Response
Subclass of: Abstract Message

Name or Value	Producer			Consumer			Description
	Level →	1	2	3	1	2	
<i>Acknowledged</i>	w←				r?		The Producer SHALL supply this Attribute with a value of "true" when it will send an asynchronous Acknowledge later.
<i>refID</i>	w←				r?		See [JDF1.5].
<i>ReturnCode</i>	w←				r?		If an error occurs, a Producer SHALL write a nonzero value. See [JDF1.5]Appendix D for a list of Supported values. A Consumer SHALL be able to detect nonzero values.
<i>Subscribed</i>	w←				r?		The Producer SHALL supply this Attribute if the Query contained a Subscription (see Table 6 Query in [JMF-ICS]).
<i>true</i>	w←				r?		A Producer SHALL accept Subscriptions for Persistent Channels in Queries.

9.3.9 Registration – Resource

Table 56: Registration – Resource
From: [JDF1.5] Tables 5-2, 5-11, 5-51

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w				r	Required in [JDF1.5].
<i>Type</i>			w			r	
<i>Resource</i>			w			r	
<i>xsi:type</i>			w			r?	
<i>RegistrationResource</i>			w			r?	
<i>ResourceCmdParams</i>			w			r	See Table 57: ResourceCmdParams (Registration).

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Subscription			w			r	See [JMF-ICS].

9.3.9.1 ResourceCmdParams (Registration)

Table 57: ResourceCmdParams (Registration)

From: [JDF1.5] Table 5-52

Referenced by: Registration – Resource

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Exact</i>			w?			r	r-Test: See [JDF1.5].
<i>false</i>			w←			r	
<i>true</i>			w←			r	
<i>JobID</i>			w?			r	r-Test: Worker SHALL respond with information for the specified @ <i>JobID</i> .
<i>JobPartID</i>			w?			r	r-Test: Worker SHALL respond with information for the specified @ <i>JobPartID</i> .
<i>Part</i>			w?			r	r-Test: Worker SHALL respond with information for the specified Part. See [JDF1.5].

9.3.10 Signal – Resource

Table 58: Signal – Resource

From: [JDF1.5] Tables 5-2, 5-6, 5-51

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>ChannelMode</i>							
<i>FireAndForget</i>		r?	r		w		
<i>Reliable</i>			r		w?	w	The Worker SHALL resend the JMF if no Response Element was received. The Worker MAY retry when a Response with a non-zero @ <i>ReturnCode</i> was received.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>refID</i>		r?			w←		If the Subscription is created by a Query , the Worker SHALL supply the @ID of the subscription Query .
<i>Time</i>			r			w	Time at which the Message was generated. When a Signal is resent as part of a Reliable Channel, this attribute SHALL hold the same value as the first occurrence of the failed Signal.
<i>Type</i>		r			w		
<i>Resource</i>		r			w		
<i>xsi:type</i>		r?			w		
<i>SignalResource</i>		r?			w		
<i>ResourceInfo</i>		r			w		See Table 59: ResourceInfo (Signal).
<i>ResourceQuParams</i>		r			w		See Table 60: ResourceQuParams (Signal).

9.3.10.1 ResourceInfo (Signal)

Table 59: ResourceInfo (Signal)

From: [JDF1.5] Table 5-53

Referenced by: Signal – Resource

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ActualAmount</i>		r			w←		The current accumulated amount of the Resource that has been consumed or produced. SHALL NOT be specified if AmountPool is present. r-Test: If Manager does costing using Signals, the Manager SHALL record the Resource consumption in its database.
<i>DeviceID</i>		r			w←		Used to disambiguate the location of a Resource when a Controller is returning cumulative Resource information from its controlled Devices.
<i>ProductID</i>		r			w←		The Worker SHALL specify either this Attribute or the Resource Element, but not both. r-Test: The Manager SHALL identify the Resource using the @ProductID.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
AmountPool		r			w←		The current accumulated amount of the Resource that has been consumed per Part. SHALL be specified if a Part is being executed. r-Test: If Manager does costing using Signals the Manager SHALL record the Resource consumption in its database. See [JDF1.5].
Comment		r?			w?		See Table 6: Comment – Worker Created.
MISDetails		r?			w?		See Table 30: MISDetails.
Resource		r			w←		The Worker SHALL specify either this Element or the @ProductID Attribute, but not both. See [JDF1.5].

9.3.10.2 ResourceQuParams (Signal)

Table 60: ResourceQuParams (Signal)

From: [JDF1.5] Tables 5-50

Referenced by: Signal – Resource

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
JobID		r			w←		If the Resource was consumed in the context of a Job, the @JobID SHALL refer to the job the Resource Signal was sent for. r-Test: The Manager SHALL record the Resource consumption against the correct job.
JobPartID		r			w←		If the Resource was consumed in the context of a Job, the @JobPartID SHALL refer to the job the Resource Signal was sent for.
QueueEntryID		r?			w←		If the Resource was consumed in the context of a Job, the @QueueEntryID SHALL refer to the Queue Entry the Resource Signal was sent for.
Part		r			w←		

9.4 Status

9.4.1 Query – Status

Table 61: Query – Status
From: [JDF1.5] Tables 5-2, 5-4, 5-58

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>Type</i>		w			r		
<i>Status</i>		w			r		
<i>xsi:type</i>		w			r?		
<i>QueryStatus</i>		w			r?		
StatusQuParams		w			r		See Table 62: StatusQuParams.
Subscription		w			r		See Table 47: Subscription.

9.4.1.1 StatusQuParams

Table 62: StatusQuParams
From: [JDF1.5] Table 5-59
Referenced by: Query – Status

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>DeviceDetails</i>		w			r		r-Test: See [JDF1.5].
<i>None</i>		w←			r		
<i>Brief</i>		w←			r		
<i>Details</i>		w←			r		
<i>Modules</i>		w←			r		
<i>all remaining values</i>		w?			r?		
<i>EmployeeInfo</i>		w←			r?	r	The Product-Sector ICSs can specify stronger requirements. Employee details are essential for <i>MIS</i> . It is therefore highly recommended to include Employee Elements for Devices that have one or more operators.
<i>JobDetails</i>		w			r		r-Test: Worker SHALL respond or create a persistent channel with the value supplied.
<i>Brief</i>		w			r		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobID</i>		w?			r?		The Worker is NOT required to maintain Subscriptions for an individual @ <i>JobID</i> , @ <i>JobPartID</i> , Therefore the Manager SHALL send create a Persistent Channel without a @ <i>JobID</i> , and/or @ <i>JobPartID</i> , Note: The Attributes mentioned above are not marked with a “!w” so that a Manager can Subscribe to an individual @ <i>JobID</i> or @ <i>JobPartID</i> and still be conformant.
<i>JobPartID</i>		w?			r?		See @ <i>JobID</i>
<i>QueueInfo</i>		w			r		r-Test: The Worker SHALL NOT return the Queue.
<i>false</i>		w			r		
<i>true</i>		!w			r?		The Manager SHALL NOT request a Queue, because there is no way to restrict the size of the returned Queue.

9.4.2 Response – Status

This section contains the Manager Response to a Status Signal transmitted over a Reliable Channel.

Table 63: Response – Status

From: [JDF1.5] Tables 5-2, 5-5, 5-58

Referenced by: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Acknowledged</i>			!w			r?	Responses to reliable Signals SHALL NOT be Acknowledged.

9.4.3 Signal – Status

Table 64: Signal – Status

From: [JDF1.5] Tables 5-2, 5-6, 5-58

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ID</i>		w			r		Required in [JDF1.5].
<i>ChannelMode</i>			r			w	

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>FireAndForget</i>		r?	r		w?	w←	
<i>Reliable</i>			r		w?	w←	
<i>refID</i>		r?			w←		If the Subscription was created by a Query Message, the Worker SHALL supply the @ID of the subscription Query.
<i>Time</i>			r			w	Time at which the Message was generated. When a Signal is resent as part of a Reliable Channel, this Attribute SHALL hold the same value as the first occurrence of the failed Signal.
<i>Type</i>		r			w		
<i>Status</i>		r			w		
<i>xsi:type</i>		r?			w		
<i>SignalStatus</i>		r?			w		
<i>DeviceInfo</i>		r			w		See Table 65: DeviceInfo.

9.4.3.1 DeviceInfo

Table 65: DeviceInfo

From: [JDF1.5] Table 5-60

Referenced by: Signal – Status

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>DeviceID</i>		r			w		r-Test: Manager SHALL identify Device using the @DeviceID.
<i>DeviceOperationMode</i>		r			w←		The Worker SHALL supply this Attribute for an attended Device. The Worker MAY supply it for an unattended Device. r-Test: Manager SHALL create costing only from Messages with @DeviceOperationMode = "Productive".
<i>all values</i>		r			w←		
<i>DeviceStatus</i>		r			w		r-Test: Manager SHALL update the displayed status of this Device.
<i>all values</i>		r			w←		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ProductionCounter</i>		r?			w←		If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker SHALL supply this Attribute.
<i>Speed</i>		r?			w←		If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker SHALL supply this Attribute.
<i>TotalProductionCounter</i>		r?			w?		Counter since birth of the Machine – probably the best value for calculating interval quantities. If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker SHALL supply this Attribute.
Activity		r?			w?		See Table 12: Activity,
Comment		r?			w?		For comments that are not within a Job context. See Table 6: Comment – Worker Created.
Employee		r			w?	w←	If a Device requires an operator for normal operation, it SHALL supply an Employee [contains(@Roles,"Operator")]. For unattended Devices, its Worker SHALL NOT supply an Employee Element. See Table 26: Employee – Operator.
JobPhase		r			w←		The Worker SHALL supply one JobPhase Element for each Job on the Device that is Active or whose @Status has just become "Completed" or "Aborted". The Worker SHALL NOT supply any JobPhase Elements during a non-productive time (e.g. maintenance or lack of Jobs) except to convey information about Jobs whose @Status has just become "Completed", "Aborted" or "Suspended". See Table 66: JobPhase.
ModuleStatus		r?			w?		A Worker MAY supply ModuleStatus Elements to show the status of individual modules of its Device. Examples of modules are: printing units of an offset press, or individual Machines for a Device that supports multiple physical Machines. See Table 68: ModuleStatus.

9.4.3.2 JobPhase

Table 66: JobPhase

From: [JDF1.5] Tables 5-61

Referenced by: DeviceInfo

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Amount</i>		r?			w←		The cumulative amount produced since the JDF Node started executing. If a Worker can distinguish between good and waste, it SHALL supply the waste amount in <i>@Waste</i> and then exclude the waste amount from <i>@Amount</i> . If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker SHALL supply this Attribute.
<i>JobID</i>		r			w←		The <i>@JobID</i> of the Node that is executing. <i>@JobID</i> SHALL be provided if known. r-Test: Manager SHALL update status of this Job only.
<i>JobPartID</i>		r			w←		The <i>@JobPartID</i> of the Node that is executing. <i>@JobPartID</i> SHALL be provided if known. r-Test: Manager SHALL update status of this Job part only.
<i>PhaseAmount</i>		r?			w?	w←	The Amount produced during this JobPhase. If a Worker can distinguish between good and waste, it SHALL supply the waste amount in <i>@PhaseWaste</i> and then exclude the waste amount from <i>@PhaseAmount</i> . If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker SHALL supply this Attribute.
<i>PhaseStartTime</i>		r?			w?	w	Start time of this JobPhase.
<i>PhaseWaste</i>		r?			w?	w←	The Amount of Waste produced during this JobPhase. If a Worker can distinguish between good and waste, it SHALL supply the waste amount in <i>@PhaseWaste</i> and then exclude the waste amount from <i>@PhaseAmount</i> . If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker SHALL supply this Attribute.
<i>StartTime</i>		r?			w?	w	The date and time the Node started executing.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Status		r			w		<p>r-Test: Manager SHALL update displayed status of this JobPhase.</p> <p>For values, see Table 67: JobPhase/@Status and PhaseTime/@Status.</p>
TotalAmount		r?			w?		The Amount to be produced.
Waste		r?			w←		<p>The cumulative amount of waste produced since the Node started executing.</p> <p>If a Worker can distinguish between good and waste, it SHALL supply the waste amount in @Waste and then exclude the waste amount from @Amount.</p> <p>If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker SHALL supply this Attribute.</p>
Activity		r?			w?		See Table 12: Activity,
Comment		r?			w?		See Table 6: Comment – Worker Created.
MISDetails		r?			w?		See Table 30: MISDetails.
ModuleStatus		r?			w?		<p>A Worker MAY supply ModuleStatus Elements to show the status of individual modules used for this JobPhase.</p> <p>See Table 68: ModuleStatus.</p>
Part		r?			w←		<p>Identification of the Part worked on.</p> <p>If the output Resource of the Process is Partitioned, the Worker SHALL supply at least one Part. Each Part SHALL have all levels of Partitioning for the JDF Node.</p> <p>The receiving Manager MAY consolidate the information from multiple Partitions into a single Partition, e.g. it may consolidate the information on a per Separation to a per Sheet.</p> <p>Other ICS's specify the Attributes for the Part Element.</p> <p>See [JDF1.5].</p>

9.4.3.3 JobPhase/@Status and PhaseTime/@Status

Table 67: JobPhase/@Status and PhaseTime/@Status

From: [JDF1.5] Tables 5-61, 3-37

Referenced by: JobPhase, PhaseTime

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Setup</i>		r			w←		A Worker SHALL supply this value during the setup phase for a Device that has such a phase for each Job.
<i>InProgress</i>		r			w←		
<i>Cleanup</i>		r			w←		A Worker SHALL supply this value during the cleanup phase for a Device that has such a phase for each Job.
<i>Stopped</i>		r			w←		
<i>Completed</i>		r			w←		JobPhase/@Status only.
<i>Aborted</i>		r			w←		JobPhase/@Status only.
<i>Suspended</i>		r			w←		
<i>all remaining values</i>		r			w?		.

9.4.3.4 ModuleStatus

Here are two options for using Modules. The second option SHOULD be used.

- A Status Signal Message is emitted on the change of status of each module. In this configuration ModulePhase/@DeviceStatus MAY be different from JobPhase/@Status.
- A separate JobPhase is included in the Signal for each combination of synchronized Modules, e.g. one for Ripping and one for Print + Stitch. With this option the ModulePhase/@DeviceStatus is always the same as JobPhase/@Status.

Table 68: ModuleStatus

From: [JDF1.5] Table 5-62

Referenced by: DeviceInfo, JobPhase

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>DeviceStatus</i>		r			w		r-Test: Manager SHALL update the displayed status of this module.
<i>all values</i>		r			w←		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ModuleID</i>		r			w←		At least one of @ <i>ModuleID</i> or @ <i>ModuleIndex</i> SHALL be specified. r-Test: Manager SHALL update the displayed status of this module.
<i>ModuleIndex</i>		r			w←		Zero-based. At least one of @ <i>ModuleID</i> or @ <i>ModuleIndex</i> SHALL be specified. r-Test: Manager SHALL update the displayed status of this module.

10 Conformance Rules – Job Submission

In the normal case, the *MIS* creates a Print Job and submits it to the production Device. In some cases, a production Device, such as a prepress Device, creates a Print Job. In this case, the customer submits a content file for a Job that the *MIS* has not yet created. In other cases, the Device splits an existing Job into different production Jobs. In these cases where the *MIS* doesn't initially create a Job, the *Device Worker* (the Worker part of a Device – see the Glossary section of [JDF1.5]) SHALL ask the *MIS Manager* to create a Job and submit it to the Device Worker.

10.1 JDF Instance Structure

JDF Instances consist of Product, Process Group, and Process Nodes. A Product Node describes the Final Product the Customer will receive. The JDF Product Intent Resources define the characteristics of this Final Product.

JDF Product Nodes SHALL contain Product Intent Resources. In other words, if the Intent cannot be described or is not available, the Root Node of the JDF Instance SHALL be a Process or a Process Group. Product Intent Resources SHALL only describe Product characteristics that the Customer supplies. Product Intent Resources SHALL describe the Customer's view of a Job. Intent Resources SHALL NOT describe details of the production Process of which the Customer has no knowledge (e.g. the individual printed sheets that make up the text of a brochure).

11 Conformance Rules – JMF Messages

11.1 Goals

Within the scope of this ICS, the description is limited to the use of JMF Messages for the following main goals:

1. Job Tracking
2. Job Costing (limited)
3. Device monitoring and (utilization) analysis
4. Material consumption

11.1.1 Job Tracking

The *MIS* generates the Job tracking information from the combination of the Attribute Values in the *DeviceInfo* and *JobPhase* Elements.

11.1.2 Job Costing

The *MIS* MAY generate the Job costing information from the combination of the Attribute Values in the *DeviceInfo* and *JobPhase* Elements. However with Level 2 of this ICS, there is no guarantee that the *MIS* will

be provided with a complete set of Messages. The communication between a Device and the *MIS* may be down for a period of time, for whatever reason. In such a situation, a Device MAY retry sending the Messages.

With Level 3 of this ICS both the Manager and the Worker SHALL support reliable channels by adding `@ChannelMode = "Reliable"` in the `Subscription`. In Reliable mode the Worker SHALL resend the JMF if no Response Element is received. The Worker MAY retry when a Response with a non-zero `@ReturnCode` is received. The order of the Messages SHALL be maintained and sent as separate Signal elements so to maintain the correct `Signal/@Time` value of each Signal. Multiple Signal elements MAY be combined in a single JMF.

After a Device has completed a Job and returned the JDF Instance to the *MIS*, the *MIS* MAY interpret the `AuditPool` information in the JDF Instance to create, update and/or modify the costing information that was gathered from previous JMF Messages. The *MIS* may use business rules to limit updates and/or modifications to costing information.

11.1.3 Device Monitoring and Analysis

The *MIS* SHALL generate the Device monitoring and analysis information from a combination of the Attribute Values in the `DeviceInfo` and `JobPhase` Elements.

Because non-productive time is not related any particular production Job, non-productive time will not appear in the `AuditPool` information of any JDF Instances returned to the *MIS*. Therefore the *MIS* has to rely solely of the information retrieved from JMF Messages to create complete Device monitoring and analysis information.

11.1.4 Resource Consumption

A Device that, during the execution of a Node, consumes Resources whose `@Class = "Consumable"` SHALL notify the *MIS* by sending a JMF Signal Resource Message. See Table 58: Signal – Resource.

11.2 When to Send a Status Signal

A Device SHALL send a JMF Status Signal to the *MIS* each time one of the Attributes of the previous Status Signal has changed. These changes include (but are not limited to) a change in the:

- Status of a Job,
- Part of the Job that is being produced (either identified by `@JobPartID` or potentially by Partition Key),
- Employee(s) operating the Device,

If a Device sends Status Signal Messages in response to a Subscription, the Device SHALL honor the `@RepeatTime` Attribute. It is up to the *MIS* to decide how to handle Status Signal Messages that do not indicate a change in status and/or Job. The *MIS* MAY merge the data from the intermediate Status Signal Messages or ignore them all together.

The Status Signal Message indicates to the *MIS* the moment in time when a transition takes place, like the indication of the start of a new status. Please note that the `JobPhase/@PhaseAmount` and `JobPhase/@PhaseWaste` Attributes indicate the amount produced since the start of the phase. Special attention is required for the transition between a `JobPhase` with production Amounts to a `JobPhase` without productions Amounts, such as from `"Running"` to `"Stopped"`. For these transitions the Device SHALL generate two Status Signal Messages. The first one is a copy of the previous Signal Messages, except for the values of `JobPhase/@PhaseAmount` and `JobPhase/@PhaseWaste`. In the second one, the Attributes are updated to show the new status of the Device. This will give *MIS* immediate feedback about the produced amounts in the closed phase.

11.2.1.1 Financial Period Costing / Analysis

The *MIS* can solely rely on the reliable JMF Status Signal Messages (in Level 3) to produce complete and accurate costing of a Job.

12 Conformance Rules – Job Completion

In a complete JDF workflow, the Manager that submits a JDF Instance to a Queue will get back the JDF Instance when the processing of the JDF Instance on the Device has completed. The returned JDF Instance SHALL contain information generated by the production Device. This information consists of:

- AuditPool Element about the actual processing at the Device.
- Updated ResourceLink information (for example amounts).
- Information required by subsequent Processes (for example **Preview** Resources).

The *MIS* can use this information to update the status of the Job and to provide updated Resource information to the next production Process for the Job.

12.1 AuditPool in JDF Elements Returned to the MIS

The MIS MAY generate the Job costing information from the combination of the Attribute Values in the *DeviceInfo* and *JobPhase* Elements of JMF Status Signals. However, in Level 2 there is no guarantee that the Device will provide the *MIS* with a complete set of Messages. For example, the communication between a Device and the *MIS* may be down for a period of time, for whatever reason. Therefore, the Device SHALL supply a complete AuditPool as defined in Section 6.5 “List of Audit Elements” of this ICS.

The MIS MAY interpret the AuditPool information in the JDF either to create the costing information or to update and/or modify the costing information that the MIS gathered from JMF Messages.

12.1.1 When to Close Audits

The Device SHALL close an Audit (*PhaseTime*) and start a new one each time one of the Attributes of the previous Audit has changed. These changes include (but are not limited to) a change in the:

- Status of a Job,
- Part of the Job that is being produced (either identified by *@JobPartID* or by Partition Key),
- Employee(s) operating the Device,

13 References

13.1 Normative References

- [Base-ICS] Base ICS, Version 1.5, published April 2015. Available at: <http://www.cip4.org>.
- [JMF-ICS] JMF ICS, Version 1.5, published April 2015. Available at: <http://www.cip4.org>.
- [JDF1.5] JDF Specification, Version 1.5, published December 31, 2013. Available at: <http://www.cip4.org>
- [MIS-ICS] MIS ICS, Version 1.5 (i.e. this document), published April 2015. Available at: <http://www.cip4.org>.

Appendix A: Changes Between Versions 1.4 and 1.5

Apart from some minor editorial changes the following more fundamental changes have been made to the MIS ICS Version 1.5 as compared to Version 1.4:

Table 69: Changes from MIS ICS 1.4

Location	Description
1. Table 4: JDF Node	Deleted <i>@Activation</i>
2. Section 6.5.1 Created	Added this section.
3. Section 6.5.2 Modified	Added this section.
4. Table 11: PhaseTime	Added <i>Activity</i> .
5. Section 6.5.4 Activity	Added this section.
6. Table 13: ModulePhase	Added <i>@ModuleType</i> , which is required in [JDF1.4] and optional in [JDF1.5]
7. Table 14: ProcessRun	Deleted <i>@ReturnTime</i> .
8. Table 21: Component	Added "Insert" to <i>@ProductType</i> .
9. Table 24: Device	Added <i>@DeviceClass</i> .
10. Table 27: Employee – Resource (Synchronization)	Added <i>@Grade</i> , <i>@ISOPaperSubstrate</i> and <i>@MediaQuality</i> .
11. Table 33: List of JMF Messages	Change <i>wr</i> values for <i>NewJDF</i> .
12. Table 33: List of JMF Messages	Added <i>Resource Response</i> and changed <i>rw</i> for 4 th <i>Resource Response</i> row.
13. Table 33: List of JMF Messages	Added <i>ResubmitQueueEntry</i> (2 rows), <i>ReturnQueueEntry</i> (3 rows) and <i>SubmitQueueEntry</i> (3 rows),
14. Table 46: ResourceQuParams (Consumption)	Added <i>@Context</i> .
15. Table 49: ResourceQuParams (Synchronization)	Added <i>@Context</i> .
16. Table 59: ResourceInfo (Signal)	Added <i>@DeviceID</i> and <i>Comment</i> .
17. Table 65: DeviceInfo	Added <i>Activity</i> and <i>Comment</i> .
18. Table 66: JobPhase	Added <i>Activity</i> and <i>Comment</i> .
19. Table 68: ModuleStatus	Deleted Employee .

CIP4 THANKS ITS PARTNER LEVEL MEMBERS

