

MIS ICS

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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 [JDF1.4a].



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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 and specified in a separate [ProductDesc-ICS],
- 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.

2 Glossary

This section defines terminology used throughout this document. References to other documents are indicated with square brackets, e.g. [JDF1.4a]. For most terms, see the Glossary section in [JDF1.4a] and [Base-ICS].

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

Table 1: Glossary

Term	Definition
<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 [JDF1.4a] Section 3.3.2.1 "Use of the Types Attribute in Process Group Nodes – Gray Boxes", and [JDF1.4a] Table 3-5 "JDF Node", row for <i>Types</i> Attribute.</p>

3 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 2, an *MIS* MUST conform to the Manager part and a Controller or Device MUST conform to the Worker part of the ICSs and levels specified in Table 2 below.

Table 2: Conformance Levels

Level of this ICS	[Base-ICS]	[JMF-ICS]	[MIS-ICS]	Description
1	1	-	-	This combination of ICS levels includes: <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	This combination of ICS levels includes: <ul style="list-style-type: none"> • All the functionality of the previous combination of ICS levels; • Job Submission using the JMF SubmitQueueEntry Message; • <i>JobPartID</i> 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. This combination of levels does require the Worker to implement a HTTP server.
3	2	1	2	This combination of ICS levels includes: <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.

4 Conformance Tables – JDF Instances

This ICS specifies the JDF Elements that are not specific to any one of prepress, press or postpress. 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.

4.1 JDF Node

This section specifies conformance requirements for a JDF Instance. 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 MUST conform to these conformance requirements. When a Worker returns a JDF Instance to a Manager, all JDF Nodes contained within this JDF Instance MUST conform to these conformance requirements.

If the JDF Node is a *Gray Box*, it MUST NOT be spawned by Partition. See [JDF 1.4] Section 4.4.3 “Case 3: Parallel Spawning and Merging of Partitioned Resources”.

For more details, see Section 8 “Conformance Rules – Job Submission”.

Table 3 specifies the Attributes and Elements for a JDF Node, whether it is a Root Node or a Subnode. Some Attributes and Elements are specified only for a Root Node and are so noted in the first line of the Description.

Table 3: JDF Node
Root Node of: JDF Instance
Referenced by: JDF Node, JobPhase

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>Activation</i>			r?			w←	MUST be set if the JDF Instance is a snapshot in a JobPhase.
<i>Informative</i>			r			w←	MUST be set to "Informative" if the JDF Instance is a snapshot in a JobPhase.
<i>Category</i>	w←			r?			When the Node is a <i>Gray Box</i> defined by an ICS, the Manager MUST 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?			
<i>ICSVersions</i>	w←			r?			MUST appear in the Root Node and MAY appear in Subnodes. For example "Base_L1-1.4 MIS_L1-1.4".
<i>MIS_L1-1.4</i>	w			r?			Specifies that the JDF Instance conforms to [MIS-ICS] level 1.
<i>MIS_L2-1.4</i>		w		r?			Specifies that the JDF Instance conforms to [MIS-ICS] level 2.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>MIS_L3-1.4</i>			w	r?			Specifies that the JDF Instance conforms to [MIS-ICS] level 3.
<i>ProjectID</i>	w?			r?			MUST NOT be specified in Subnodes. An ID assigned by the MIS for grouping multiple Jobs into one "Customer Order".
<i>RelatedJobID</i>	w←			r?			MUST be present if <i>RelatedJobPartID</i> is present. MUST be present if the Node parameters are the same as the Node parameters of the <i>RelatedJobID</i> .
<i>RelatedJobPartID</i>	w?			r?			MAY be present if the Node parameters are the same as the Node parameters of the <i>RelatedJobPartID</i> .
<i>Type</i>	w			r			Worker conformance is further defined in domain ICSs.
<i>Product</i>	w←			r?			Specifies that this Node describes a final or Partial Product and it MAY have nested JDF Subnodes.
<i>ProcessGroup</i>	w←			r?			Specifies that this Node describes multiple Processes and that it may take several Devices to process them, possibly with spawning.
<i>Combined</i>	w←			r?			Specifies that this Node describes multiple Processes (specified by the <i>Types</i> Attribute).
<i><Process Name></i>	w←			r?			Specifies that this Node describes a single Process (specified by the value of this Attribute).
<i>Types</i>	w←			r?			MUST be specified if <i>Type</i> ="Combined".
<i>all values</i>	w?			r?			The Product-Sector ICSs specify particular values.
<i>Comment</i>	w?			r?			The Manager MAY supply one or more Comment Elements with information for the Worker. See Table 4: Comment – Manager Created.
<i>Comment</i>	r?			w?			The Worker MAY supply one or more additional Comment Elements with information for the Manager. See Table 5: Comment – Worker Created.
<i>AuditPool</i>	w r?	wr		r? w			r-Test: Manager MUST record actual processing time retrieved from PhaseTime Elements against the Job. See Table 7: List of Audit Elements and see [Base-ICS].
<i>JDF</i>	w?			r			Child JDF Nodes. r-Test: Worker MUST be able to read and

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							process child Nodes. See Table 3: JDF Node.
ResourcePool	w←			r			The Product-Sector ICSs specify particular Resource children of this Element. See Table 6: List of Resources.

4.2 Comment – Manager Created

Table 4: Comment – Manager Created

Referenced by: JDF Node

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>	w			r			r-Test: Worker MUST read and display the content of the Comment if it has a graphical display.
<i>Description</i>	w←			r?			For a comment that describes the Node. It MUST only be in a JDF Subnode.
<i>Instruction</i>	w←			r?			For instructions to the operator. It MUST 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 MUST only be in a JDF Root Node or in the AncestorPool/Ancestor of a spawned Job.
<content of Element>	w			r←			The Worker MUST retain any white space and newline characters in the content of the Element when rendering it. Worker MUST read and display the comment if it has a graphical display.

4.3 Comment – Worker Created

Table 5: Comment – Worker Created
Referenced by: JDF Node, PhaseTime

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>AgentName</i>	w			r?			
<i>AgentVersion</i>	w			r?			
<i>Name</i>	r			w			r-Test: Manager MUST 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> .
<content of Element>	r			w			The Manager MUST retain any white space and newline characters in the content of the Element when rendering it.

4.4 List of Resources

Table 6: List of Resources

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
Component	w?			r?			Conformance is further defined in domain ICSs. See Table 17: Component.
ConsumableResource	w?			r?			Conformance is further defined in domain ICSs. See Table 12: Abstract Consumable Resource.
CustomerInfo	w←			r?			The Root Node MUST have a CustomerInfo Resource linked as an Input. Other Nodes in the same JDF Instance MAY link to the same CustomerInfo Resource but MUST NOT link to a different CustomerInfo Resource. See Table 19: CustomerInfo.
NodeInfo	w← r			r w←			The Root Node MUST have a NodeInfo Resource linked as an Input. Other Nodes MAY be required to have a NodeInfo Resource linked as an Input. See Table 27: NodeInfo.

4.5 List of Audit Elements

When a Worker returns a JDF Instance to its Manager, the Worker **MUST** 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 **MUST** add information into the AuditPOOL of the Process Node that was executed.

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

Table 7: List of Audit Elements

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
PhaseTime		r			w		See Table 8: PhaseTime.
ProcessRun	r?			w			MUST 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 10: ProcessRun.
ResourceAudit		r			w←		The domain ICS for the Worker specifies the types of Consumable Resources for which consumption MUST be reported and for which this Element MUST be supplied. See Table 11: ResourceAudit.

4.5.1 PhaseTime

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

In a change to JDF version 1.3, [JDF1.4a] only mandates a single method to supply Audit Elements for Devices with Modules, namely Audit Elements with overlapping PhaseTime Elements.

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 8: PhaseTime

Referenced by: List of Audit Elements

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>End</i>		r			w		r-Test: The Manager MUST create Job costing based on the PhaseTime Elements, calculating the duration specified by <i>Start</i> and <i>End</i> .
<i>ID</i>		r			w		Any Audit supplied by a Worker MUST have an <i>ID</i> Attribute whose value MUST 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.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							r-Test: Manager MUST NOT create costing data from the same Audit more than once.
<i>refID</i>		r			w←		<p>Once an Audit is supplied, it MUST 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 MUST 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 MUST 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		r-Test: See <i>End</i> .
<i>Status</i>		r			w		<p>r-Test: The Manager MUST 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</i> = “<i>Suspended</i>” MUST be excluded from the costing. The duration for <i>Status</i> = “<i>Stopped</i>” MAY be excluded from the costing.</p> <p>For values, see Table 62: JobPhase/@Status and PhaseTime/@Status.</p>
<i>Comment</i>		r?			w?		See Table 5: Comment – Worker Created.
<i>Device</i>		r			w?		See Table 20: Device.
<i>Employee</i>		r?			w?		See Table 22: Employee – Operator.
<i>MISDetails</i>		r			w←		<p>MUST be supplied if known to the Worker, either via the NodeInfo or by operator input.</p> <p>See Table 26: MISDetails.</p>
<i>ModulePhase</i>		r?			w?		See Table 9: ModulePhase.
<i>Part</i>		r?			w←		<p>If this Audit Element doesn’t describe all parts of a Process, then the Worker MUST supply this Part Element and it MUST specify the parts of a Process that this Audit Element belongs to.</p> <p>See [JDF1.4a].</p>
<i>ResourceLink (Output)</i>		r?			w?		<p>This ResourceLink is a copy of the ResourceLink that references the Resources that were produced during the execution of this PhaseTime.</p> <p>Resource production SHOULD be recorded using ResourceAudit Elements (Table 11).</p> <p>See Table 13 (as Abstract ResourceLink) and see [Base-ICS].</p>

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
ResourceLink (Input)		r?			w?		<p>This ResourceLink is a copy of the ResourceLink that references the Resources that were consumed during the execution of this PhaseTime.</p> <p>Resource consumption MUST be recorded using ResourceAudit Elements. See Table 11: ResourceAudit.</p> <p>See Table 13 (as Abstract ResourceLink).</p>

4.5.2 ModulePhase

See Section 4.5.1 PhaseTime above for a discussion about overlapping PhaseTime Elements versus overlapping ModulePhase Elements.

Table 9: ModulePhase
Referenced by: PhaseTime

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
DeviceStatus		r?			w←		

4.5.3 ProcessRun

Table 10: ProcessRun
Referenced by: List of Audit Elements

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Duration		r?			w		
End		r?			w		
EndStatus		r?			w		
<i>all values</i>		r?			w←		
ReturnTime		r?			w		
Start		r?			w		
Part		r?			w←		<p>If this Audit Element doesn't describe all parts of a Process, then the Worker MUST supply this Part Element and it MUST specify the parts of a Process that this Audit Element belongs to.</p> <p>See [JDF1.4a].</p>

4.5.4 ResourceAudit

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

Table 11: ResourceAudit
Referenced by: List of Audit Elements

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>ID</i>		r			w		Any Audit supplied by a Worker MUST have an <i>ID</i> Attribute whose value MUST 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 MUST NOT create costing data from the same Audit more than once.
<i>refID</i>		r			w←		Once an Audit is supplied, it MUST 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 MUST 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 MUST 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 MUST NOT create costing entries for ResourceAudit Elements with <i>Reason</i> = "PlanChange".
<i>ProcessResult</i>		r			w		
<i>all remaining values</i>		r			w←		
Part		r?			w←		MUST be supplied if a Part was executed. See [JDF1.4a].
ResourceLink		r			w		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 13 (as Abstract ResourceLink) and see [Base-ICS].

5 Conformance Tables – Abstract Resources

5.1 Abstract Consumable Resource

Table 12: Abstract Consumable Resource

Referenced by: List of Resources

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>DescriptiveName</i>	w			r←			r-Test: If the Worker identifies this Consumable Resource to the operator, the Worker MUST display this value.
<i>LotControl</i>			w?			r←	Domain ICS documents specify for which type of Resource lot control is required. r-Test: If <i>LotControl</i> = "Controlled", the appropriate Lot Elements MUST 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			MUST 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 MUST include this value in the display.

5.2 Abstract ResourceLink and ResourceLink/AmountPool/PartAmount

Table 13: Abstract ResourceLink and ResourceLink/AmountPool/PartAmount

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

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>ActualAmount</i>		r			w		The Amount of the Resource that was produced or consumed during this PhaseTime. MUST NOT be supplied if AmountPool exists. r-Test: The Manager MUST create costing entries for quantity specified in this Attribute.
<i>Lot</i>			r			w←	MUST be specified if Resource is lot controlled. MUST NOT be supplied if AmountPool

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							exists. r-Test: The Manager must create costing entries based on the specified LOT. See Table 15: Lot.
AmountPool		r?			w←		MUST NOT be specified in PartAmount. See Table 14: AmountPool (from Abstract ResourceLink).

5.2.1 AmountPool

Table 14: AmountPool
Referenced by: Abstract ResourceLink

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
PartAmount		r			w		See Table 13 (as ResourceLink/AmountPool/PartAmount).

5.2.2 Lot

Table 15: Lot
Referenced by: Abstract ResourceLink and ResourceLink/AmountPool/PartAmount

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ActualAmount</i>			r			w	r-Test: see <i>ActualAmount</i> in Table 13.
<i>LotID</i>			r			w	r-Test: The Manager must create costing entries based on the specified LOT.
<i>Consumption</i>			r?			w	
<i>Full</i>			r?			w←	
<i>Partial</i>			r?			w←	

6 Conformance Tables – Resources

6.1 Company

Table 16: Company
Referenced by: Contact

Name or Value	Manager			Worker			Description	
	Level →	1	2	3	1	2		3
<i>OrganizationName</i>		w			r?			Name of the customer's organization.
<i>ProductID</i>		w			r?			

6.2 Component

Each Product Node's ResourceLinkPool MUST contain at least one output ComponentLink (which, of course, links to a **Component**). To put it more succinctly, each Product Node MUST 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 17 shows the Conformance Requirements for such Output **Component** Resources.

Table 17: Component
Referenced by: List of Resources

Name or Value	Manager			Worker			Description	
	Level →	1	2	3	1	2		3
<i>ComponentType</i>		w			r?			
<i>FinalProduct</i>		w←			r?			MUST be the value of <i>ComponentType</i> for a Component that represents the single finished Product that the customer ordered.
<i>Dimensions</i>		w←			r?			MUST be supplied if (contains(@ComponentType,"FinalProduct")).
<i>ProductType</i>		w←			r?			The Manager MUST 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.
<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?			

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

6.3 Contact

Table 18: Contact
Referenced by: CustomerInfo

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>ContactTypes</i>	w			r?			
<i>Customer</i>	w			r?			
<i>Administrator</i>	w			r?			
<i>ProductID</i>	w			r?			
Company	w←			r?			See Table 16: Company.
Person	w			r?			See Table 28: Person.

6.4 CustomerInfo

Table 19: CustomerInfo
Referenced by: List of Resources

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>CustomerID</i>	w			r?			
<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 18: Contact.

6.5 Device

Table 20: Device
Referenced by: PhaseTime

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>DeviceID</i>		r			w		r-Test: When costing a Job based on hours, the Manager MUST select the cost rate using the <i>DeviceID</i> .

6.6 Employee

6.6.1 Employee – CSR

Table 21: Employee – CSR
Referenced by: NodeInfo

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

6.6.2 Employee – Operator

Table 22: Employee – Operator
Referenced by: DeviceInfo, ModuleStatus, PhaseTime

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>PersonallID</i>		r			w		r-Test: The Worker MUST retain the identification of the operator that is specified by <i>PersonallID</i> . MUST have same value as <i>ProductID</i> .
<i>ProductID</i>		r?			w		MUST have same value as <i>PersonallID</i> .
<i>Roles</i>		r			w		r-Test: The Worker MUST at least retain the identification of the Employee with <i>Roles</i> = "Operator".

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Operator</i>		r			w←		
<i>Assistant</i>		r?			w?		"Assistant" means assistant operator.

6.6.3 Employee – Resource (Synchronization)

Table 23: Employee – Resource (Synchronization)

Referenced by: ResourceInfo

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>PersonID</i>		w			r		MUST 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?		
<i>ProductID</i>		w			r		MUST have same value as <i>PersonID</i>
<i>Person</i>		w			r		See Table 28: Person.

6.7 Media

6.7.1 Media – Resource (Synchronization)

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

Table 24: Media – Resource (Synchronization)

Referenced by: ResourceInfo

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		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>MediaType</i>		w r			r w		
<i>Paper</i>		w r			r w		Only <i>MediaType</i> of "Paper" MUST 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			r w		
<i>GeneralID</i>			r?			w←	MUST be supplied by Worker that has a Paper Catalog with Worker specific IDs. See Table 25: GeneralID.

6.7.1.1 GeneralID

Table 25: GeneralID
Referenced by: Media – Resource (Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>IDUsage</i>			r			w	
<i>DeviceProductID</i>			r			w←	
<i>IDValue</i>			r			w	The ID that the Media has in the Device Media Catalog

6.8 MISDetails

Table 26: MISDetails
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 MUST store the <i>CostType</i> against the actual hours.
<i>all values</i>			r			w←	

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

6.9 NodeInfo

Table 27: NodeInfo

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 MUST be used. Other ICSs MAY define further requirements for these attributes.
<i>Start</i>			w?			r?	
<i>BusinessInfo</i>		!w			r?		See [JDF1.4a].
<i>Employee</i>		w←			r?		MUST appear in the Root Node and MAY appear in Subnodes. The employee is an internal customer service representative. See Table 21: Employee – CSR.

6.10 Person

Table 28: Person

Referenced by: Contact

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>FamilyName</i>		w←			r←		If the family name is known, it MUST be specified.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							MUST 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 MUST be specified. MUST be read when Person is in Response to a Resource Query for Resource Synchronization.
<i>DescriptiveName</i>	w			r←			The full name MUST be specified in the <i>DescriptiveName</i> Attribute. MUST be read when Person is in Response to a Resource Query for Resource Synchronization.
<i>ProductID</i>	w			r←			MUST be read when Person is in Response to a Resource Query for Resource Synchronization.

7 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 29 below emphasize that Query Elements with Subscription are an optional way to activate Signal Messages in Level 2.

For more details, see Section 9 “Conformance Rules – JMF Messages”.

Table 29: List of JMF Messages

Message Type	Family	Manager			Worker			Description
		Level →	1	2	3	1	2	
NewJDF	Query		w			r		See Table 30: Query – NewJDF.
NewJDF	Response		r			w		See Table 32: Response – NewJDF.

Message Type	Family Level →	Manager			Worker			Description
		1	2	3	1	2	3	
Notification	Signal		w←			r?		If the Manager can detect the completion of production stages, it MUST send a Signal Message after the completion of each stage. See Table 34: Signal – Notification.
Resource (NodeInfo)	Command			w?			r?	Command to update NodeInfo scheduling attributes. See Table 37: Command – Resource (NodeInfo).
Resource	Command		w			r		Command to Synchronize Resource information. See Table 39: Command – Resource (Synchronization).
Resource	Query		w			r		For Resource Consumption. See Table 41: Query – Resource (Consumption).
Resource	Query		w			r		Query to Synchronize Resource information. See Table 44: 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 46: Response – Resource.
Resource	Response		r?			w		Response to Command to Synchronize Resource information. This section contains the Worker Response to the Resource Command used by the Manager to push Resource synchronization information to the Worker. Table 47: Response – Resource (Push Synchronization).
Resource	Response		r?			w		Response to Query to Synchronize Resource information. See Table 49: Response – Resource (Pull Synchronization).
Resource	Response		r			w		A Response from: <ul style="list-style-type: none"> Command – Resource (NodeInfo) Query – Resource (Consumption) See the Response table in the [JMF-ICS].
Resource	Registration			w			r	See Table 51: Registration – Resource.
Resource	Response			r			w	A Response from a Registration Message. See the Response table in the [JMF-ICS].
Resource	Signal		r			w		See Table 53: Signal – Resource.
Status	Query		w			r		See Table 56: Query – Status.

Message Type	Family Level →	Manager			Worker			Description
		1	2	3	1	2	3	
Status	Response			w			r	See Table 58: Response – Status.
Status	Response		r			w		See the Response table in the [JMF-ICS].
Status	Signal		r			w		See Table 59: Signal – Status.

7.1 NewJDF

7.1.1 Query – NewJDF

Table 30: Query – NewJDF

In: List of JMF Messages

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<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 31: NewJDFQuParams.

7.1.1.1 NewJDFQuParams

Table 31: NewJDFQuParams

Referenced by: Query – NewJDF

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

7.1.2 Response – NewJDF Query

Table 32: Response – NewJDF

In: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<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 33: IDInfo.

7.1.2.1 IDInfo

Table 33: IDInfo

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←		MUST be supplied if JDF Node has a <i>Types</i> Attribute.

7.2 Notification

7.2.1 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 [JDF1.4a] 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* MUST send the Signal Messages for a Job to all Workers that the *MIS* has submitted the JDF Instance to.

Table 34: Signal – Notification

In: List of JMF Messages

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>refID</i>		w←			r?		If a Query causes the creation of a Subscription, the Worker MUST 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 35: Notification.

7.2.1.1 Notification

Table 35: Notification

Referenced by: Signal – Notification

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>Class</i>		w			r		
<i>Event</i>		w←			r		
<i>JobID</i>		w			r		r-Test: Worker MUST apply this notification to the specified <i>JobID</i> .
<i>Type</i>		w			r		
<i>Milestone</i>		w←			r		
Milestone		w←			r		MUST be supplied if <i>Type</i> = " <i>Milestone</i> ". See Table 36: Milestone.

7.2.1.2 Milestone

Table 36: Milestone

Referenced by: Notification

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>MilestoneType</i>		w			r		r-Test: Worker MUST mark Job as completed.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobCompletedSuccessfully</i>		W	W←		r		MUST 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?	

7.3 Resource

7.3.1 Command – Resource (NodeInfo)

Table 37: Command – Resource (NodeInfo)

In: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Type</i>			W			r	
<i>Resource</i>			W			r	
<i>xsi:type</i>			W			r?	
<i>CommandResource</i>			W			r?	
<i>ResourceCmdParams</i>			W			r	See Table 38: ResourceCmdParams (NodeInfo).

7.3.1.1 ResourceCmdParams (NodeInfo)

Table 38: ResourceCmdParams (NodeInfo)

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>							

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Incremental</i>			w			r	The Resource MUST 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	MUST 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 27: NodeInfo.

7.3.2 Command – Resource (Synchronization)

Table 39: Command – Resource (Synchronization)

In: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<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 40: ResourceCmdParams (Synchronization).

7.3.2.1 ResourceCmdParams (Synchronization)

Table 40: ResourceCmdParams (Synchronization)

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 MUST NOT return the requested JDF Resource.
<i>JobID</i>		!w			r?		
<i>JobPartID</i>		!w			r?		
<i>QueueEntryID</i>		!w			r?		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ResourceName</i>		w			w r		<p>The Worker MUST synchronize Resources by using <i>ResourceName</i>.</p> <p>The domain ICS for the Worker specifies the types of Resources for which synchronization MUST be supported.</p> <p>r-Test: The Worker MUST respond according to the filters as specified in this Element.</p>
<i>Contact</i>		w			r		
<i>Employee</i>		w			r		MUST be supported for Worker Devices that are operated in attended mode.
<i>Media</i>		w			r		<p>MUST be supported for Worker Devices that consume <i>Media/@MediaType = "Paper"</i>.</p> <p>Only Media of <i>MediaType = "Paper"</i> MUST be returned by the Manager.</p>
<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
Part		!w			r?		
Contact		w←			r		<p>The Contact details that need to be supplied in JDF are the same as the details that need to be synchronized.</p> <p>This synchronization is from Manager to Worker only.</p> <p>See Table 18: Contact.</p>
Employee		w←			r		<p>This synchronization is from Manager to Worker only.</p> <p>See Table 23: Employee – Resource (Synchronization).</p>
Media (Paper)		w←			r←		<p>This synchronization is from Manager to Worker only.</p> <p>The Worker “read” requirement applies only to a Worker that consumes Media with <i>MediaType="Paper"</i>.</p> <p>See Table 24: Media – Resource (Synchronization).</p>

7.3.3 Query – Resource (Consumption)

Table 41: Query – Resource (Consumption)

In: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Type		w			r		
Resource		w			r		
xsi:type		w			r?		
QueryResource		w			r?		
ResourceQuParams		w			r		See Table 42: ResourceQuParams (Consumption)
Subscription		w			r		See Table 43: Subscription.

7.3.3.1 ResourceQuParams (Consumption)

Table 42: ResourceQuParams (Consumption)

Referenced by: Query – Resource (Consumption)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Classes		w			r		r-Test: The Worker MUST respond or create a persistent channel. according to the filters specified in this Element.
Consumable		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 MUST be reported.
Handling		w←			r		The Manager requests all Handling Resources from the Worker's Device.
Exact		w?			r		r-Test: If <i>Exact</i> = "false", the Signals MUST NOT include a copy of the Resources. If <i>Exact</i> = "true", the Signals MUST include a complete copy of the Resources that meet the filter.
false		w←			r		
true		w←			r		
JobID		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 MUST create a Persistent Channel without a <i>JobID</i> , <i>JobPartID</i> ,

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							<i>QueueEntryID</i> or <i>ResourceID</i> . Note: The Attributes mentioned above are not marked with a “! w” so that a Manager can Subscribe to an individual <i>JobID</i> , <i>JobPartID</i> , <i>QueueEntryID</i> or <i>ResourceID</i> and still be conformant.
<i>JobPartID</i>		w?			r?		See <i>JobID</i> .
<i>QueueEntryID</i>		w?			r?		See <i>JobID</i> .
<i>ResourceID</i>		w?			r?		See <i>JobID</i> .
<i>ResourceName</i>		w?			r		r-Test: See <i>Classes</i> .

7.3.3.2 Subscription

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

Table 43: Subscription

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

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ChannelMode</i>			w			r	
<i>FireAndForget</i>			! w			r?	
<i>Reliable</i>			w			r	r-Test: Manager MUST send a Response Element in the HTTP response to a Signal. Worker MUST repeat Messages for which no Response Element was received.
<i>RepeatTime</i>		w?			r		r-Test: See [JDF1.4a].
<i>RetryPolicy</i>			w			r	
<i>DiscardAtNextSignal</i>			w←			r?	The Worker MAY only discard messages that were created as a result of the elapse of the <i>RepeatTime</i> . The Worker MUST repeat Messages (as for " <i>RetryForever</i> ") created as a result of a Status transition as described in Section 9.2 “When to Send a Status Signal”.
<i>RetryForever</i>			w←			r	“ <i>RetryForever</i> ” MUST be interpreted as no less than 72 hours. The JMF retry MUST survive reboot of the Worker, but results after a power failure of the Worker are implementation dependent.

7.3.4 Query – Resource (Synchronization)

Table 44: Query – Resource (Synchronization)

In: List of JMF Messages

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

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>Type</i>		w			r		
<i>Resource</i>		w			r		
<i>xsi:type</i>		w			r?		
<i>QueryResource</i>		w			r?		
ResourceQuParamsResourceQuParams		w			r		See Table 45: ResourceQuParams (Synchronization).

7.3.4.1 ResourceQuParams (Synchronization)

Table 45: ResourceQuParams (Synchronization)

Referenced by: Query – Resource (Synchronization)

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<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?		

7.3.5 Response – Resource (Signal)

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

Table 46: Response – Resource (Signal)

Referenced by: List of JMF Messages

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

7.3.6 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 47: Response – Resource (Push Synchronization)

In: List of JMF Messages

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<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 MUST contain one ResourceInfo per Resource that is included in the Command. See Table 48: ResourceInfo (Push Synchronization).

7.3.6.1 ResourceInfo (Push Synchronization)

Table 48: ResourceInfo (Push Synchronization)

Referenced by: Response – Resource (Push Synchronization)

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

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<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		

7.3.7 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 49: Response – Resource (Pull Synchronization)

In: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<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		
<i>ResourceInfo</i>		r			w		See Table 50: ResourceInfo (Pull Synchronization).

7.3.7.1 ResourceInfo (Pull Synchronization)

Table 50: ResourceInfo (Pull Synchronization)
Referenced by: Response – Resource (Pull Synchronization)

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Media		r			w←		<p>This synchronization is from Manager to Worker and Worker to Manager.</p> <p>The Worker “write” requirement applies only to a Worker that has a Paper Catalog with Worker specific IDs.</p> <p>See Table 24: Media – Resource (Synchronization).</p>

7.3.8 Registration – Resource

Table 51: Registration – Resource
In: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Type			w			r	
Resource			w			r	
xsi:type			w			r?	
RegistrationResource			w			r?	
ResourceCmdParams			w			r	See Table 52: ResourceCmdParams (Registration).
Subscription			w			r	See [JMF-ICS].

7.3.8.1 ResourceCmdParams (Registration)

Table 52: ResourceCmdParams (Registration)
Referenced by: Registration – Resource

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
Exact			w?			r	r-Test: See [JDF1.4a].
false			w←			r	
true			w←			r	

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>JobID</i>			w?			r	r-Test: Worker MUST respond with information for the specified <i>JobID</i> .
<i>JobPartID</i>			w?			r	r-Test: Worker MUST respond with information for the specified <i>JobPartID</i> .
<i>Part</i>			w?			r	r-Test: Worker MUST respond with information for the specified <i>Part</i> . See [JDF1.4a].

7.3.9 Signal – Resource

Table 53: Signal – Resource

In: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>ChannelMode</i>							
<i>FireAndForget</i>		r?	r		w		
<i>Reliable</i>			r		w?	w	The Worker MUST 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.
<i>refID</i>		r?			w←		If the <i>Subscription</i> is created by a Query, the Worker MUST supply the <i>ID</i> 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 MUST 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 54: <i>ResourceInfo</i> (Signal).
<i>ResourceQuParams</i>		r			w		See Table 55: <i>ResourceQuParams</i> (Signal).

7.3.9.1 ResourceInfo (Signal)

Table 54: ResourceInfo (Signal)
Referenced by: Signal – Resource

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>ActualAmount</i>		r			w←		The current accumulated amount of the Resource that has been consumed or produced. MUST NOT be specified if AmountPool is present. r-Test: If Manager does costing using Signals, the Manager must record the Resource consumption in its database.
<i>ProductID</i>		r			w←		The Worker MUST specify either this Attribute or the Resource Element, but not both. r-Test: The Manager must identify the Resource using the <i>ProductID</i> .
AmountPool		r			w←		The current accumulated amount of the Resource that has been consumed per Part. MUST be specified if a Part is being executed. r-Test: If Manager does costing using Signals the Manager must record the Resource consumption in its database. See [JDF1.4a].
MISDetails		r?			w?		See Table 26: MISDetails.
Resource		r			w←		The Worker MUST specify either this Element or the <i>ProductID</i> Attribute, but not both. See [JDF1.4a].

7.3.9.2 ResourceQuParams (Signal)

Table 55: ResourceQuParams (Signal)
Referenced by: Signal – Resource

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>JobID</i>		r			w←		If the Resource was consumed in the context of a Job, the <i>JobID</i> MUST refer to the job the Resource Signal was sent for. r-Test: The Manager MUST record the Resource consumption against the correct job.
<i>JobPartID</i>		r			w←		If the Resource was consumed in the context of a Job, the <i>JobPartID</i> MUST refer to the job the Resource Signal was sent for.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>QueueEntryID</i>		r?			w←		If the Resource was consumed in the context of a Job, the <i>QueueEntryID</i> MUST refer to the Queue Entry the Resource Signal was sent for.
Part		r			w←		

7.4 Status

7.4.1 Query – Status

Table 56: Query – Status

In: List of JMF Messages

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<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 57: StatusQuParams.
Subscription		w			r		See Table 43: Subscription.

7.4.1.1 StatusQuParams

Table 57: StatusQuParams

Referenced by: Query – Status

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>DeviceDetails</i>		w			r		r-Test: See [JDF1.4a].
<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?		

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<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 MUST respond or create a persistent channel with the value supplied.
<i>Brief</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> , Therefore the Manager MUST 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 MUST NOT return the Queue.
<i>false</i>		w			r		
<i>true</i>		!w			r?		The Manager MUST NOT request a Queue, because there is no way to restrict the size of the returned Queue.

7.4.2 Response – Status

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

Table 58: Response – Status
Referenced by: List of JMF Messages

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

7.4.3 Signal – Status

Table 59: Signal – Status

In: List of JMF Messages

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>ChannelMode</i>			r			w	
<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 MUST supply the <i>ID</i> 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 MUST 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 60: DeviceInfo.

7.4.3.1 DeviceInfo

Table 60: DeviceInfo

Referenced by: Signal – Status

Name or Value Level →	Manager			Worker			Description
	1	2	3	1	2	3	
<i>DeviceID</i>		r			w		r-Test: Manager must identify Device using the <i>DeviceID</i> .
<i>DeviceOperationMode</i>		r			w←		The Worker MUST supply this Attribute for an attended Device. The Worker MAY supply it for an unattended Device. r-Test: Manager MUST create costing only from Messages with <i>DeviceOperationMode</i> = " <i>Productive</i> ".
<i>all values</i>		r			w←		
<i>DeviceStatus</i>		r			w		r-Test: Manager MUST 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 MUST 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 MUST 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 MUST supply this Attribute.
Employee		r			w?	w←	If a Device requires an operator for normal operation, it MUST supply an Employee [contains(@Roles,"Operator")]. For unattended Devices, its Worker MUST NOT supply an Employee Element. See Table 22: Employee – Operator.
<i>JobPhase</i>		r			w←		The Worker MUST supply one JobPhase Element for each Job on the Device that is Active or whose <i>Status</i> has just become "Completed" or "Aborted". The Worker MUST NOT supply any JobPhase Elements during a non-productive time (e.g. maintenance or lack of Jobs) except to convey information about Jobs whose <i>Status</i> has just become "Completed", "Aborted" or "Suspended". See Table 61: JobPhase.
<i>ModuleStatus</i>		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 63: ModuleStatus.

7.4.3.2 JobPhase

Table 61: JobPhase
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

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
							<p>Node started executing.</p> <p>If a Worker can distinguish between good and waste, it MUST supply the waste amount in <i>Waste</i> and then exclude the waste amount from <i>Amount</i>.</p> <p>If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker MUST supply this Attribute.</p>
<i>JobID</i>		r			w←		<p>The <i>JobID</i> of the Node that is executing.</p> <p><i>JobID</i> MUST be provided if known.</p> <p>r-Test: Manager MUST update status of this Job only.</p>
<i>JobPartID</i>		r			w←		<p>The <i>JobPartID</i> of the Node that is executing.</p> <p><i>JobPartID</i> MUST be provided if known.</p> <p>r-Test: Manager MUST update status of this Job part only.</p>
<i>PhaseAmount</i>		r?			w?	w←	<p>The Amount produced during this JobPhase.</p> <p>If a Worker can distinguish between good and waste, it MUST supply the waste amount in <i>PhaseWaste</i> and then exclude the waste amount from <i>PhaseAmount</i>.</p> <p>If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker MUST supply this Attribute.</p>
<i>PhaseStartTime</i>		r?			w?	w	Start time of this JobPhase.
<i>PhaseWaste</i>		r?			w?	w←	<p>The Amount of Waste produced during this JobPhase.</p> <p>If a Worker can distinguish between good and waste, it MUST supply the waste amount in <i>PhaseWaste</i> and then exclude the waste amount from <i>PhaseAmount</i>.</p> <p>If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker MUST supply this Attribute.</p>
<i>StartTime</i>		r?			w?	w	The date and time the Node started executing.
<i>Status</i>		r			w		<p>r-Test: Manager MUST update displayed status of this JobPhase.</p> <p>For values, see Table 62: JobPhase/@Status and PhaseTime/@Status.</p>
<i>TotalAmount</i>		r?			w?		The Amount to be produced.

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Waste</i>		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 MUST supply the waste amount in <i>Waste</i> and then exclude the waste amount from <i>Amount</i>.</p> <p>If a Worker's Device produces countable output (e.g. a Press or Folding Machine), the Worker MUST supply this Attribute.</p>
<i>MISDetails</i>		r?			w?		See Table 26: MISDetails.
<i>ModuleStatus</i>		r?			w?		<p>A Worker MAY supply <i>ModuleStatus</i> Elements to show the status of individual modules used for this JobPhase.</p> <p>See Table 63: <i>ModuleStatus</i>.</p>
<i>Part</i>		r?			w←		<p>Identification of the Part worked on.</p> <p>If the output Resource of the Process is Partitioned, the Worker MUST supply at least one Part. Each Part MUST 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 [JDF1.4a].</p>

7.4.3.3 JobPhase/@Status and PhaseTime/@Status

Table 62: JobPhase/@Status and PhaseTime/@Status

Referenced by: JobPhase, PhaseTime

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>Setup</i>		r			w←		A Worker MUST 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 MUST supply this value during the cleanup phase for a Device that has such a phase for each Job.
<i>Stopped</i>		r			w←		

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<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?		.

7.4.3.4 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 63: ModuleStatus
Referenced by: DeviceInfo, JobPhase

Name or Value	Manager			Worker			Description
	Level →	1	2	3	1	2	
<i>DeviceStatus</i>		r			w		r-Test: Manager MUST update the displayed status of this module.
<i>all values</i>		r			w←		
<i>ModuleID</i>		r			w←		At least one of <i>ModuleID</i> or <i>ModuleIndex</i> MUST be specified. r-Test: Manager MUST 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> MUST be specified. r-Test: Manager MUST update the displayed status of this module.
<i>Employee</i>		r?			w?		See Table 22: Employee – Operator.

8 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 [JDF1.4a]) MUST ask the *MIS Manager* to create a Job and submit it to the Device Worker.

8.1 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 MUST contain Product Intent Resources. In other words, if the Intent cannot be described or is not available, the Root Node of the JDF Instance MUST be a Process or a Process Group. Product Intent Resources MUST only describe Product characteristics that the Customer supplies. Product Intent Resources MUST describe the Customer's view of a Job. Intent Resources MUST 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).

9 Conformance Rules – JMF Messages

9.1 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

9.1.1 Job Tracking

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

9.1.2 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 MUST support reliable channels by adding *ChannelMode = "Reliable"* in the *Subscription*. In Reliable mode the Worker MUST 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 MUST 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.

9.1.3 Device Monitoring and Analysis

The *MIS* must 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.

9.1.4 Resource Consumption

A Device that, during the execution of a Node, consumes Resources whose *Class = "Consumable"* MUST notify the *MIS* by sending a JMF Signal Resource Message. See Table 53: Signal – Resource.

9.2 When to Send a Status Signal

A Device **MUST** 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 **MUST** 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 production Amounts, such as from "Running" to "Stopped". For these transitions the Device **MUST** 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.

9.2.1.1 Financial Period Costing / Analysis

The **MIS** cannot solely rely on the non-reliable JMF Status Signal Messages (of Level 2) to produce complete and accurate costing of a Job, but it has the requirement to provide (nearly) real-time costing and work-in-progress (WIP) information. Therefore, a Level 3 Device **MUST** use reliable channels or **MAY** send, via a Status Signal Message, a "snapshot" JDF Instance with an AuditPool, at least once every 3 hours (for Jobs that run for more than 3 hours). In the second case the AuditPool **MUST** be complete up to and including the current *PhaseTime*, however the current *PhaseTime* **NEED NOT** be complete and **MAY** continue after the snapshot. In other words, the *PhaseTime/@End* in the Node's final AuditPool **MAY** be different from the *PhaseTime/@End* in the snapshot. If a Job goes to *Status = "Suspended"*, a snapshot **MUST** be sent to the Manager.

10 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 **MUST** 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.

10.1 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 **MUST** supply a complete AuditPool as defined in Section 4.5 "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.

10.1.1 When to Close Audits

The Device MUST 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,

11 References

11.1 Normative References

- [Base-ICS] Base ICS, Version 1.4, published December 2009. Available at: <http://www.cip4.org>.
- [JMF-ICS] JMF ICS, Version 1.4, published December 2009. Available at: <http://www.cip4.org>.
- [JDF1.4a] JDF Specification, Version 1.4a, published December 17, 2009. Available at: <http://www.cip4.org>

11.2 Informative References

- [ProductDesc-ICS] Product Description ICS, Version 1.4, to be published sometime in the future. Will be available at: <http://www.cip4.org>.

Appendix A: Changes Between Versions 1.3 and 1.4

Apart from some minor editorial changes the following more fundamental changes have been made to the MIS ICS Version 1.4 as compared to Version 1.3:

- The requirement to support JMF messages in the **NodeInfo** has been dropped. The MIS ICS now requires that all JMF messages are to be separately transmitted from Manager to Worker. There is also no longer the requirement on the Worker to support JMF Resource and Status Queries (with Subscriptions) for individual Job (Parts).
This change has been done to reduced complexity, reduce the number of ways Persistent Channels can be created and lower the implementation burden on the worker.
This change also has the effect that the number on combination of ICS levels available for certification has been reduced to 3 (from the previous 4)
- The requirement to support Audit snapshots in JMF Status Signal messages, and the related creating of extra Persistent Channels, has been removed from this ICS.
- The requirement to support Reliable Channels has been added to Level 3 of this ICS.
Although Job Costing using JMF Signals has always been part of the fundamental design of JDF/JMF, there were issues with the degree of reliability of this method job costing. With this change a much higher degree of reliability has been added to this method of job costing. Introducing this high degree of reliability allowed the requirement for Audit snapshots to be dropped.
- The requirement to support Resource Synchronization for **Contact**, **Employee** and **Media** has been added to Level 2 of this ICS.
- The ability to support Resource (NodeInfo) Commands for the update of the job scheduling attributes in the **NodeInfo** has been added to Level 3 of this ICS. This enables systems with the MIS role to set and update the scheduling of production in a Worker system.

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