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*** APPLICABLE DOCUMENTS**

- * PM-4053 PROCESS MANUAL – Access limited due to Proprietary Data contained therein. Sellers contracted to fabricate or rework Special Tooling shall contact Buyer to submit access request.

PO APPENDIX T – Special Tooling Identification requirements for Non Recurring Tools.

PART I

AIRCRAFT ITEMS AND TOOLING - SELLER REQUIREMENTS

1.0 GENERAL

1.1 This Tooling Manual ("Manual") contains the contractual requirements to properly control and maintain Buyer-furnished and/or Seller-manufactured Special Tooling ("ST"), Support Equipment ("SE"), Manufacturing Support Equipment ("MSE"), Special Test Equipment ("STE") and Manufacturing Test Equipment ("MTE") for Buyer, as such terms are hereinafter defined, used to produce Items for Buyer.

1.2 This Manual contains general and specific requirements that are applicable as specified in this Purchase Order ("PO"). The terms "Item" or its plural "Items", "PO", "Seller", and "Buyer" as used herein, have the same meaning as the terms "Work", "Contract", "SELLER", and "LOCKHEED MARTIN", respectively.

1.3 Access to this manual can be found on the Material Management Home Page at <http://www.lockheedmartin.com/aeronautics/materialmanagement>, under Quality Requirements > Control Specs.

2.0 TOOLING DEFINITIONS

2.1. ST means all jigs, dies, fixtures, molds, patterns, taps, gages, other equipment and manufacturing aids, and replacements which are of such a specialized nature that without substantial modification or alteration, their use is limited to the development or production of particular supplies or Items thereof, or the performance of particular services.

2.2 Modification Kit Tool ("MKT") is categorized as ST and used to update or modify aircraft assemblies and structures.

2.3 "Tooling Tools" means all gage's used by Seller to control the fabrication or coordination of production tooling, holes, Interchangeable-Replaceable ("I/R") features, critical mating points and surfaces or contours it represents. Tooling Tools are for tooling purposes only and shall not be used for production purposes.

2.4 "Seller-Owned Tooling" means all ST and Tooling Tools owned by Seller and used in the process of fabricating, inspecting, assembling and coordinating of particular Items and/or tools as described in paragraphs 2.1 and 2.3.

2.5 STE means either single or multipurpose integrated test Items engineered, designed, fabricated or modified to accomplish special purpose testing. STE consists of Items that are interconnected and interdependent so as to become a new functional entity for special testing purposes. STE excludes:

- Consumable property
- ST
- Facility Items (except necessary improvements for installing STE)
- Plant equipment Items used for general plant testing purposes

2.12 Electronic Supplier Problem and Resolution (“e-SPaR”) - This online system is available on the Buyer’s Material Management Homepage at <http://www.lockheedmartin.com/aeronautics/materialmanagement> and is the approved system to request information regarding PO requirements.

2.13 Seller Aircraft Tooling Report (“SATR”)

2.13.1 This online system is available on the Buyer’s Material Management Homepage and was created to provide Seller with a traceable electronic means of reporting ST discrepancies and achieving disposition authorization from Buyer’s program representative.

2.13.2 Access is granted by applying for an account on the Buyer’s Material Management Homepage at <http://www.lockheedmartin.com/aeronautics/materialmanagement>. Highlight “Quality Requirements” and select “Corrective Action”.

2.13.3 A SATR is a document initiated by Seller to document a discrepant Buyer-furnished ST condition. Buyer shall reply with authorization for repair, if required, of "out of engineering" discrepancies or conditions.

** 2.14 Seller Aircraft Tooling End Item Acceptance (“SATEIA”) Report

2.14.1 Delegation of End Item Acceptance (“EIA”), if granted by Buyer, shall be granted to Seller only by formal letter of authorization that specifically addresses Aircraft Tooling and defines applicable requirements.

2.14.2 Seller shall complete and submit a SATEIA Report for manufactured or reworked ST as defined in Part I, section 2.0 and Seller shall include such report as specified in Part II, section 4.0 of this Manual.

2.14.3 The SATEIA Report is a checklist utilized exclusively by Sellers that have received Buyer authorized delegation to perform EIA in-lieu of Buyer’s Representative performing the acceptance task.

2.14.4 Seller shall obtain a copy of the SATEIA Report from Buyer’s Representative or Seller shall utilize and submit an equivalent report.

3.0 INTERCHANGEABLE- REPLACEABLE (“I/R”)

3.1 Seller shall comply with I/R requirements imposed by this PO.

3.2 “Interchangeable Items” – Interchangeable Items are completely finished and have designed/controlled features which allow them to be installed, removed, or replaced without alteration, misalignment, or damage to installed or adjoining Items. Interchangeable Items require only attaching means (bolts, nuts, screws, pins, etc.) to install. Interchangeable Items do not require any fabrication operations such as cutting, filing, drilling, hammering or forcing at the point of installation.

3.3 “Replaceable Items” – Replaceable Items are partially finished and have designed/controlled features which require alteration of the Items in addition to the normal application and/or methods of attachment at the point of installation. Such alterations are limited to specified areas and may include drilling, filing, trimming, bending, etc.

3.4 "Interchangeable Category Items" – Items so designated are typically Items which are attached by bolts or screws, readily removable and replaceable. Such Items are designed in such a manner that all like Items made within the engineering drawing tolerances will substitute one for another. Interchangeable Category Items are Items that are maintained by Seller through use of normal manufacturing methods and compliance with engineering drawing dimension tolerances, without the use of I/R Control Media.

4.0 "TO MATCH" HOLE PATTERNS AND OTHER I/R FEATURES

4.1 The term "To Match", when specified on Buyer engineering drawings relative to hole locations, indicates that the dimensions including tolerances, even when met, may not necessarily ensure physical mating of Item hole patterns at the point of installation. This is true even though from a dimensional standpoint the features are within engineering drawing tolerance

- ** 7.1.1 Seller's Quality Management System (QMS) shall provide calibration or testing procedures capable of verifying configuration control of Seller-owned or Buyer-furnished SE, MTE and STE.

- * 7.2 Upon receipt of boxed and sealed tools, Seller shall notify Buyer's Representative to break the seal of the container and visually inspect the tool and contents for completeness and damage. Seller's Quality Assurance (QA) personnel are allowed to open sealed containers in the event that Buyer's Representative is unavailable to support requested program need date(s). Seller shall complete form FWP-1209 "Gage Storage Record" accompanying the tool for Fort Worth tools or form GD1856-1 "Tooling Log Book" for Marietta tools. Seller shall enter discrepancies, if any, in the remarks column. If Seller does not receive the applicable form with the tool, Seller shall initiate an e-SPaR requesting the correct form.

- 7.3 In no case shall Seller attempt to rework, in any manner, Buyer-furnished tooling without prior written authorization from Buyer. Rework is defined as any modification to a tool that affects the tool configuration such as; hole patterns, contour, periphery, etc.

 - * 7.3.1 Seller shall review Buyer authorization for repair and contact Buyer's Representative to discuss appropriate level of verification or oversight required to ensure that rework has been completed.

 - 7.3.2 All I/R tooling and tooling used as a media of acceptance shall require delta FAI demonstrations upon completion of rework, unless the reworked tool is coordinated to designated control media. Additional I/R and non-I/R repair, preservation and coordination guidance is provided, but not limited to, Part IV of this Manual.

 - 7.3.3 Seller shall initiate a SATR to receive Buyer authorization to rework and/or repair Buyer-furnished ST

- 7.4 Seller shall maintain the ability to produce the original, or any subsequent Item configuration, including spares, unless changes made by Buyer's engineering are retroactive to the original point of affectivity of Item. Seller shall accomplish this by fabricating other Control Media for its use, or from Buyer-furnished Control Media.

- 7.5 When Buyer authorizes rework and when a tool is capable of producing earlier configurations, Seller shall re-identify the tool to the new configuration Item number. When Buyer-authorized rework and/or modification will render a tool incapable of producing earlier configurations without extensive alteration, Seller shall notify Buyer prior to continuing any rework and request additional specific instructions for tool rework, or for potentially manufacturing new additional tooling.

- * 10.3 Seller shall contact Buyer's Representative for closure of the Control Media container. If Buyer's Representative is unavailable within two (2) business days to witness the closure of the Control Media container, Seller's QA shall fill out the form FWP-1209, "Gage Storage Record" or tooling log book as applicable. Seller's QA and/or Buyer's Representative shall verify the following are complete and included before closure and sealing:

- A. Control Media contents are complete
- B. Applicable surfaces are greased
- C. Contents are shored
- D. Gage storage record is stamped and complete

10.4 Prior to shipment, Seller shall note physical damage, if any, to the tools and shall document all such damage, if any, as specified in this Manual in Part I, Paragraphs 2.12 and 2.13.

10.5 Seller shall use lead seals, steel stamped by Seller, to seal the Control Media box.

10.6 If movement of Control Media will affect Seller's ability to meet a delivery schedule, Seller shall immediately notify Buyer.

10.7 At such time Buyer determines that Buyer-furnished tools located at Seller's facility are to be dispositioned, Buyer shall list the tools on form SF1432/1433 "Inventory Schedule" and forward the Inventory Schedule or a listing, as appropriate, to Seller. Upon receipt of the completed Inventory Schedule or listing, Seller shall process the listed tools as follows:

Segregate the tools to a secured storage area.

Indicate on the Inventory Schedule or listing, in the space provided, the specific location of the segregated tools and Seller representative to be contacted regarding final disposition instructions.

Sign and return the Inventory Schedule or listing to Buyer.

10.8 Upon Buyer's written notification and transfer of tool title from Buyer to Seller, Seller shall remove all evidence of ownership markings from tools and tool containers or render markings unrecognizable. This tooling identification removal includes, but is not limited to, the following:

- Ownership markings on plaques
- Barcodes
- Steel stamping
- Vibro-engrave etching
- Paint markings

Seller shall reference FAR 45.506 for contractor requirements of U.S. Government-owned property. Seller shall exercise caution to ensure that Tool Code and part number identifications are not removed.

11.0 TOOLING PERIODIC INSPECTION AND VERIFICATION ("PI/V")

- * 11.1 PI/V is a process comprised of the cyclical verification of "Selected Tooling", as defined in paragraph 11.2, used as a media of acceptance of a feature(s) of an Item.

Example of Selected Tooling that would be placed into a PI/V recall cycle: A Drill Jig (DRJI) used to drill four holes in an aircraft part and subsequently used to verify the

same four holes spacing, location, diameter, depth, or under circumstances where Seller is not employing any other verification method.

11.1.1 Seller shall place all Buyer-furnished or Seller-owned Inspection Gages ("INGA") or Check Fixtures ("CKFX") into a PI/V recall cycle.

11.1.2 Seller shall place all tooling that controls I/R into a PI/V recall cycle.

** 11.1.3 Seller shall utilize the coordination tolerances provided in Part IV of this manual.

* 11.2 "Selected Tooling" is defined as any Buyer-furnished or Seller-owned tool used as a media of acceptance for a feature of any Item deliverable to Buyer. Seller shall be responsible for establishing a PI/V procedure for Buyer-furnished or Seller-owned tools used as a media of acceptance to produce Buyer Items, and present proof of administering these procedures to Buyer or Buyer's Representative upon request. Tools designated by Buyer as Master Tooling or Tooling Tools and used for coordinating purposes only, do not require PI/V but do require unique preservation controls to ensure configuration and integrity of tools are maintained. Preservation, maintenance and standard repair specifications are illustrated in Part IV of this Manual.

* 11.3 Seller shall perform PI/V of Selected Tooling at Seller's facility annually and review tool history after each PI/V to determine whether tool performance has been such that subsequent periodic cycles can be increased, remain as scheduled or be reduced. Seller shall coordinate any deviations from the annual requirement through Buyer by initiating an E-SPaR and subsequently receiving authorization from Buyer's Program Management, e.g. F-16, F-22, C-130, etc. Seller shall receive deviation authorization only through PO revision.

11.6 Seller shall request from Buyer all necessary Tooling Tools to perform PI/V coordination to Control Media.

- * 11.7 Seller's digitization of Master Tooling or Tooling Tools is an acceptable alternative to Seller storing Master Tooling or Tooling Tools at Seller's facility for coordination activity. Digitizing data is a method of retaining the Master Tooling features for coordination activity. Seller shall use this digitized data to perform acceptance of features of Buyer deliverable Items. Digitized data does not require PI/V.

CAUTION: Digitized data is acceptable for this PO only. Seller shall verify that any additional purchase order for the same deliverable Item is to the latest revision for Master Tooling or Tooling Tools. Seller shall verify the digitized masters are to the latest configuration. When performing coordination or verification of a physical tool back to digitized data, applicable tolerances apply as if performing a tool-to-tool coordination. Tolerance requirements are illustrated in Part IV of this Manual.

12.0 TOOLING PERIODIC INSPECTION AND RE-VERIFICATION (PI/V) RECORDS

12.1 Seller shall maintain a record on all tools requiring PI/V. Such record shall list:

- Buyer-assigned tool number
- Buyer-assigned tool code
- Buyer-assigned part number
- Next PI/V recall date
- = Quality acceptance verification
- Control Media used, if applicable, shall be recorded in the PI/V record
- History of previous PI/V
- Date of PI/V
- PI/V check sheet (if applicable)
- Inactive tools

12.2 Upon Buyer or Buyer Representative's request, Seller shall present the PI/V record.

PART II

MANUFACTURED SPECIAL TOOLING- SELLER REQUIREMENTS

- * **1.0 GENERAL** – Part II of this Manual is applicable to all domestic and international Sellers that manufacture or rework ST and is in addition to requirements defined in Part I.

2.0 DEFINITIONS – “REDLINE TOOL DESIGNS” – “Redline Tool Design” is a tool design drawing made by Buyer or Seller which has modifications marked in red ink. Such modifications provide clarification to tool fabrication changes and are known as “Redline Tool Design” changes. The redline change to the drawing is made with the understanding that a formal release incorporating the redline change(s) will be forthcoming. Detailed instructions about “Redline Tool Design” requirements are set forth in PM-4053.

3.0 SPECIAL TOOLING INSPECTION AND QUALITY REQUIREMENTS

3.1 Seller shall comply with stress relief, annealing, and penetrant inspection operations in accordance with PM-4053. Seller shall flow the following instructions in purchase orders to their sub-tiers:

- Buyer identification number for Seller
- Buyer identification number for Seller’s sub-tier (if applicable)
- All applicable Buyer-imposed specifications

3.2 Unless otherwise stated in Buyer’s Build-to-Package (“BTP”), CMM, theodolite, photogrammetry, calibrated machine probe, and/or laser tracking are the only acceptable methods for contour verification, and are the preferred methods for hole pattern verification. CMM inspection is the overall preferred method for verification. Exception: if the CMM output data is such that the data is not electronically transmittable to a CATIA model for review, and/or calculations must be performed manually in order to

PART III

INTERNATIONAL SELLER REQUIREMENTS

1.0 GENERAL

- * 1.1 Part III is applicable to programs in which Buyer furnishes Seller with Items and/or material to support Buyer's BTP.

1.2 Fabrication requirements of ST, STE, and MKT by Seller or Seller's sub-tiers to produce Buyer-designed controlled Items and aircraft modifications, as specifically contracted by this PO, are defined in Part II of this Manual and controlled by PM-4053.

2.0 CONTROL OF SE, MTE AND STE

2.1 Receipt of SE – Seller shall return a stamped copy of SE receiver to Buyer within five (5) working days upon receipt of SE.

2.1.1 Maintenance and repair parts for SE – Seller shall requisition maintenance and repair parts for the SE provided as MSE from Buyer.

2.1.2 Modification of SE provided as MSE peculiar modification of SE – Seller shall receive a tool order, a peculiar modification kit and written Buyer authorization. Upon completion of modification, Seller will return the stamped off / approved copy of the tool order to Buyer.

2.1.3 Time Compliance Tech Order ("TCTO") modification of SE – Seller shall receive a TCTO modification kit and written authorization from Buyer authorizing Seller to install the kit. Upon completion of kit installation, Seller shall return a completed Letter of Certification ("LOC") to Buyer.

2.2 Receipt of MTE – Seller shall acknowledge receipt of the CPL by signing and returning the original CPL to Buyer.

2.2.1 Maintenance and Repair parts for MTE – Seller shall requisition maintenance and repair parts for the MTE from Buyer.

2.2.2 Modification of MTE – Seller shall not perform modification on MTE without prior written authorization from Buyer.

2.3 Receipt, Maintenance and Modification of STE other than MTE Receipt – Seller shall acknowledge receipt of STE, if any, by signing and returning the original CPL to Buyer within five (5) working days after receipt of STE.

2.3.1 Maintenance and Repair Parts – Seller shall requisition maintenance and repair parts for STE from Buyer.

2.3.2 Modification – Seller shall not perform modification of STE without prior written authorization and direction from Buyer.

2.4 Disposition of SE, MTE and STE – Seller shall request disposition instructions from Buyer when SE, MTE and STE become surplus or obsolete.

3.0 CHANGE AUTHORIZATION

3.1 Seller shall not rework or in any way alter control tools without prior Buyer written authorization with a revised CPL and tool drawings, if required, to rework and/or re-stamp control tools.

- * 3.2 Seller shall return to Buyer the stamped and signed Tool Rework Form (TRF) document and CPL.

4.0 TOOLING PRACTICES FOR BUYER-FURNISHED TOOLS – Category “A” tools are control tools that establish dimensions and features of production tools which control I/R and/or coordination points of other production tools. Seller shall use these tools as Control Media only to fabricate production and inspection tools. The following is a list of the affected tools:

- COMG – Component Master Gage
- FCGA – Facility Gage
- MSFM/TOFM - For contour only. Lines on MSFM/TOFM are for reference only and Seller may revise or add these lines to satisfy their production tool requirements without prior written authorization from Buyer.
- MSGGA – Master Gage
- MSPE – Master Plate
- PDSE – Production Samples (Tube)
- TOGA – Tooling Gage
- TOSE – Tooling Sample (Welded Tubes/Ducts)

Any tool identified by this PO and provided as a control tool

5.0 LISTINGS OF SELLER-FABRICATED/PROCURED ST OR STE

5.1 Seller shall establish and maintain a part list and tool list, by manufacturer's part number, of ST or STE fabricated or procured by Seller, as required by Buyer. Seller shall not include any Buyer-furnished ST or STE in the list(s).

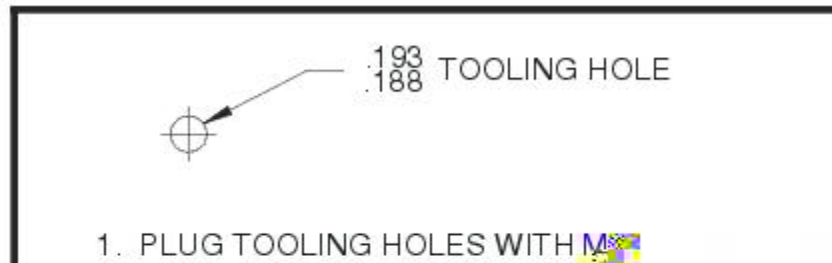
5.2 Seller shall produce and maintain listings of all tools required to fabricate Federal Identification Item Number (“FIIN”) spare Items.

6.0 DRAWINGS, SKETCHES, TOOL DESIGNS, ETC.

6.1 Seller shall maintain Seller-owned or Buyer-furnished current tool designs, sketches, photographs, and schematic drawings used in the fabrication, testing, or calibration of tooling. Seller shall provide a disposition of this data at the same time disposition for related tooling is given, as requested by Buyer.

6.2 Seller shall ensure Seller's STE drawings of any electrical, electronic, hydraulic or pneumatic type, at a minimum, consist of a schematic with component parts called out by characteristics and/or part number, including adequate calibration and operation instructions.

Figure 2. Tooling Holes Are .188 / .193 Inch Diameter



1. PLUG TOOLING HOLES WITH M...



Verify replaceable and non-I/R part perimeters produced with production trim tools or check fixtures have allowable production tolerances from a maximum of .030 smaller, to a maximum of .030 larger than the tool, relative to the engineering drawing applicable feature tolerance as illustrated in Figure 4 and 5.

Verify perimeters are plus or minus .030 tolerances, unless otherwise stated on face of drawing. Example: An E.O.P. dimensioned as $+0.015, -0.030$ from a F.S., W.L., B.L. would apply. A "Tab" dimensioned as $+ \text{ or } -0.010$ for overall width, would apply if stated on the drawing.

Utilize a check pin to verify all I/R hole patterns are made in accordance with the tool coordination tolerance table.

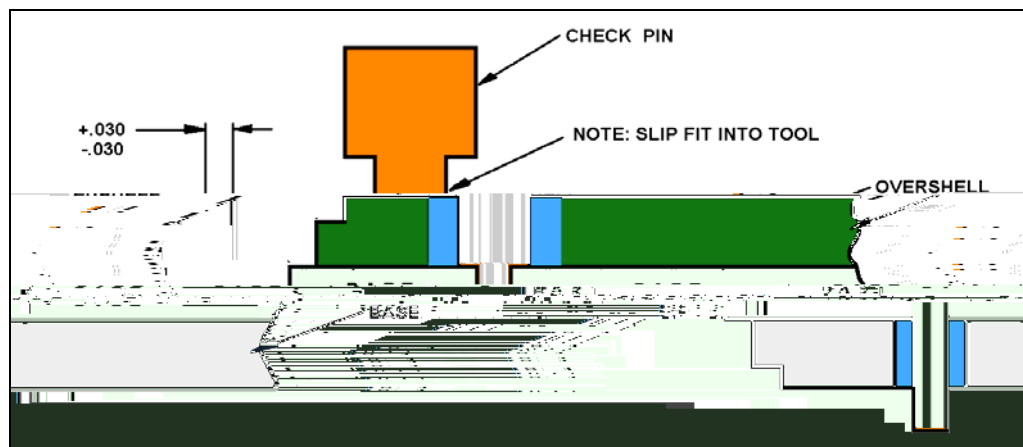
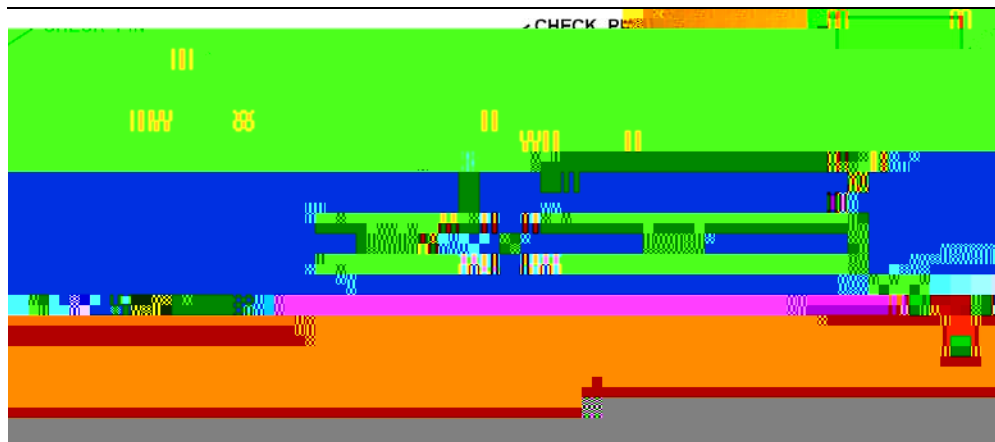


Figure 4. DOUBLE RAIL (REPLACEABLE, AND NON I/R, NET OR WITH EXCESS)



heat treat callout of RC 55-65 for pins with a diameter of .2500 or larger, and a RC 38-48 for pins with diameters smaller than .2500.

STEP PINS		
Nominal $+0.0001/+0.0004$ Nominal $+0.0000/-0.0002$ Nominal $+0.0000/-0.0002$.0005 Max	Transfer of Hole Pattern (New Make) Bushing I.D. Tolerance Lg. Dia. Pin Tolerance Sm. Dia. Pin Tolerance Concentricity	Nominal $+0.0001/+0.0006$ Nominal $+0.0000/-0.0002$ Nominal $+0.0000/-0.0002$.0005 Max
Nominal $+0.0001/+0.0010$ Nominal $-0.0000/-0.0002$ Nominal $-0.0015/-0.0020$	Cross Coordination / Coord. Check of Control Tools Bushing I.D. Tolerance Lg. Dia. Pin Tolerance Sm. Dia. Pin Tolerance	Nominal $+0.0001/+0.0010$ Nominal $-0.0000/-0.0002$ Nominal $-0.0020/-0.0025$

Table 2.0 Coordination Check of Production Tools

HOLES UNDER .250	STRAIGHT PINS	HOLES .250 AND OVER
Nominal $+0.0001/+0.0004$ Nominal $+0.0000/-0.0002$ Nominal $+0.0001/+0.0004$ Nominal $+0.0001/+0.0010$ Nominal $-0.0020/-0.0025$	Transfer of Hole Pattern (New Make) C/T Bushing I.D. Tolerance Pin Tolerance P/T Bushing I.D. Tolerance	

Nominal +.0000/-.0002 Nominal +.0001/+.0004 .0003	Additional Production Tool Tolerances O/D of Slip Bushing I/D of Slip Bushing Concentricity O/D to I/D	Nominal +.0000/-.0002 Nominal +.0001/+.0006 .0003
Nominal +.0000/-.0002 Nominal -.0010/-.0012 .0005 Max	Hinge Line Tool Tolerances Pins for End Hinges Pins for Middle Hinges Concentricity (end & middle)	Nominal +.0000/-.0002 Nominal -.0010/-.0012 .0005 Max

3.3 Seller shall utilize step pins, as illustrated in Table 3.0, to perform a verification check of production Items to production tools. Seller shall ensure the check-pin diameter is made to the low engineering range of the hole diameter being checked with the pin diameter tolerance as shown in Table 3.0.

Table 3.0 COORDINATION CHECK OF PRODUCTION TOOLS

HOLES UNDER .250	STEP PINS	HOLES .250 AND OVER
Nominal +.0001/+.0010 Nominal +.0000/-.0002 Nominal +.0000/-.0030 * .0005 Max	Coordination of Production Parts to Production Tools (Using Step Pins) P/T Bushing I/D Tolerance Lg. Dia. Pin in Tool Sm. Dia. Pin in Part Concentricity	Nominal +.0001/+.0010 Nominal +.0000/-.0002 Nominal +.0000/-.0030 .0005 Max

C/T - CONTROL TOOL P/T - PRODUCTION TOOL	I/D - INSIDE DIAMETER O/D - OUTSIDE DIAMETER
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3.4 Seller shall verify I/R tooling tolerances are as follows:

Master Tooling is net (nominal).

Master Tooling to production tooling for trim and contour is +/- .005

Production tool to production Item for edge and/or cutout trim is +/- .010, except replaceable edges, net or with excess, which is +/- .030, unless otherwise stated on the engineering drawings.

Production tool to production Item tolerance for contour is .000 to +.020.

Note: This tolerance is a tooling application which recognizes the engineering drawing tolerance of +/- .010, unless otherwise specified, for sheet metal Item

