Approver	Approver
Director of Quality	Executive Director of Engineering
David Rosenlund	Matthew McNutt

DANBRO TOOL & DIE

COMPONENT/CHILD, ASSEMBLY, / & CMM/CAR SET

INSPECTION FIXTURES GUIDELINES

Scope:

This standard applies specifically to check fixtures constructed for use at Danbro Tool & Die and its suppliers.This manual should be referenced when quoting, designing or manufacturing parts inspection fixtures for Danbro Tool & Die. Any deviation from these standards without written permission from Danbro Tool & Die, could result in the manufacture accruing the cost to modify or repair the inspection fixture to meet these standards.

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REFERENCED TERMS USED

D/C - Design change or engineering change
Assembly - Final assembly parts
Sub Assembly - Assembly Parts, but not the final assembly.
Component part - Individual stamped parts that make up assembled parts.

Printed, saved copies of this Fixture Specification are Uncontrolled.
For all Question during concept, design, and manufacturing phases please contact Danbro Tool & Die.

Change History

	Revision	Who	When	Details of Change
	000	Mircea Iordachescu	12-Jan-24	Initial Release

INSPECTION FIXTURE CONCEPT

MODEL:					
COMP					
PART NO#					
CHILD PART:					
PART NO#:	LEVEL	D/C LEVEL	REVISION	DATE	ISSUE

Notes: Fixture construction is to follow Danbro Tool & Die fixture standards, & any other OEM Standards

CONCEPT APPROVAL SIGN OFF AREA (USE INK ONLY)

APPROVAL	APPROVAL	APPROVAL	APPROVAL	APPROVAL	ISSUER

Notes:
1. Body line shall be marked on fixture at every 100mm.
2. T,B,H or X,Y,Z datums shall be identified on fixture.(For measurement).
3. All holes with general tolerances shall be marked by scribe line unless otherwise specified.
4. Model color: **TBD**
6. Gap or flushness shall conform to Danbro Tool & Die Group Std
7. Flush check shall have a minimum of 30mm flush surface.

OEM Asset information:

- Net Pads with clamps
- Removable 3.0mm Net Pads
- Templates 3plcs
- Removable Block

If the fixture concept is not customer specific, this would be the standard.

n

INSPECTION FIXTURE CONCEPT

MODEL: **TLAA**					
MOTHER PART: STIFF COMP ROOF PANEL					
PART NO# 62110-TLAA-A000-H1					
CHILD PART:	0	TLAA-F 597			
PART NO#:	LEVEL	D/C LEVEL	REVISION	DATE	ISSUE

Notes: Fixture construction is to follow Danbro Tool & Die fixture standards

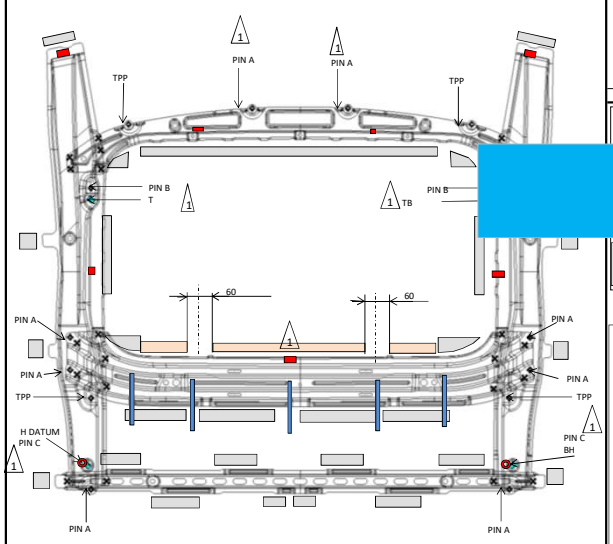
CONCEPT APPROVAL SIGN OFF AREA (USE INK ONLY)

APPROVAL	APPROVAL	APPROVAL	APPROVAL	APPROVAL	ISSUER

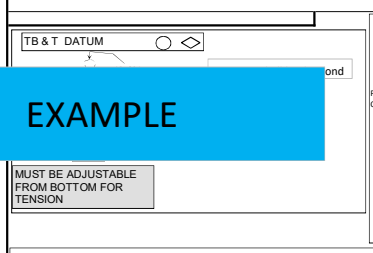
DESCRIPTION （記事）
1. Body line shall be marked on fixture at every 100mm.
2. T,B,H datums shall be identified on fixture.(For measurement).
3. All holes with general tolerances shall be marked by scribe line unless otherwise specified.
4. Model color: YR 39-80D 10GY8/2, Easy Green SW6450
6. Gap or flushness shall conform to Danbro Tool & Die Group Std
7. Flush check shall have a minimum of 30mm flush surface.

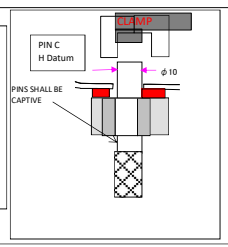
OEM Asset: The words **"PROPERTY OF HONDA"** must be ***permanently marked*** on to the fixture (***using an Danbro Tool & Die-approved method***) as part of our purchase agreement. Please address any questions with regard to this to your contact at Danbro Tool & Die.

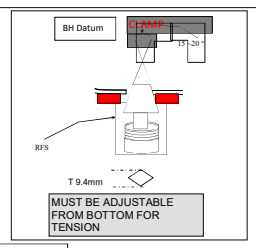
Net Pads with clamps
Removable 3.0mm Net Pads
Templates 3 plcs
Removable Block

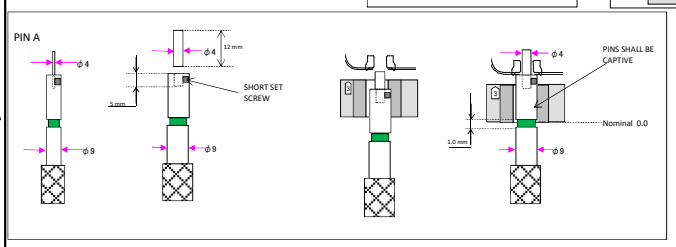


EXAMPLE









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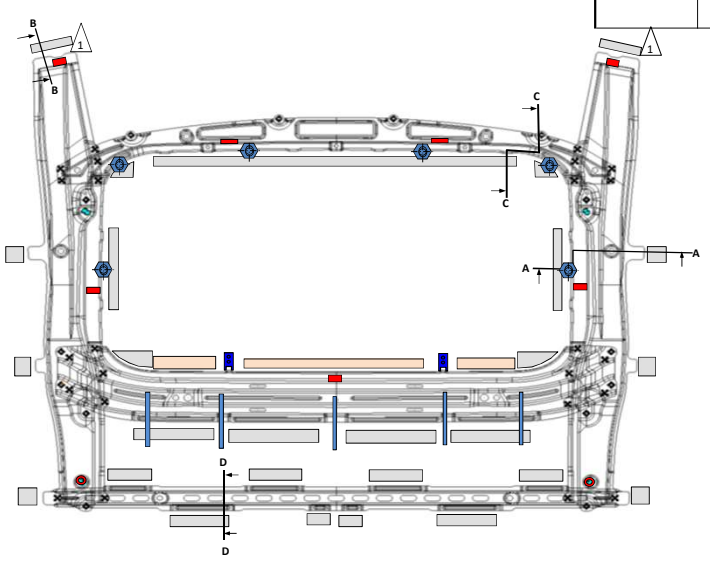

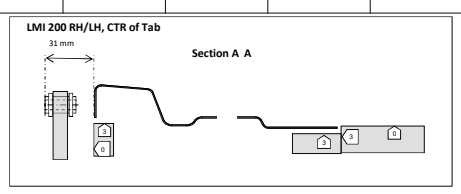

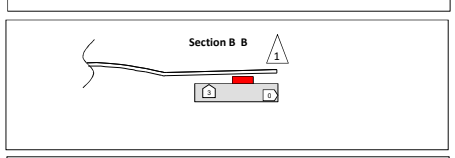

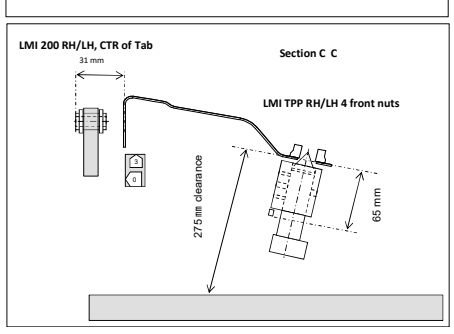

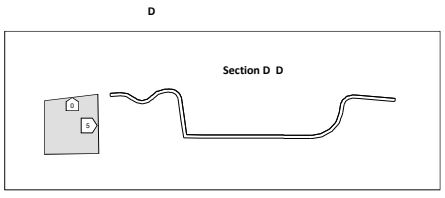

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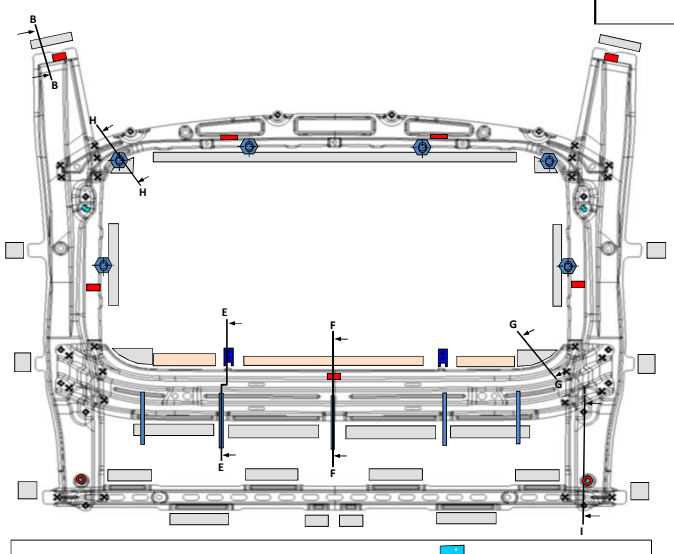

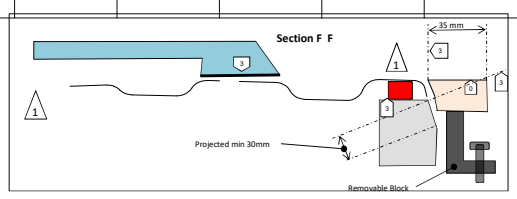

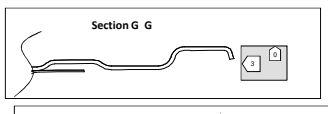

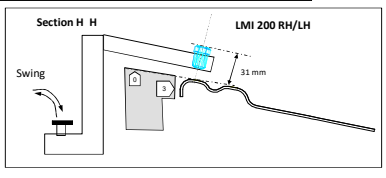

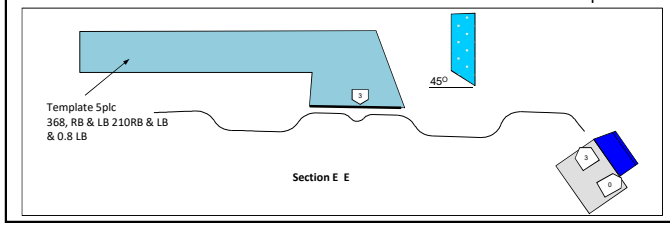

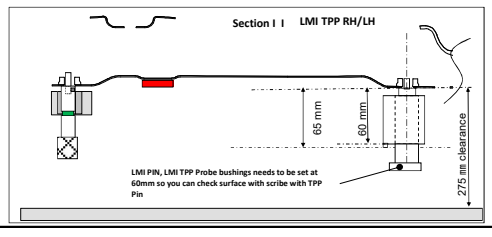

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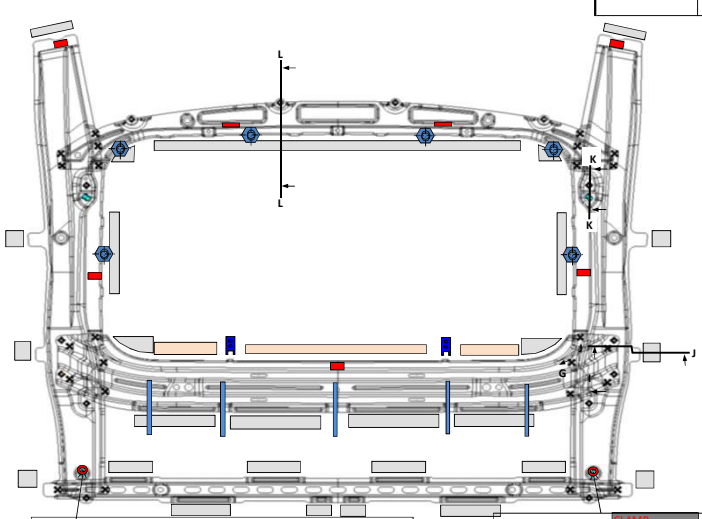

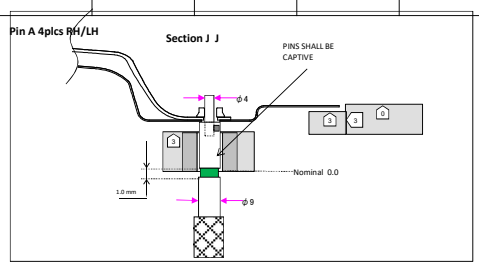

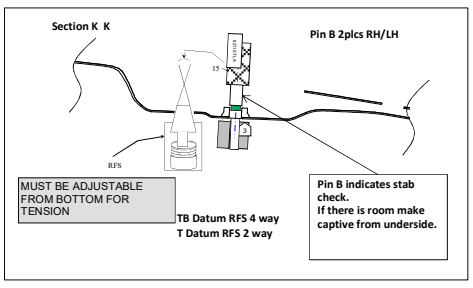

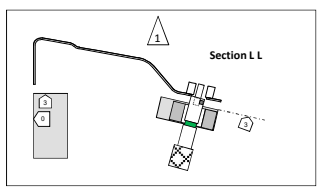

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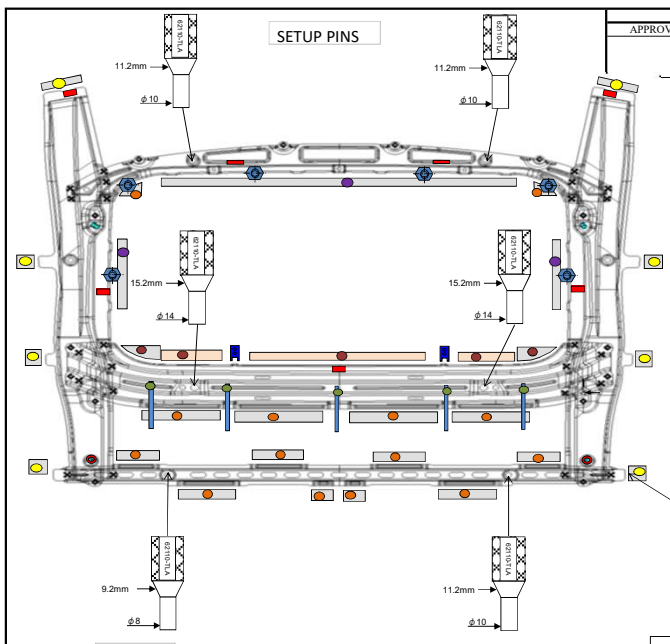

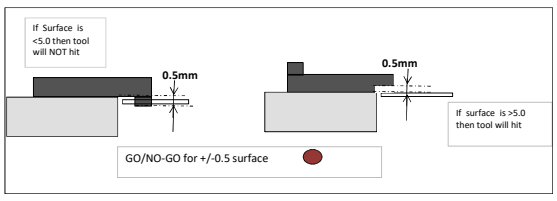

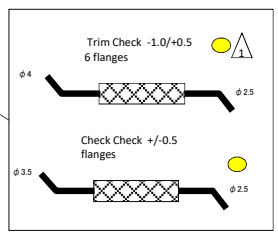

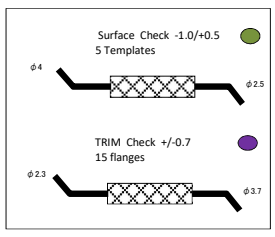

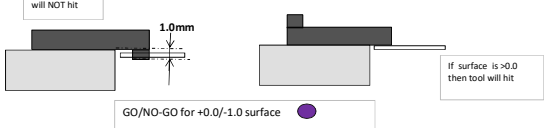

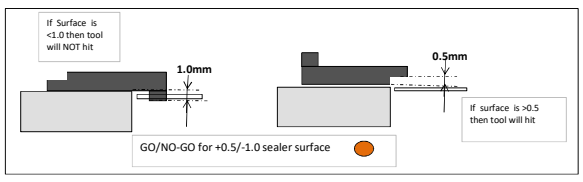

CONCEPT APPROVAL SIGN OFF AREA (USE INK ONLY)					
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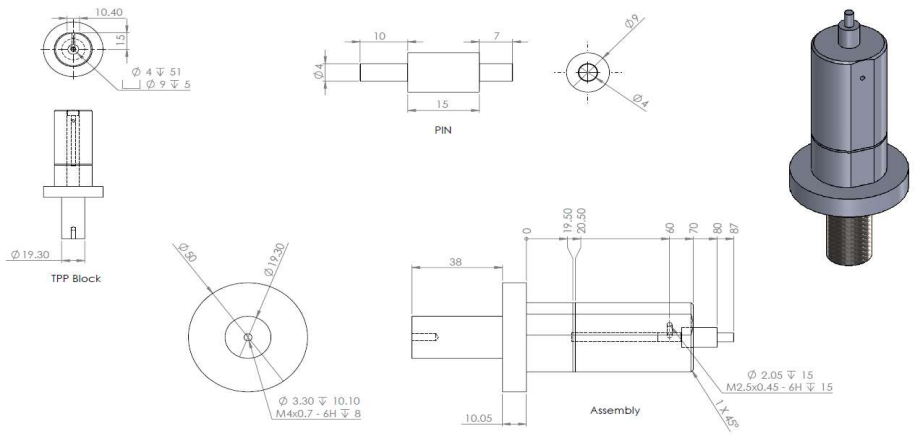
LMI TPP PIN



Design Review Check Sheet

DANBRO Tool & Die	**Part No.**		**Inspection by**		Manufacturer	Plant	Customer
	Part Name		**Manufacturer**				(N/A)
	Model		**Date**				

Inspection By	Pass / Fail	Check Points	Notes / Countermeasure
		Datums Match Customer Final Assembly Drawing	
		Datums Match Inspection Fixture Concept	
		Points are accounted for and match Inspection Fixture Concept	
		Template block accounted for match Inspection Fixture Concept (marked with 5mm gap stamped)	
		Check Pins accounted for with scribe lines	
		All True Position Probe Fit (check clearance)	
		All LMI Probe Fit (check clearance)	
		Height of the over all Fixture	
		Tooling Balls / Bushings / Set-Up Points and easy to access	
		XYZ (TBH) Base Plate Body Scribe Lines (100 or 200 mm increments)	
		Component part Set match Inspection Fixture Concept	
		Component parts pins I.D. (numbering system / color code) on fixture and pin	
		All loose details have storage and are I.D.	
		Tooling ball covers	
		Eye hooks present	
		Fork lift pockets needed	
		Flatness concerns	
		If LMI Data required easy of access for operation	
		All Customer specific Requirements are present	
		Property of Label / Tag attached	
		All swing units, templates, clamps, and pinch points are confirmed for safe operation	
		As applicable the design must include the cart, the cart must be rigid, and as per cart design requirements from this manual.	
		The design must includes all the attributes (various complete labels, all axes coordinates, weight, etc.…)	

NOTES:

Inspection Fixture Buy Off Check List

DANBRO Tool & Die	**Part No.**		**Inspection by**		Manufacturer	Plant	Customer
	Part Name		**Manufacturer**				(N/A)
	Model		**Date**				

Inspection By	Pass / Fail	Check Points	Notes / Countermeasure
		Datums Match Customer Final Assembly Drawing	
		Datums Match Inspection Fixture Concept	
		CMM Cert Data required at buy-off and all points within spec	
		Clear list of open items and closure dates if applicable	
		Points are accounted for and match Inspection Fixture Concept	
		Template block accounted for match Inspection Fixture Concept (marked with 5mm gap stamped)	
		Check Pins accounted for with scribe lines	
		All True Position Probe Fit (check clearance)	
		All LMI Probe Fit (check clearance)	
		Check the Reference Plate for the right information Part No#	
		Check the Reference Plate for the right information Part Name	
		Check the Reference Plate for the right information D/C Leave and Serial #	
		Check the Property of '…"Plate for the right information Customer Name	
		Weight Information	
		Mobility of the Inspection Fixture	
		Height of the over all Fixture	
		Tooling Balls / Bushings / Set-Up Points and easy to access	
		XYZ (TBH) Base Plate Body Scribe Lines (100 or 200 mm increments)	
		Component part Set match Inspection Fixture Concept	
		Component parts pins I.D. (numbering system / color code) on fixture and pin	
		Pin up the component parts (if are available)	
		All loose details have storage and are I.D.	
		Certification Data both end's of the tooling ball correct vector (completed)	
		Eye hooks present	
		Fork lift pockets are present	
		Inspection Fixture has been confirmed base for flatness in its nature state	
		Gage R completed	
		Fixture has a cart and is functional	
		All swing units, templates, clamps, and pinch points are confirmed for safe operation	
		"Safety" No pinch points between any clamps or moveable details	

NOTES:

GENERAL INFORMATION

1. Inspection fixtures should be designed according to the inspection fixture concept, (Page 4). A concept will indicates the location on the datum nets, inspection fixture check locations, feeler checks, component part set up locations or any other characteristic that needs to be called out for designing the inspection fixture. The Customer Specific Requirements related to Check Fixture Specifications to be considered as the primary guidance unless otherwise specified in the Danbro Tool & Die quote. All clamps and details shall be free of any " pinch points" that could result in a safety concern. Fixture maintenance is the responsibility of the supplying plant for program life. Fixtures are customer owned and must be appropriately protected from excessive environmental conditions.

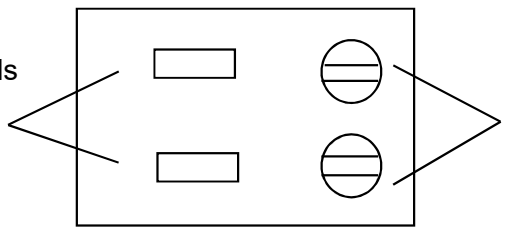
2. Danbro Tool & Die will provide the fixture manufacturer with nominal locations for the check points. Any areas that can not be checked because of interferences or any other issues must be discussed with Danbro Tool & Die before manufacturing the inspection fixture.

3. All Fixtures over 50 pounds must have a cart. The cart must be included in the quote.

4. 6-inch rubber casters (wheels) should be used unless otherwise specified. Two wheels should turn to allow the fixture to turn easier. All wheels should lock down to prevent the fixture from moving while it is in a stationary position. (see Example #1)

EXAMPLE #1:

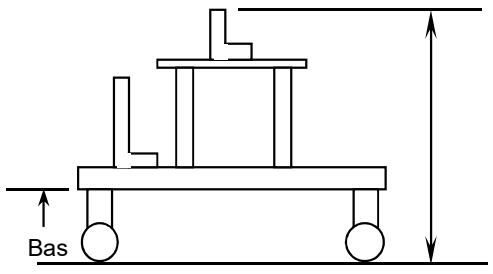
Non-Rotating Wheels
With lock down



Ability to Rotate
With lock down

5. Inspection fixture base height from the floor should have a max working height of about 762-889 mm. Height should be developed with ergonomics as a priority. It should be considered how far will the part have to be lifted to be set into the inspection fixture and how low the person inspecting the part will have to set to the floor to collect the data.
All fixture heights will be reviewed by Danbro Tool & Die at design review/buy off.

EXAMPLE #2:



Working Height
Max: 30 - 35 "

6. Design Changes should be tracked during the manufacturing of the inspection fixture. It is possible that a D/C could occur during the manufacturing process. Included on each inspection fixture should be a reference plate (Shown in the example below.) The plate should be attach to the base by (rivet or screw).

EXAMPLE #3:

MANUFACTURER NAME:		FIXTURE I.D.#:	
PART NO#			
PART NAME:			
DESIGN LEVEL:			
FIXTURE LENGTH SIZE MM	IF. CONCEPT LEVEL:	FIXTURE WEIGHT:	KG
FIXTURE WIDTH SIZE MM	MANUFACTURED DATE:	TOTAL WEIGHT INCL. CART:	KG
FIXTURE HEIGHT SIZE MM	REVISION RECORD:	DATE:	
PROPERTY OF:			

7. Inspection fixture instructions must be attached to the base plate.

*D/C Levels must be updated with fixture build so it is current when shipped.

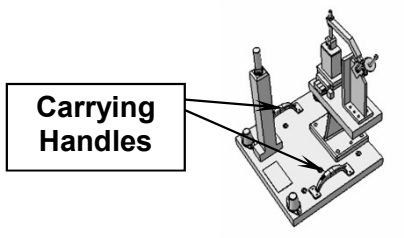
GENERAL INFORMATION (CONT'D)

8. Whenever possible the inspection fixture should be designed with the part set up in car position. Part set up direction will be defined on the Inspection Fixture Concept. If in car is deviated from approval from the OEM is required.

9. If the inspection is heavier than 50 pounds require swivel clevis type eyebolts at all four corners. In addition the eyebolts must have the load capacity to lift the maximum weight of the inspection fixture plus 25%. If the fixture exceeds 500 lbs refer to # 10 below.

10. Forklift pockets for fixtures over 500 lbs will be required on the fixture itself, not the stand. Stand must allow for access for forklift pick up, and deviate must be confirmed by the plant.

11 The comp inspection fixtures weighting under 20 pounds must have two metal handles so the fixture can be easily carried. The comp inspection fixtures weighting between 20 and 50 pounds must have four metal handles.
EXAMPLE #5



12 Each inspection fixture has a model specific color (as applicable). This specific color will be provided at the time of kick off and the inspection fixture should be painted this color. This usually a Sherman Williams color code no#.
Note: Only portions of the fixture require this color, base, riser, stand, not entire fixture, and definitely not the part or measurement surfaces.

COMPONENT PART (STAMPING) INSPECTION FIXTURES

13 Component part fixtures are to be assumed Aluminum, (Baseplate & part profile).
If Danbro Tool & Die would prefer, designed into their concept "pattern plank" type is still acceptable. (The purpose to using this material is for cost down (machine time / labor). As for details: datums, pins, nets, etc. (all wearing details) are required to be hardened steel. Under no circumstances should "Grey Fixture Plank" be used. This is easily broken and wears quickly.
Component part fixture shall conform to all other standards defined within this standard.
If the Plank will be over 24 inches it shall be supported by a baseplate of reinforced aluminum.

a Whenever possible the component part datums are assumed RFS unless otherwise specified by customer or in CF Concept.

b Go/Nogo stab pins used for hole position

c All trim tolerances with a GDT profile of 2.0 mm or less must have a feeler check. Feeler must be set at 10.0 mm nominal distance.
Component part trim Scribe lines, are assumed at 'MIN & MAX' for GDT Profiles greater than 2.0 mm

d Hole size to be confirmed by standard Go.NoGo pins

e Fixture concept will define feeler size based off facilities tolerance defined. Ball type are only used upon special required.

f If critical SPC are required, they will be called out on the inspection fixture concept.

* Holder blocks or holding clips for all stab pins/feelers are to be standard features for each gauge.

* All fixture tolerances defined in this spec apply to component part fixtures also*

BASE PLATE INFORMATION

1.0 Inspection fixture base plate flatness tolerance should be 0.1mm. The inspection fixture base design should be designed in a way that prevents sagging so that the 0.1 tolerance can be achieved. For gages with size over 25 inches the aluminum base must be reinforced. Base plates that do not meet these requirements may be rejected from use.

1.1 Base sizes larger than 1500 mm x 1500 mm are to be steel. Base sizes smaller than 1500mm x 1500 are to be fabricated Aluminum or " Wolverine " style cast Aluminum. Bases under 300 mm x 300 mm may be cast Aluminum or " Wolverine" style cast Aluminum. Bases under 300 mm x 300 mm may be cast Aluminum (>25.4 mm thick). All Machined surfaces must be between 70 and 100 micro-inch finish.

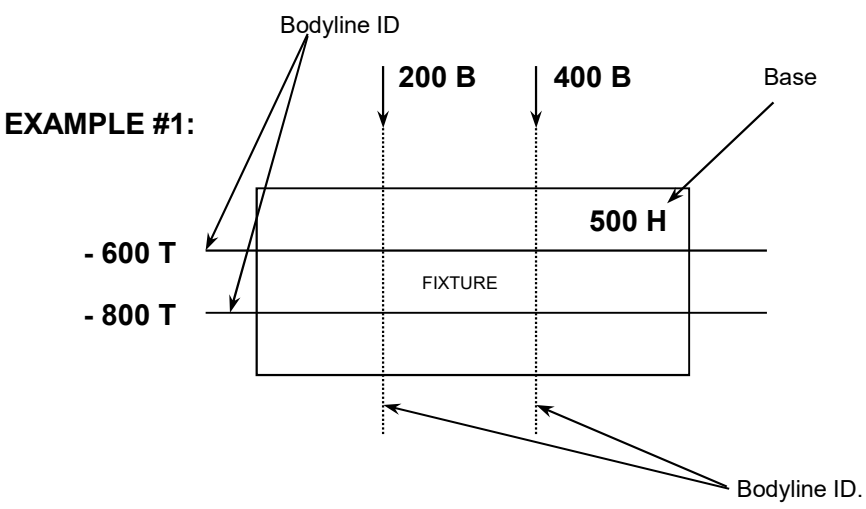
500 mmx 500 mm bases or larger, base surface must extend 200 mm beyond details.
Less than 500 mm x 500 mm, base surface must extend 100 mm beyond details.

No details or loaded parts may extend past the base edges when in open or closed pos.

1.2 Inspection fixture base plate flatness needs to be checked in its mass production state. Which would be on its stand/cart, or with its removable feet attached.

2 Base starting corner must be identified with all the axis identified (e.g. X/T=100, Y/B= 200, Z/H=300)

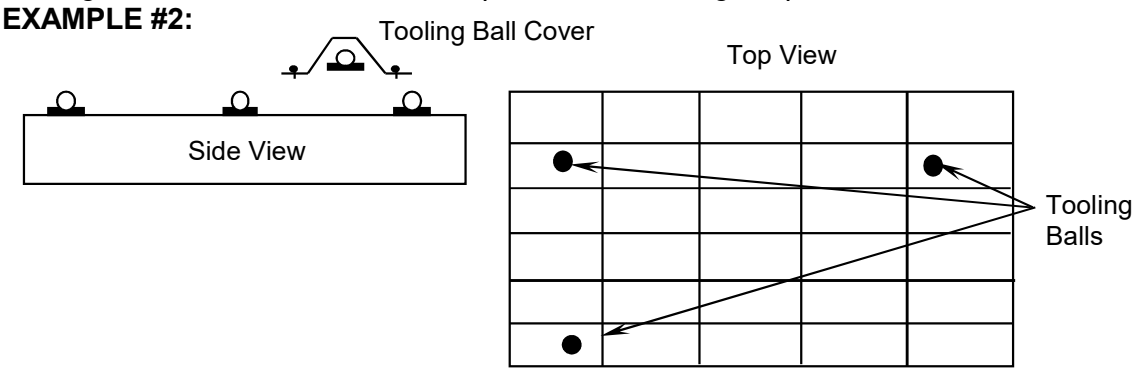
2.1 Body scribe lines should be identified on the fixture base and should be shown every 200mm or as per customer request, exception will be included in teh CF design. Body lines are defined using X/T,Y/B,Z/H coordinates (X/T,Y/B,Z/H). Please verify the assembly drawing to identify what coordinates should be used. (MUST BE STAMPED INTO THE INSPECTION FIXTURE BASE.)



3. Inspection Fixture Setup for CMM Verification

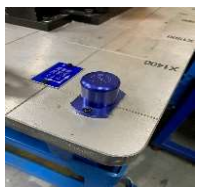
Option 1:
Three position tooling alignment balls are for set-up.
Tooling balls MUST have removable protective coverings to protect.

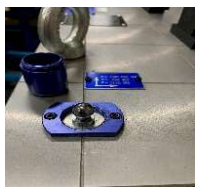
EXAMPLE #2:



Note: Plastic tooling ball covers are not acceptable, metal tooling ball covers required

ok	not ok



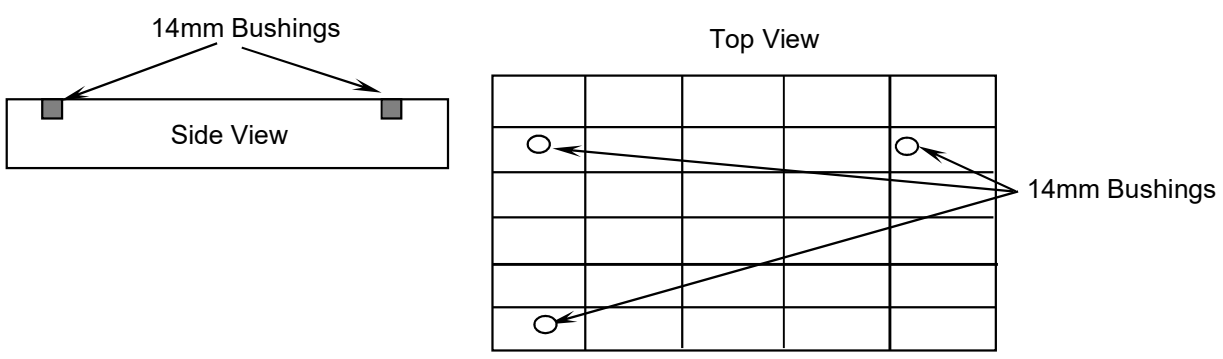
BASE PLATE INFORMATION (CONT'D)

3. Inspection Fixture Setup for CMM Verification (Continued)

Option 2:

Three position tooling alignment 14mm bushings are for set-up. The bushings must be protected on both side of CF base (as applicable).

EXAMPLE #4:

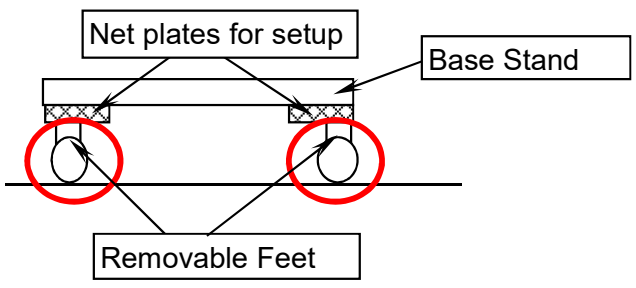


NOTE: Regardless of option used, all set up points must be put in a position that can be reached by CMM or portable CMM arm, and TBH (XYZ) locations stamped on the base plate.

4. All surfaces of the base plate, risers pins, etc. shall be rust proofed. If Aluminum determined to be used be cautious of the 0.1mm flatness specification, (rust proofed not required on Aluminum).

5 Inspection fixtures can have the ability to remove the feet/wheels directly from the base to eliminate the need for an addition cart. This type of fixture would remove the feet and be placed onto the CMM machine for verification.

EXAMPLE #6:



GENERAL DATUM'S AND NETS INFORMATION

(INCLUDING COMPONENT PART SETUP, page 6)

1. All datum pins and datum blocks are to be hardened. HRC 52-56.

2. All nets are to be attached to the fixture by screw and removable if needed. All nets MUST have clamps. Rubber tipped clamps are not acceptable and will wear down.

3 All primary location pins shall use MMC pin locators unless otherwise specified on the comp inspection fixture concepts. RFS pin can be used only if Danbro Tool & Die approves or as per customer request.

4 Secondary datum pins in some cases will be mounted on a slide unit to allow for the tolerance pitch. This slide unit should have the ability to pin at zero and also take LMI data to verify the pitch. If the component/child part is the same that locates the primary and secondary datum's this may not apply.

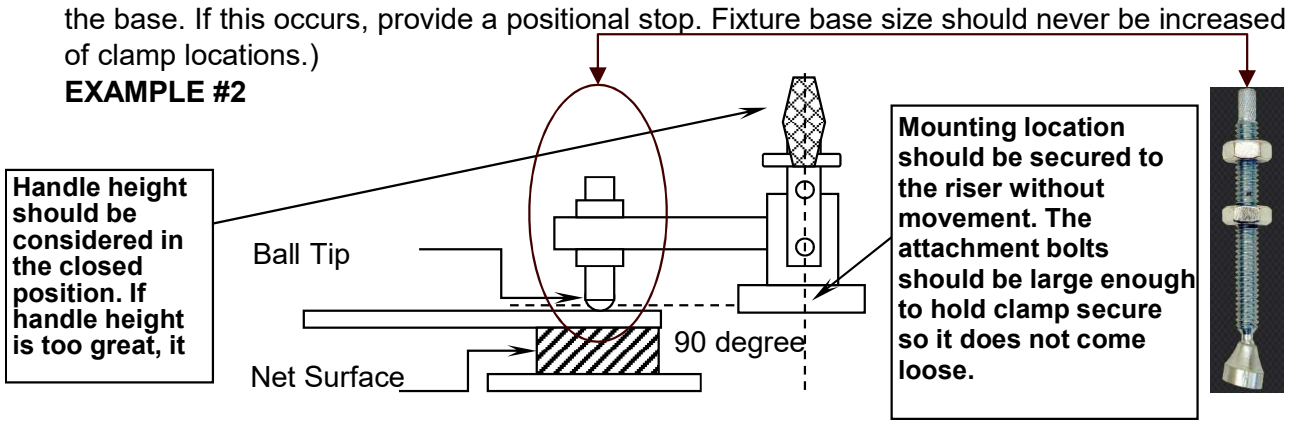
Note: If the pitch of the comp is not complex, or the customer does not required variable data a simple to control pitch to +/-0.3 would be having a stationary 2 way pin 0.6 undersize in desired direction.

5 For net surfaces Danbro tool & Die will provide the manufacturer with the nominal location and net size on the inspection fixture concept. Also to be specified if clamping will be used or not used. In most cases the net surface is called out on the final assembly drawing. All nets need to be on the fixture with one set screw minimum.

6 The clamp should be mounted 90 degrees from the surface of material. A ball or swivel flat metal tip should be used and the clamp should contact the center of the net surface. Rubber tips are not acceptable. This should also lock into position. The clamp should be located at minimum 20 mm distance from the fixture. All clamps to be numbered in sequence to the fixture instruction.

(Note: Stops should be added to prevent pinch points for safety reasons. Also no clamp should overhang the base. If this occurs, provide a positional stop. Fixture base size should never be increased because of clamp locations.)

EXAMPLE #2



DATUM & NETS TOLERANCES

7 Datum Pin and Net Location Tolerance, (Component, Assembly, & Car Set Stands)

Feature	Shape	Location Tolerance
MMC Pins		Location (+-0.05), Pitch (+0.1)
Spring loaded RFS pins		Location (+-0.05), Pitch (+0.1)
Net Surfaces	Flat	Surface Tol. (+-0.05)
Datum Pin (non-RFS)	Round / Tulip Style	Location (+-0.05), Size -0.1, Pitch (+0.1)

GENERAL COMPONENT PART SET PINS INFORMATION

"How to determine if the assembly fixture requires component part setup pins?"

A Rank Comp - (high complexity, high importance to body) "Yes, must have"

B Rank Comp - (med complexity, med importance to body) "Yes, but subject to plant discretion"

C&D Rank Comps - (low complexity, low importance to body) "Not required"

Comp Rank to be determined by customer or internal before quoting begins.

Assume Danbro Tool & Die require, although Danbro Tool & Die concept can over turn if not required.

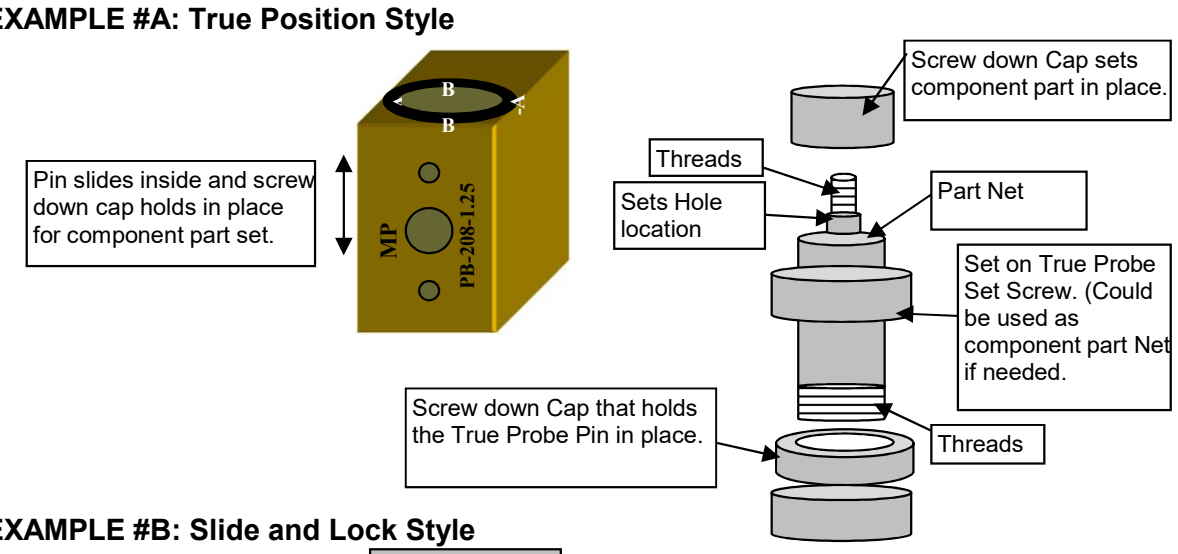
1. Component part set up location will be specified on the assembly inspection fixture concept. Component part setup locaters can be any of the following styles unless otherwise specified on the Assembly inspection fixture concept. Designer should choose applicable style.

2. Include a Road Map for component part set. With all component part set pins, nets, and blocks need be to be I.D. so they can be matched to the correct with numbering system AND/OR color code.

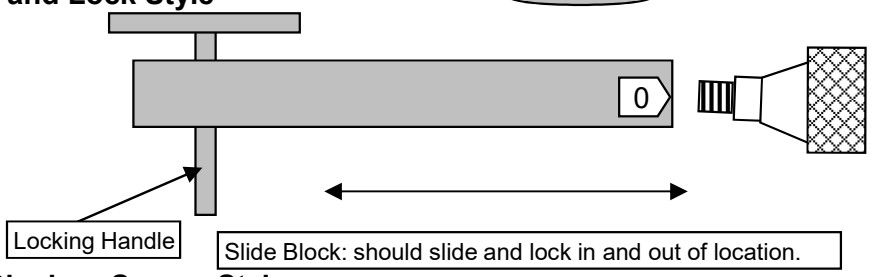
3. All threaded pin need to be removable. They can not stay on the fixture. There is to be no threads on the fixture, (on pin Only).

4. Component part sets need to be stored in a plastic box. That is screwed to the base plate. With the fixture comp number on the box. Example would be a (OtterBox 2500 or 3500 in black) There maybe more then one box per fixture.

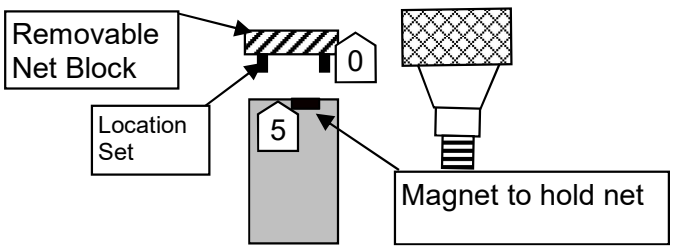
EXAMPLE #A: True Position Style



EXAMPLE #B: Slide and Lock Style



EXAMPLE #C: Net Block or Spacer Style



FIXTURE BLOCKS, PROFILES, SPC POINTS, & PINS

1. Swing blocks are to be stable in the locked position. There should be absolutely no movement while in the locked position. Swing blocks should also include a positive stop for set position, Pin should not hold the weight of the swing block.

2. Swing blocks must be secure when placed into the upright position. This is a safety related concern.

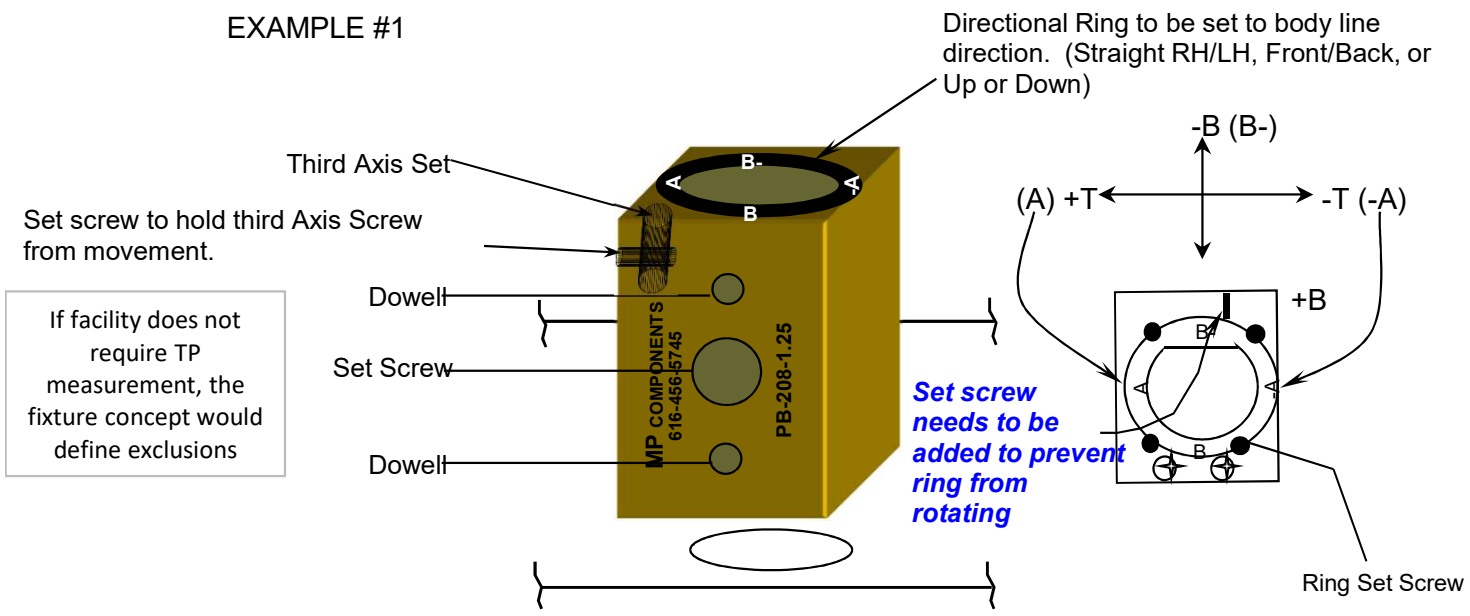
3. As applicable any weldments require stress relieving.

4. Swing arms weighing is excess of 10 lbs must be controlled by air or gas shock. This is a safely related concern.

5. Swing block pins and bushings must be made with hardened steel. HRC 45~50. Positive stop blocks and any metal to metal contact points must have hardened steel at the points of contact to control excessive wear. Rockwell HRC to be 45~50.

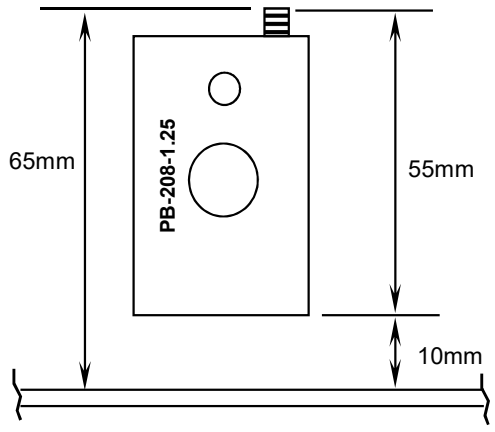
6. All LMI Probe Blocks are to be set for three-Axis, (T, B & H). (Unless otherwise indicated on the comp inspection fixture concept) Blocks are to be mounted by using the two hard dowel holes and single holding screw.

EXAMPLE #1



7. All LMI Probe Blocks are to be the PB-208-1.25 Model **FROM LMI ONLY**. Blocks are to be set at 65.0mm.

EXAMPLE #2:

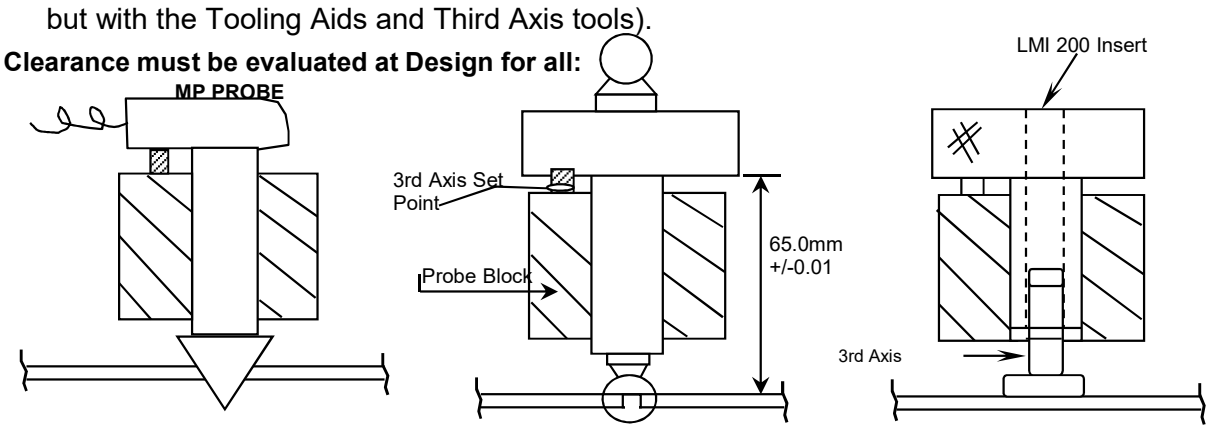


The PB-208-1.25 LMI Probe block can be modified if clearance to part is insufficient. Modifications to block needs to be approved by Danbro Tool & Die.

FIXTURE BLOCKS, PROFILES, SPC POINTS, & PINS

8. Probe Block needs to be placed in a position for enough clearance for the Datamyte gauges, Third Axis measuring adaptor, and tooling aids. (Most interference problems are not with the True Position Probe, but with the Tooling Aids and Third Axis tools).

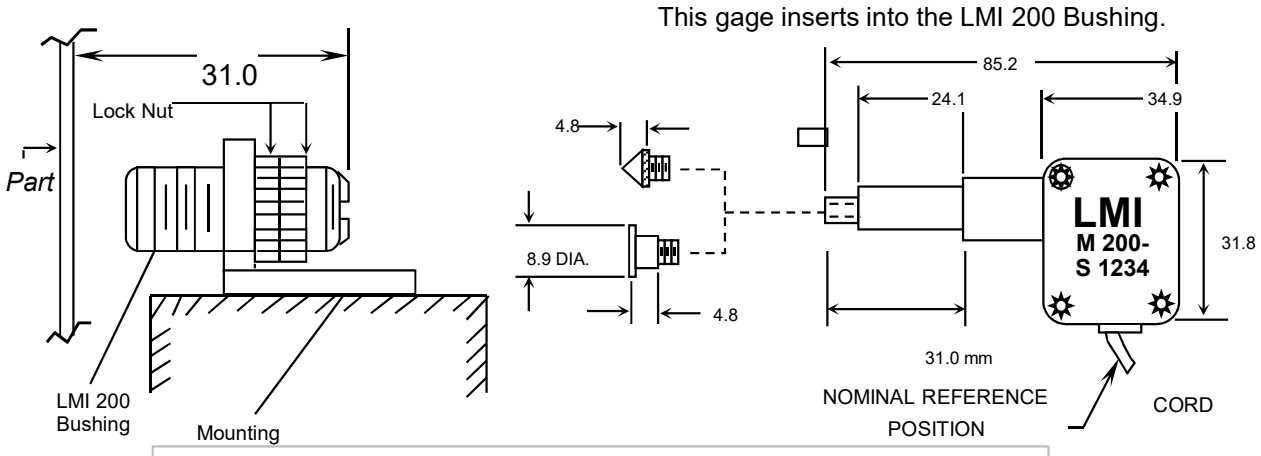
Clearance must be evaluated at Design for all:



True Position probes must include wireless and standard hard wire.	Certification Tooling Aid,	3rd axis set with LMI 200 probe

9. LMI 200 Bushing is to be mounted by means of the designed holding bracket, or placed into template. Locking nuts are to be used to lock the bushing into place. If locking nuts cannot be used, other ideas need to be approved by Danbro Tool & Die.

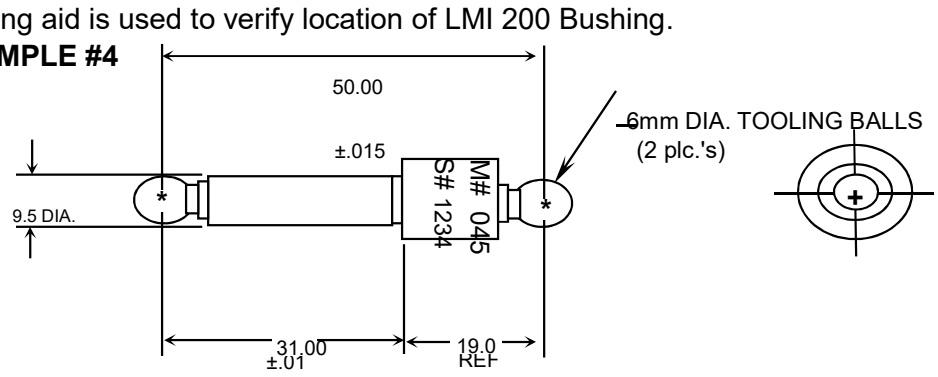
LMI 200-SB is used to measure surface location.
This gage inserts into the LMI 200 Bushing.



LMI 200 probes must include wireless and standard hard wire clearance.

10. Tooling aid is used to verify location of LMI 200 Bushing.

EXAMPLE #4



11. If the plant requires variable data it is assumed that Zero blocks will be required on the fixture. Here are a few examples: LMI True Position, LMI 241, and LMI 200.

EXAMPLE #5

True Position

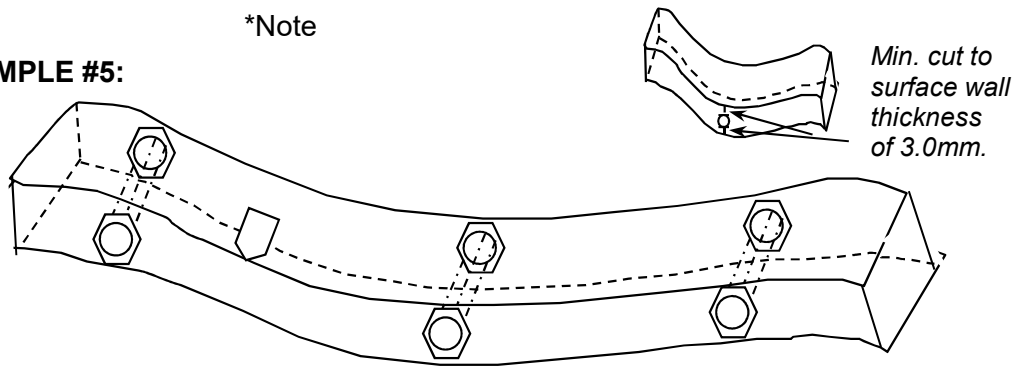
LMI 241

LMI 200

BLOCKS, PROFILES, SPC POINTS, & PINS (CONT'D)

12a LMI 200 inserted into surface profile template block.
NOTE: For gap requirements, refer to Assembly Inspection Fixture Concept.

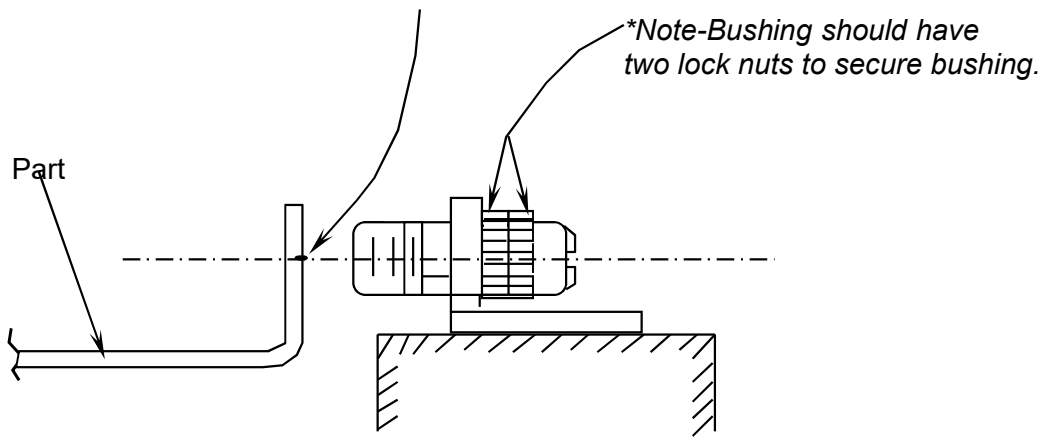
EXAMPLE #5:



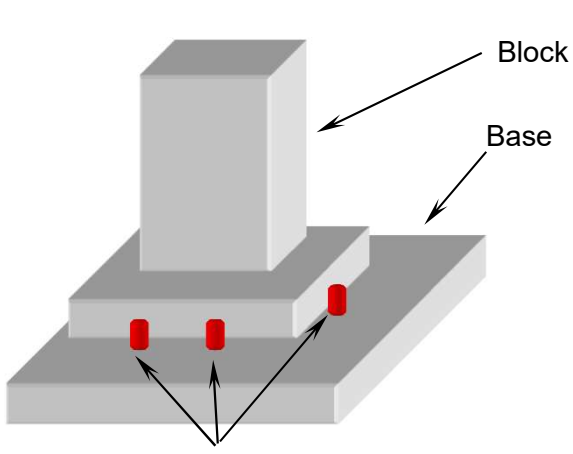
12b Flush check shall have a minimum of 30mm flush measurement surface.

13 All LMI checkpoints are to be positioned to touch at center point of weld flange. If center point cannot be checked, other location must be approved by Danbro Tool & Die.

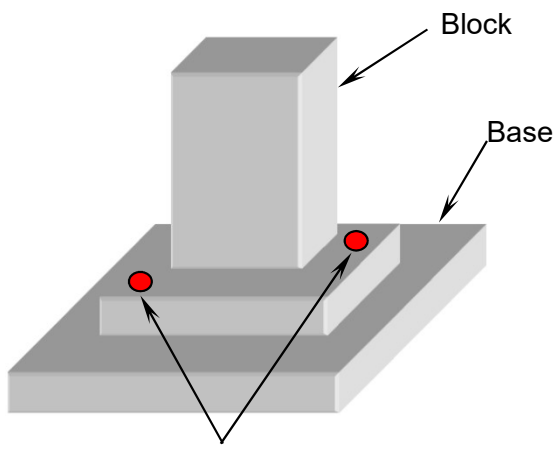
IMPORTANT: STAY OUT OF RADIUS OF PART AND WELD POINTS.
EXAMPLE #6:



14 Dowel pins for holding accuracy of fixture blocks are to be set as followed:
EXAMPLE #7:



Dowel pin locations to be ***outside*** of the Block



Dowel pin locations to be ***inside*** of the Block

15. All stab pins must have bushings. Pins and Bushing to be hardened. HRC 45~50.

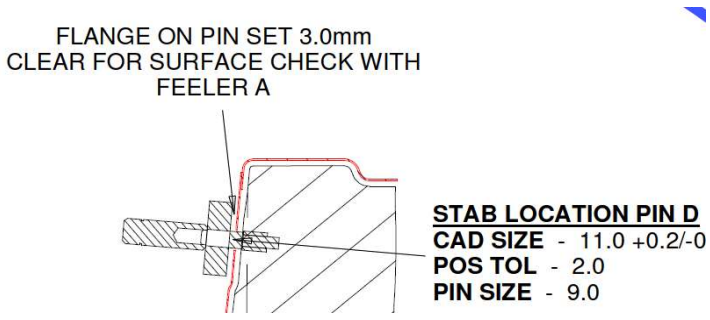
BLOCKS, PROFILES, SPC POINTS, & PINS (CONT'D)

16. All pins, nets or any other loose items on the inspection fixture should be provide with a toolbox mounted on the inspection base, or be tethered to the fixture. These items should be color coated and I.D. stamped in some way so it can be easily identified the placement location.
Note: If tethered a swivel to each end should be attached to prevent binding or kinking. A storage hole or area should also be provided.

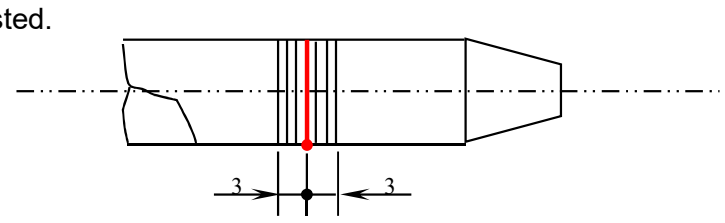
17 Feeler gauges must have a machined dimple painted to match the surface/trim location and stamped an unique ID in alpha/numeric character (second option of colored tethers to match the profile should only be used if the plant approves).

18 Stab pins are to check position and surface. See example below. To check surface a feeler would be applied around the large pin diameter. This is default unless determined otherwise by the plan fixture concept.
.

EXAMPLE #8:



17. Other methods of pin surface check are shown below and should only be used if Danbro Tool & Die concept has requested.
EXAMPLE #9:



18. No details on the inspection fixture can have use shims to meet the required location tolerance.

19.

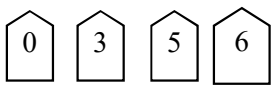
FEATURE	SHAPE	LOCATION TOLERANCE
Surface Templates	Surface Profile	Location (+-0.1)
Stab Pins		Location (+-0.1)
True-Position Blocks		Location (+-0.1)(X,Y,Z)(T,B,H)
LMI / SPC port		Check location (+-0.1)(position location +-0.2)
LMI 241 Block		Check location (+-0.1)(position location +-0.2)
Component part Set Pins		Location (+-0.1)

20

FEATURE	SHAPE	LOCATION TOLERANCE
Trim feeler	Surface Profile	Location (+-0.1)
Surface feeler	Surface Profile	Location (+-0.1)
5 (6)mm Gap 	Surface Profile	Special request as per Fixture Concept
3mm Gap 	Surface Profile	**Standard Trim and surface profile are 3mm**
"Zero" Gap 	Surface Profile	Special request as per Fixture

Note: Where drawing tolerances are less than 0.5mm range, standard gauge tolerance are to reduce from 0.1mm to 0.05mm.

21 Gap standard should be indicated on areas that are designed with a controlled gap. Use the symbol (See example below) to indicate a gap check area. See Inspection Fixture Concept for proper gap. These must be stamped onto the fixture. Stick on labels or decals are not acceptable. These features could also be scribed permanently as well.
NOTE: Tolerance bands below 1.0mm require a 3mm Gap, above 1.0mm are to be 6mm Gap

EXAMPLE #4 

22 If the customer does not have any requirements for feeler gage color identification the following should apply with the plant approval:

Blue +/- 1.0
Red +/-0.50
Green +/-0.25 (to be made with a larger diameter, so that the operator cannot use the wrong feeler for the tighter tolerance areas).

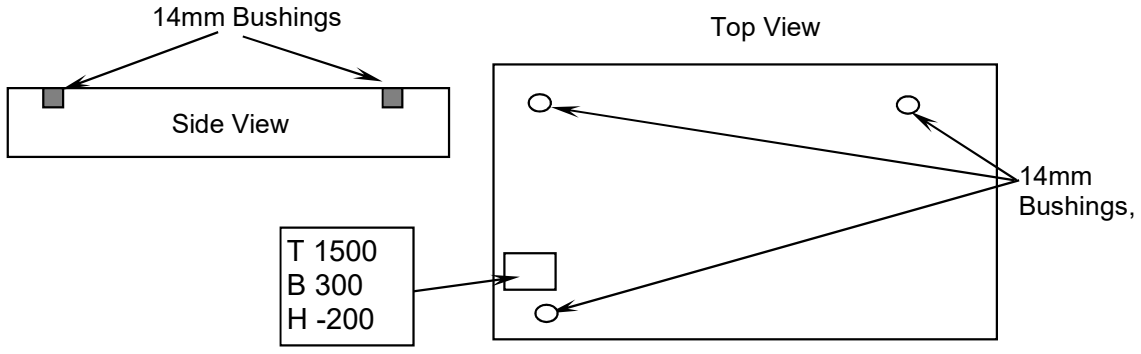
GENERAL INFORMATION ON CMM / CAR SET UP STANDS

1. Car set stands can be used for CMM measurement, and evaluation multiple Assembly part fit. The use of multiple stands will simulate the full car body set up results. Based off business awarded will define if mating parts and Car Set Stands are required. A concept will be provide at the time of quote if these are required.

2. For Datum and Net accuracy locations, please reference the section under Assembly inspection fixture accuracy.

3 The same as Assembly inspection fixture a model paint color will be assigned to the stands, this will also be provided at the time the business is awarded.

4. Three position tooling alignment 12 or 14mm bushings should be use for set-up. Also part must be labeled beside bushing. (This must be stamped on a plate or directly in the base)



5. Minimum number of CMM touch points per geometric feature:
   Plane - 4, Diameter - 4, line - 3, cylinder - 8
Nets must have minimum of 4 points
LMI/SPC points must be verified at both part contact point and 31 mm distance

NOTE: All set up points must be put in a position that can be reached by CMM or portable CMM arm.

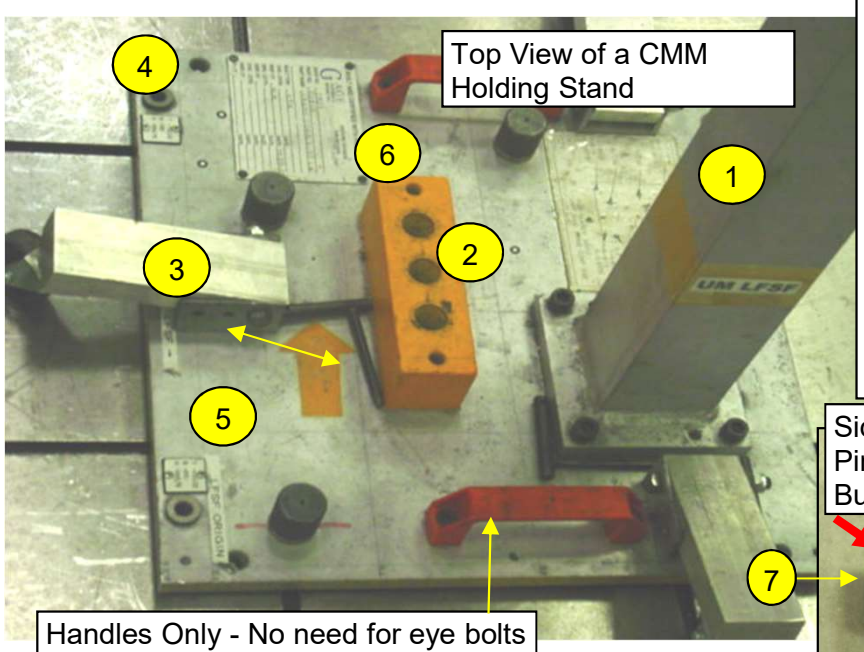
CMM / CAR SET UP STANDS DESIGN OPTIONS

5. See 2 Examples below for reference:
   Option 1: Use L pins to locate the plates to the base/CMM table, and screw down pins to hold them down, (L pins and Screws to be provided with the stands)
   Option 2: Use Grid table set pin style, (Set pins to be provided with the stands).

EXAMPLE 1 OF CAR SET / CMM STANDS ON CAR SET TABLE.

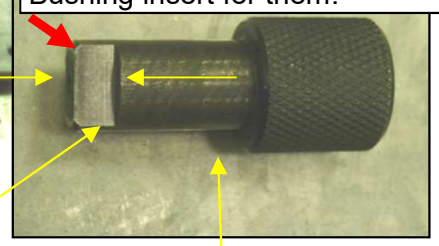
STANDS SHOULD BE DESIGNED TO FIT ON THE TABLE AT THE SAME TIME. (CLEARANCE BETWEEN STANDS)

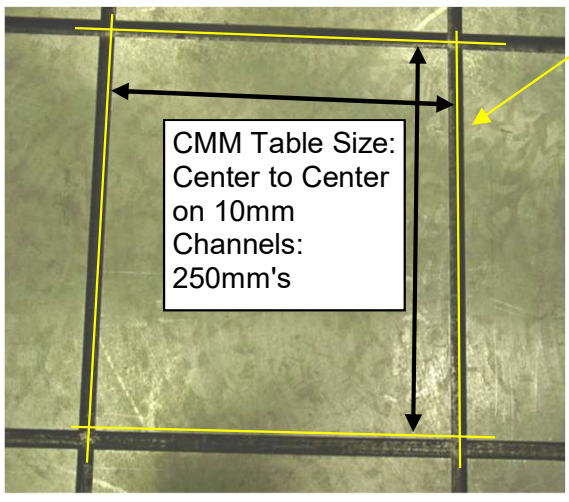
EXAMPLE 2 OF CAR SET / CMM STANDS ON CMM TABLE

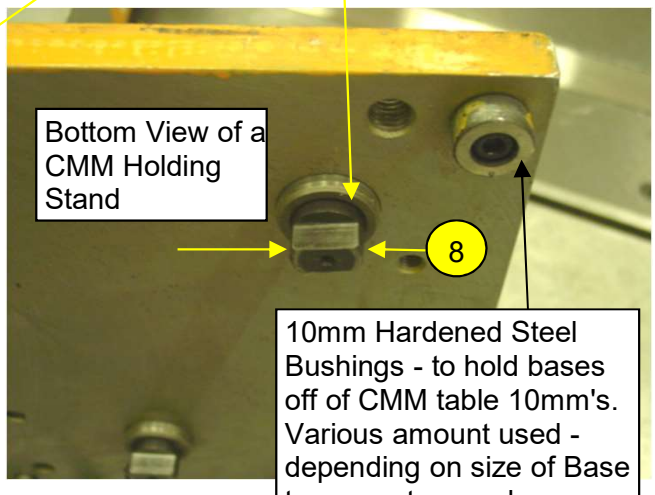


1. Aluminum Riser.
2. Block to hold table pins.
3. Attached wheels with brackets to allow stands to be raised up off of table and moved easily. Removable pins to hold in down position. #of wheels dependent on size of bases. (Over 60lb need wheels)
4. Steel Hardened Alignment Bushings with TBH coordinates. 3 per stand.
5. Steel Base.
6. Label Plate.
7. 8mm depth for pin insertion into CMM table. Add a 1mm, 45degree chamfer to bottom edge (red arrow).
8. 20mm Diameter.

Side View of a CMM Holding Stand Pin - 3 per Stand. Hardened Steel Bushing insert for them.







CONDUCTING BUSINESS WITH DANBRO TOOL & DIE

STEPS IN THE DESIGN, BUILD, AND BUY OFF

STEP 1: Danbro Tool & Die to issues a concept to the fixture manufacturer only if a fixture concept it is required by the customer. If the Customer does not require a check fixture concept, the fixture manufacturer will base the CF design on the part drawing, Customer Specific Requirements and this manual.
(Note: It is Danbro Tool & Die to have a minimum of 3 fixture manufacturers quote, so please submit your best price.) However price is not always the final decision in deciding maker layout. Past experiences play a big role in deciding: Meeting completion targets, quality of the inspection fixture, and communication during the manufacturing process. (Keeping track of the project status).

STEP 2: The final development dwg will be issued to Danbro Tool & Die, and the initial GO release for design. This will be the final quote before the maker layout is set. You will be notified of the final status of your quote. There will be no chance to re-quote a better price, so give your best quote.

STEP 3: Once the final quotes are received a tentative maker layout will be set. Danbro Tool & Die will define which fixture maker receives award, and than the fixture manufacture will be notified.

STEP 4: Our customer will give Danbro Tool & Die final approval for design, than a sign PO will be sent to the manufacturer to begin design. Once the design is completed, the fixture manufacturer must notify, and send the design for approval. Danbro Tool & Die is the only facility that can approve the design.

STEP 5: Once design approval is given, the manufacturer will be notified by email to proceed with the build assembly, and verification of the fixture. Completion timing also will also be confirmed.
(NOTE: IF A DESIGN CHANGE IS ISSUED AFTER A GO HAS BEEN GIVEN FOR DESIGN OR BUILD. PLEASE QUOTE CHANGES SEPARATELY IF THERE IS ANY COST IMPACT.)

STEP 6: Danbro Tool & Die may visit the manufacturer for a buy off.
(For Assembly & Component parts), if parts are available in advance they will be brought to complete a part set in the inspection fixture to confirm any Interference points, all checkpoints are accessible, datum's hold part constantly, manufacturer to complete GRR, etc. If parts are not available at that time this must be completed asap as to set direction if open issues occur prior to final buy-off.

FIXTURE VERIFICATION

1. Inspection Fixture verification data should include the following items

a) Inspection date

b) Inspectors name

c) Proof of lab ISO17025 accreditation

c) CMM inspection standards, measurement data, and error (Include Road Map)
(CMM print out can be used, but numbers must correlate with illustration.)
All location pins, True Position Block, LMI Bushing, holes, trim lines and mating surfaces must be verified.

d) The Inspection Fixture verification data needs to be in an order that makes sense, For Example:
1. Datums 2. True Positions block 3. LMI Bushings 4. Component Part Set Pins
5. Templates 6. Flatness of Base in nature state

e) Define Inspection equipment used on report
– Machine type
– Manufacturer
– Machine accuracy
– Last calibration date on machine

f) Gauge R data if applicable/available

2. Physical Fixture should be delivered by the manufacturer to Danbro Tool & Die after the shipping evaluation and buy-off is completed. The Catia data , drawing and instructions (soft copy and on the fixture) must be sent with the fixtures.
Fixture verification data listed above should also be delivered at this time also.

3. Danbro Tool & Die uses the top of the inspection fixture base and both alignment lines or tooling balls to check and verify all important areas on the fixture. ALL PINS, FEATURES OR ANY OTHER ITEM USED TO CHECK THE PART MUST BE WITHIN THE CMM/SET-UP POINTS.

4. Gauge R&R must be completed before shipping the Inspection Fixture, (Manufacturer responsibility). If no parts are available, the Gauge R will be completed at Danbro Tool & Die ASAP.
Note: The Manufacturer is responsible to achieve an acceptable GRR prior to full buy-off.
Requirements:

1. 3 associates, 10parts, 10 time. 10% maximum tolerance error Acceptable
2. 10-30% must be evaluated for improvement, and discussed with Danbro Tool & Die/OEM Customer.
3. More than 30% it is unacceptable, the CF it is rejected and must be improved.
Danbro Tool & Die will define the critical points for GRR and communicate to manufacturer.

5. In Preparation for Buy off, please review our check list requirements.

QUOTING INSPECTION FIXTURES WITH DANBRO TOOL & DIE

1. Danbro Tool & Die will provide the manufacturer with a inspection fixture concept. This will indicate the approximate size of the part and all the check points on the inspection fixture.

2. Danbro Tool & Die will provide the manufacturer the timing when the inspection fixture will be needed. This should be indicated on the quote.

3. All Fixtures over 50 pounds must have a cart. The cart must be included in the quote.

4. Carefully review items on modified inspection fixtures. Once quoted in most cases, this is the final cost. If a mistake is made on the quote, because of missed items, this may be determined to be the manufacturer's responsibility.

5. Please include shipping cost on the quote.

6. Provide a break down on the quote. Example: design cost, build and assembly cost, verification cost, shipping cost or if multiple models are being added at the same time, split the cost on these items also. This will make it less time consuming when Danbro Tool & Die has to complete a tooling change sheet that is required by our customer.

7. Fixture maintenance is the responsibility of Danbro Tool & Die for the program life.

MANUFACTURING GUIDELINES

All fixtures shall be built to math data and GD&T

Note: Any unclear issues need to be clarified by Danbro Tool & Die before proceeding with building the fixture.

All inspection fixtures, fixture concepts, and actual design of inspection fixtures need to be approved by Danbro Tool & Die before the manufacturer can proceed with the building of the fixture.

Make sure all information on a concept drawing is clear.

A detailed build schedule must be submitted after job is granted to Fixture maker.

A week by week follow up should be provided to Danbro Tool & Die.

LESSONS LEARNED

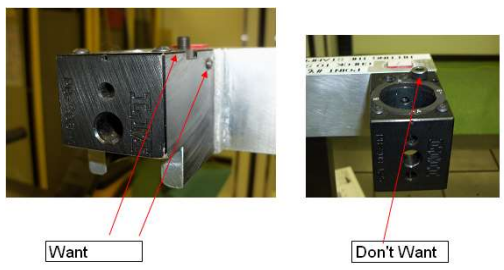
1. Design should be reviewed utilizing full 3D CAD data, 2D Drawings are not acceptable.
2. Component part set ups are used on assembly and sub assembly inspection fixtures. This means Danbro Tool & Die will assemble the component parts in the inspection fixture. In the past there has been many cases of component part pins interfering with other parts or can not swing a block into location because of pin interference. These items should be verified at during design.

3. Block clearance concerns with True Position probes and Third Axis probe interfering with other blocks when trying to be inserted into the true position check block. This need to be verified also during design.

4. Third axis screws missing after inspection fixture arrives, but third axis accuracy data is present on the verification data. Must set third axis screws to correct location.
5. No road map to indicate where points on the inspection fixture verification data are check. This make the recertification process that is required by our customer verify difficult. A illustration or reference to the inspection fixture concept should be included in the verification data.
6. Forklift pockets too close or too far apart to be used. In some cases missing altogether.
7. SPC (LMI 200) checks or template blocks designed to the incorrect side of material. Nominal for design side used when opposite design side is checked.
8. Component part pins not holding the part tight to the net (Pin threads not long enough, pin bushing bottoming out inside the screw bushing, or pin taper hitting on the net block to early to set the part are some of the issues.

9. Swing arms to have stops to avoid injury to employees or fixture. Swing arms that are large not having some kind of shock system to prevent large blocks from falling and causing injury to employees.

10. All Datums need to be held with a set screw, or bolt. They should not be loose on the Fixture
11. All True Positions block need to be Third Axis Set with set screw to held the third axis screw from movement



12. All True Positions block need to be from LMI not made in house

Modatek
Nominal Go NoGo feeler gage for profile (form), ball style = 6.0 mm
Nominal Go NoGo feeler gage for trim line (as applicable), barrel style = 10.0 mm
Check Fixture to de design in car position
Cart as applicable + forklift pockets
Net size preferable dimensions = 25.0 x 25.0 x 6.0 mm
Spring loaded pins are preferable but, RFS pin to be used only with clamp around the pin
Tooling balls size = 12.0 mm diameter
Clamps to apply pressure at the center of the net
No clamps to be used where there is no net
If net not around the pin MMC pin to be used.

BMW
1. 150 MM MINIMUM FROM Bottom Plate to the flange surface (page 13)
2. Profile GAP for stamping = 3.0 mm (page 18)
3. Profile GAP for assembly = 5.0 mm (page 18)
4. Visual hole inspection for presence - cutoff 5.0 mm deep in the check fixture body and paint RED (page 21)
5. Vehicle Axis (page 28)
6. Check fixture to be design in car position (page 29)
7. 2 way & 4 way pins (page 29 to 32)
8. Net diameter = 12.0 mm
9. Clamp away minimum 5.0 mm from the edge
10. Base material thickness minimum 15.0 mm and minimum 3.0 mm away from radius

SPECIFIC REQUIREMENTS

1. Trim Line for tolerance over 2.0 mm:
   McB - Scribe Line preferable, no flush
   MsB - Scribe line or Flush
   MsO - Scribe Line preferable, no flush

2. Surface Profile verification:
   McB - Full Barrell go NoGo feeler gage preferable, no ball end feeler gage
   MsA - Full Barrell go NoGo feeler gage preferable, no ball end feeler gage

3. Surface Profile verification, nets nominal height:
   McB - 6.0 mm.
   MsO - 6.0 mm.
   MsB - 5.0 - 6.0 mm

4. Go NoGo Gage for slot size verification:
   MsO - The Go & the NoGo gage for the length must be separated and not combined with same for width.

NOTE:

The Customer Specific Requirements related to above Check Fixture Specifications to be considered as the primary guidance unless otherwise specified in the Danbro Tool & Die quote.