

<b>Rev.</b>	<b>ECO</b>	<b>Description</b>	<b>Author</b>	<b>Approved</b>	<b>Date</b>
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C		General Editorial Update	B. Klatt	M. Bautz	07/16/14

**Massachusetts Institute of Technology  
 Kavli Institute for Astrophysics and Space  
 Research (MKI)**

**Fabrication Documentation**

Dwg. No. 99-03001  
 Revision C  
 May 9, 2014

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## **Preface**

Revision A was the Initial Release of 99-03001 written by Brian Klatt 12/18/90 and checked by W. F. Mayer on 04/24/91.

Revision B issued a General Revision on 02/17/06.

Revision C issued a new format and general editorial update on 07/16/14.

## 1.0 Scope

This procedure is a collection of the fabrication forms and documentations which are used on Sponsored Research Projects at the Massachusetts Institute of Technology (MIT) in the Kavli Institute for Astrophysics and Space Research (MKI).

## 2.0 Applicable Documents

None.

## 3.0 Requirements

The forms and documentation included herein are imposed as a requirement by this specification. The forms contained herein, document parts, materials, processes, procedures, assembly steps, and configuration of hardware fabricated for the MKI project.

## 4.0 Contents

Forms and documentation included in this specification are as follows:

- ❖ Assembly Work Order Documentation Package – including:
  - Instructions for Assembly Work Order (AWO)
  - Assembly Work Order (AWO)
  - Assembly Work Order (AWO) – Continuation Sheet
  - Assembly Work Order (AWO) – Revision Sheet
  - Instructions for Mechanical Work Order
  - Mechanical Work Order
  - Instructions or Assembly Fault Log
  - Assembly Fault Log
  - Instructions for Kit Tag
  - Conformal Coat Assembly Work Order
  - Materials Process Mixing Record
  - Solder Connector Assembly Work Order
  - Crimp Connector Assembly Work Order
  - Kit Tag
  - Potting Log
  - Configuration Traceability List
  - Material Status Tag
  - Assembly Work Order (AWO) – Final

## 4.1 Assembly Work Order Documentation Package

The Assembly Work Order Documentation Package includes the following:

- **Assembly Work Order.** This includes:
  - Assembly steps
- **Inspection Checkpoints.** These include:
  - Fabrication Inspections
  - Quality Assurance Inspections
  - Government Source Inspections (GSI)
  - Other Mandatory Inspection Points (MIPs)
- **AWO Continuation Sheet.** Self Explanatory
- **AWO Revision Sheet.** This includes:
  - Unanticipated assembly steps
  - Unanticipated inspection steps
  - ECO number
  - Revision letter
  - Inspections
  - Tests
- **Mechanical Work Order.** This includes:
  - Shop traveller
  - Machining operations
  - Insert installation
  - Inspections
- **AWO Final Checklist**

Provides a checklist to be used during final review of electronic assemblies. The object of this document is to ensure that consistent tests and inspections are applied to all assemblies prior to moving the hardware to the next assembly level. Included are:

  - Visual inspections
  - Parts location and orientation
  - Revision check
  - Assembly drawing note check
  - I/O connector Quality check
  - I/O connector ring-in
  - Electrical tests at present level
  - Photographic record
- **Fault Log.** This includes:
  - Physical discrepancies
  - Electrical discrepancies
  - Rework sign-offs
  - Re-inspection sign-offs
- **Potting Log.** This includes:
  - Potting compounds
  - Conformal Coatings
  - Spot bonding materials
  - Epoxies
  - Material Manufacturer
  - Material Manufacturer's Part Number
  - Lot Or Date Code
  - Date Of Manufacture
  - Date Of Expiration
  - Weight Ratios (if not pre-packaged)

- **Configuration Traceability List.** This includes:
  - Individual Part Identification
  - Part Number
  - Part Description
  - Part Purchase Order Number
  - Part Serial Number
  - Part Lot-Date Code
- **Kit Tag.** The kit tag becomes the temporary nameplate for the subassembly during fabrication. It includes:
  - Assembly Drawing Number
  - Assembly Serial Number
  - Individual Preparing The Kit
  - Individual Inspecting The Assembly
  - Individual Fabricating The Assembly
  - Individual Accepting The Assembly Performance
- **Material Status Tag.** This includes:
  - Material or Part Name
  - Material Manufacturer
  - Material Distributor
  - Manufacturer's Part Number
  - Lot Number
  - Purchase Order Number
- **Reject Tag.** This includes:
  - Part Name
  - Part Number
  - Reason for Rejection
  - Hardware Disposition

## 5.0 Instructions for Completing the Assembly Work Order

Project	The abbreviated form of the project name, i.e., XTE, AXAF, SAS-C, MJS, TESS, etc.
Assembly Name	Name of the assembly.
Page ___ of ___	Page number and total number of pages in the AWO.
DWG No.	The drawing used for the particular assembly work.
Build to Rev.	The drawing revision used for the particular assembly work, at the time of AWO issue.
Assembly Serial No.	The identifying number of the particular assembly.
Special Instructions	Particular instruction required to perform the assembly task but which may not be shown on the drawing (i.e. safety, or handling instructions).
Authorizing Engineer	The particular engineer, as designated by the Project Manager, responsible for the particular assembly job.
Build Data Package Approval	As determined by the project production supervisor.
Document Control	The project Production Supervisor.
R&QA	Review and sign off of the assembly work order by the cognizant Q.A. representative.
Build History/Changes Incorporated	Changes incorporated after the initial work order is completed.
Step No.	A procedural step number.
Type	Electrical, mechanical, MKI QA, Customer QA, Fabrication/Assembly, Inspection, or Test.
Description	Brief description of the step to be performed.
Performed by	The signature of the person performing the particular step.
Final Acceptance	Project Manager or his designee, signature.
R&QA	The Reliability and Quality Assurance Representative's signature.

## Assembly Work Order

Project:

Page:      of:

Assembly Name:	Drawing Number:	Build To Rev.	Assembly Serial Number:
----------------	-----------------	---------------	-------------------------

Special Instructions:

  
  
  

Authorizing Engineer: \_\_\_\_\_ Date: \_\_\_\_\_

Build Data Package Approval:	Document Control	R&QA:
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Build History/Changes Incorporated:

  
  
  

Step No.	Type	Description	Performed By:	Date

Final Acceptance:

Engineering:	Date	R&QA:	Date:
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# Revision Sheet Assembly Work Order

Project:

Page: of

Assembly Name:	Drawing Number:	Build To Rev.	Assembly Serial Number:
----------------	-----------------	---------------	-------------------------

Assembly Drawing No: \_\_\_\_\_

ECO NO.: \_\_\_\_\_ Revision Letter: \_\_\_\_\_ Performed by: \_\_\_\_\_

Parts Location and Orientation Check: \_\_\_\_\_

Visual Inspection

MIT Q.A.: \_\_\_\_\_

NASA Q.A.: \_\_\_\_\_

Photographic Record, if needed: \_\_\_\_\_

ECO Description: \_\_\_\_\_

Assembly Drawing No: \_\_\_\_\_

ECO NO.: \_\_\_\_\_ Revision Letter: \_\_\_\_\_ Performed by: \_\_\_\_\_

Parts Location and Orientation Check: \_\_\_\_\_

Visual Inspection

MIT Q.A.: \_\_\_\_\_

NASA Q.A.: \_\_\_\_\_

Photographic Record, if needed: \_\_\_\_\_

ECO Description: \_\_\_\_\_

Assembly Drawing No: \_\_\_\_\_

ECO NO.: \_\_\_\_\_ Revision Letter: \_\_\_\_\_ Performed by: \_\_\_\_\_

Parts Location and Orientation Check: \_\_\_\_\_

Visual Inspection

MIT Q.A.: \_\_\_\_\_

NASA Q.A.: \_\_\_\_\_

Photographic Record, if needed: \_\_\_\_\_

ECO Description: \_\_\_\_\_

## 6.0 Instructions for Completing the Mechanical Work Order

Project	Abbreviated form of the project name, i.e., XTE, AXAF, ASTRO-D, HEAO-B, TESS, etc.
Originator	The cognizant Mechanical Engineer requesting the work.
Approval	Program Manager or Production Supervisor.
CPY No.	3 copies are needed: one for the originator, one for the production file, and one copy accompanies the work.
Part No and rev.	The drawing and revision number to which part or assembly will be made.
Part Description	Part name
QTY/Pld.	Quantity per payload (gives and indication of spares).
Req'd By	Date parts are required.
Engineer	The cognizant Mechanical Engineer.
Description of Work	(quantity) brief description of the work order including the quantity
Operations	Machine, plate, inspection, polish, etc.
Location	Location where the job will be performed.
Signature	Signature of the person performing the actual work.
Remarks	Special instructions
Routing	Pertains to outside machine shops. Topics are self-explanatory.
Close out	Date work order is completed.
Comments	On the job performance.

## Mechanical Work Order

Work Order MIT	Originator & Date	Approval & Dates	Copy No.
Part No:	Rev.	Part Description:	Qty/Pld:
Req'd by:		Engineer	
Description of Work (including Quantity):			

Operations	Location	Signature	Date

Remarks:

Routing	<u>Outside</u>	Close Out	
Quotes Requested	_____ (Date)	W.O. Closed	_____ (Date)
Quotes Received	_____ (Date)	Comments:	
Successful Bidder	_____ (Date)		
P.O. Let	_____ (Date)		
Work Received	_____ (Date)		

## 7.0 Instructions for Completing the Assembly Fault log

Project	The abbreviated form of the project name, i.e., XTE, AXAF, SAS-C, MJS, HEO-B, TESS, etc.
Assembly DWG No.	The drawing used for the particular work order
Ser. No.	The identifying number of the particular assembly.
Page ___ of ___	Number of pages required for the Fault Log.
NO.	The item number (discrepancy).
Description	A brief description of the problem.
Originator	The person first noting the discrepancy.
MRB NO.	Where appropriate, the Material Review Board action number.
ECO.	Engineer Change Order No. associated with the problem if appropriate.
Rework and Re-Inspection	The person responsible for re-work and the person responsible for re-inspection.

## Assembly Fault Log

Project: \_\_\_\_\_

Assembly Dwg. No. \_\_\_\_\_ Ser. No. \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_\_

No.	Date	Description	Originator	Disposition			
				MRB No.	ECO No.	Rework & Re-inspection	Remarks

## 8.0 Instructions for Completing the Kit Tag

Project	The abbreviated form of the project name, i.e., XTE, AXAF, SAS-C, MJS, HEO-B, TESS, etc.
Assembly Drawing No.	Self Explanatory
Assembly Ser. No.	A unique number which identifies hat particular subassembly or assembly from all other subassemblies or assembly of the same type.
Accepted by and Date	The signature of the Project Engineer or his designee: month, day, and year.
Inspected by and Date	The inspector's signature or mark; month day and year.
Assembly Fabricated by and Date	The person who fabricates the assembly or subassembly.

### Kit Tag

**Kavli Institute For Astrophysics and Space  
Research  
Massachusetts Institute of  
Technology**

Project: \_\_\_\_\_

Assembly Dwg. No. \_\_\_\_\_

Assembly Ser. No. \_\_\_\_\_

Kit Prepared By: \_\_\_\_\_ Date: \_\_\_\_\_

Assembly Fabricated By: \_\_\_\_\_ Date: \_\_\_\_\_

Assembly Inspected By: \_\_\_\_\_ Date: \_\_\_\_\_

Assembly Tested By: \_\_\_\_\_ Date: \_\_\_\_\_

Performance Accepted By: \_\_\_\_\_ Date: \_\_\_\_\_

# Material Processing Mixing Record

ASSEMBLY NAME \_\_\_\_\_.

DRAWING # \_\_\_\_\_.

SERIAL # \_\_\_\_\_.

PROCESS	TECH DATE	SURFACE PREP	LOT NUMBER	EXP DATE	MIX RATIO	OUT GAS	INSPECT		CURE	
							CONTR SAMPL	WITN SAMPL	HUM. TEMP	TIME

# MKI Potting Log

Assembly No.

Assembly Serial No.

Date

---

AWO No.	Manufacturer	Manufacturers Part Number	Lot Number	Date of Manufacture	Expiration Date	Weight



# Connector Mate/Demate Log

Project:

Page

of

Assembly Name:	Drawing Number:	Build To Rev.	Assembly Serial Number:
----------------	-----------------	---------------	-------------------------

CONN #	DATE												
	M												
	D												
	M												
	D												
	M												
	D												
	M												
	D												
	M												
	D												
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	M												
	D												
	M												
	D												

# Configuration Traceability List

PROJECT \_\_\_\_\_

DATE \_\_\_\_\_

ASSEMBLY NO \_\_\_\_\_ NAME \_\_\_\_\_ S/N \_\_\_\_\_ PAGE \_\_\_\_ OF \_\_\_\_

Special Instructions

Assembly Name		Dwg. No.		Rev.	Serial Number		Kitted By:
Part Dwg. No.	Rev.	No. Req	Description	S/N	Lot #	Date Code	Remarks

# Conformal Coat Work Sheet

## Assembly Work Order

Project:			Page: 1 of:
Assembly Name:	Drawing Number:	Build To Rev.	Assembly Serial No.:

**SPECIAL INSTRUCTIONS:**

- HANDLE PER MKI STATIC HANDLING PROCEDURE 99-01003 and ANSI ANSI/ESD S20.20,
- REFERENCE DOCUMENTS  
IPC-J-STD-001ES

Step No.	Type	Description	Perf By:	Date
1	I	VERIFY CONFORMAL COAT LOT WITH TEST SAMPLE		
2	P	VERIFY ELECTRICAL TEST ACCEPTANCE		
3	P	VERIFY FINAL CHECKLIST SIGNED OFF		
4	A	CLEAN P.C. BOARD		
4		-CLEAN AND SOAK USING REAGENT GRADE XYLENE BLOW DRY WITH DRY NITROGEN		
4		-SOAK AND RINSE USING REAGENT GRADE ISOPROPYL ALCOHOL BLOW DRY WITH DRY NITROGEN		
4		-USE PINK ANTI-STATIC GLOVES FOR HANDLING BOARD AFTER CLEANING		
5	I	MKI. Q.A. INSPECT FOR CLEANLINESS		
6	A	DRY P.C. BOARD BY EVACUATING @ 30 IN/MERCURY FOR 1/2 HOUR		
		START: DATE TIME		
		FINISH : DATE TIME		
7	A	REMOVE FROM VACUUM SYSTEM AND BAG IN NEW ANTI-STATIC BAG		
		PURGE WITH DRY NITROGEN AND HEAT SEAL BAG.		
8	A	MOVE TO CLEAN BENCH		
		-MASK LOCATIONS TO BE FREE OF CONFORMAL COATING USING FLIGHT TAPE. LOCATIONS SPECIFIED BY ASSEMBLY DRAWING		
		-SPOT BOND COMPONENTS PER NASA-STS-8739.1 USING URALANE 5753A/B.		
		-CURE OVER NIGHT IN CLEAN BENCH. PLACE IN ANTI-STATIC BAG, PURGE WITH NITROGEN AND SEAL.		

## Crimp Connector Assembly Work Order

Project: \_\_\_\_\_ Page: \_\_\_\_\_ of: \_\_\_\_\_

Assembly Name:	Drawing Number:	Build To Rev.	Assembly Serial Number:
J#/P#	Connector	Contact	
Prepared By:		R&QA	Project

Step No.	Type	Description	Perf By:	Date
1	A	PREPARE WIRES AND CRIMP CONTACTS PER NASA-SRD-8739.4		
2	A	PREPARE WIRES FOR CRIMPING		
		-STRIP WIRES WITH MECHANICAL STRIPPER LABELLED PER WIRE GAUGE WIRE STRIPPER SET #		
		-CLEAN WIRES USING WIPES AND ISOPROPANOL		
3	A	PREPARE CONTACTS FOR CRIMPING		
		-BLOW OUT CONTACT BARREL USING COMPRESSED AIR		
		-VISUALLY INSPECT CRIMP CONTACTS INSURING NO DEBRIS IN CONTACT BARREL		
4	A	CRIMP TOOL QUALIFICATION		
		-CRIMP TOOLS USED		
		-TOOL: M22520/2-01 RECALIBRATION DATE		
		- TURRET: M22520/2-		
5	A/I	TEST		
		-GO/NO GO TEST WITH TOOL M22520/3-01		
		-VERIFY PULL TEST PERFORMED PER "TENSILE TEST DAILY LOG"		
6	A/I	CRIMP PINS/SOCKETS FOR CONNECTOR J#/P# PER SCHEMATIC DRAWING REV		
		-CONNECTOR TYPE PER PARTS LIST		
		-CONTACT TYPE		
		-USE TOOL SPECIFIED IN STEP 4		
		-CRIMP TOOL SETTING WIRE TYPE #1		
		-CRIMP TOOL SETTING WIRE TYPE #2		
		-CRIMP TOOL SETTING WIRE TYPE #3		
		-VISUAL INSPECTION M.I.T. Q.A.		
7	A	INSERT CONTACTS IN CONNECTOR PER ATTACHED WIRING LIST		
		-LABEL CONTACT PIN #'S ON WIRES		
8	A/I	VERIFY PIN RETENTION M.I.T. Q.A.		
9	A	CLEAN, BAG, AND TAG HARNESS; INSTALL CONN COVERS		
10	A	STORE IN FLIGHT ASSEMBLY AREA FOR NEXT LEVEL OF ASSEMBLY		

## Solder Connector Assembly Work Order

Project:

Page:        of:

Assembly Name:	Drawing Number:	Build To Rev.	Assembly Serial Number:
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Build History/Changes Incorporated:

Step No.	Type	Description	Perf By:	Date
1		SOLDER WIRES IN CONNECTOR # PER SCHEMATIC:		
		-BLOW OUT SOLDER CUPS		
		-INSPECT SOLDER CUPS INSURE FREE OF DEBRIS AND INSURE THAT GOLD PLATING IS FREE OF FLAWS		
		-TIN CUPS AND REMOVE SOLDER (3X)		
		-AVOID SPILLOVER		
		-INSTALL WIRES PER SCHEMATIC		
		-CUT AND STRIP WIRES		
		-INSPECT STRIPS		
		-TIN WIRES		
		-INSPECT TINNING		
		-SOLDER WIRES IN CUPS		
		-CLEAN EACH SOLDER CONNECTION AFTER SOLDERING, USE ISOPROPANOL.		
		-AFTER ALL CONNECTIONS MADE CLEAN CONNECTIONS USING XYLENE AND RINSE USING ISOPROANOL.		
		-INSPECT		
		M.I.T. QA		
		ONR		
		-SLEEVE CONNECTIONS USING SHRINK TUBING		

## Assembly Work Order Final Check List

Project:

Page:

Of:

Assembly Name:	Drawing Number:	Build To Rev.	Assembly Serial Number:
----------------	-----------------	---------------	-------------------------

- A. Revision Check

  - Latest Revision Letter in ECO Book: \_\_\_\_\_
  - Latest Revision Letter performed per Revision Sheet: \_\_\_\_\_
- B. Parts location and orientation check per Assembly Drawing

  - Assembly Drawing No: \_\_\_\_\_ Revision Letter \_\_\_\_\_
  - Performed by: \_\_\_\_\_
- C. Assembly Drawing Note Check:

  - Performed by: \_\_\_\_\_
- D. I/O Connector Quality Check:

  - Sockets - Retention Check - Performed by: \_\_\_\_\_
  - Pins - Push Test - Performed by: \_\_\_\_\_
- E. I/O Connector Ring-in

  - Performed by: \_\_\_\_\_
- F. Visual Inspection

  - MIT Q.A.: \_\_\_\_\_
  - NASA Q.A.: \_\_\_\_\_
- G. Electrical Test

  - Performed by: \_\_\_\_\_
- H. Photographic Record \_\_\_\_\_

# MKI Reject Tag

<b>MKI REJECT Tag</b>	
<b>KAVLI CENTER FOR SPACE RESEARCH Massachusetts Institute of Technology</b>	
Project: _____	Date _____
Part Name: _____	Part No. _____
Reason for Rejection: _____	
_____	
_____	
Disposition _____	
_____	
Inspector: _____	