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### 1 Purpose

- 1.1 The purpose of Stage 2 is to select and develop a single product concept for any high risk sub-systems. In doing so major risks should be mitigated and the plan for the remaining development will be complete.

### 2 Scope – *applies to where & when the procedure is used*

- 2.1 This process applies to all North American based R&D programs for MTS Test.

### 3 Definitions and Acronyms

- 3.1 High Risk Item: Any item that needs Proof of Concept validation through testing, modeling, analysis, etc.


### 4 Graphic (if needed)



Stage 2 Concept  
Selection & Proof of C

### 5 Responsibilities

See Graphic

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## 6 Procedure

### 6.1 Approved Stage 2 Program Plan

The R&D council approves the development program for Stage 2 and notifies the Product Manager and Program Leader.

Output: Stage 2 Approval Email (Quality Record 7.1)

Template: None

### 6.2 Update Development Team

The Program Leader updates the Development Team.

Output: Development Team Checklist (Quality Record 7.2)

Template: Development Team Checklist Template

### 6.3 Begin Product Compliance Process for Stage 2

The Program Leader works with Compliance Engineer to begin Product Compliance Process for Stage 2.

Output: None

Template: None

### 6.4 Update Combined Product Requirements & Design Specifications

The Program Leader and Product Manager update the Product Requirements & Design Specifications.

Output: Product Requirements & Design Specifications (Quality Record 7.4)

Template: Product Requirements & Design Specifications Template

### 6.5 Create Physical Diagram

The Program Leader generates a detailed Physical Diagram showing how the different components of the system and customer's facility interface to one another.

Output: Physical Diagram (Quality Record 7.5)

Template: Physical Diagram Template

### 6.6 Create Functional Diagram

The Development Team will create a functional diagram that describes the interrelationships of a system.


Output: Functional Diagram (Quality Record 7.6)

Template: Functional Diagram Template

### 6.7 Create Workflow Diagram

The Development Team will create a workflow diagram that show how tasks will flow between resources.

Output: Workflow Diagram (Quality Record 7.7)

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Template: Workflow Diagram Template

**6.8 Internal MTS Facility & Safety Considerations**

The Program Leader conducts a Facility & Safety Review with the Safety and Environmental Manager per ISO 14001 and OSHAS 18001. This is specific to internal facility and human safety considerations at MTS Systems.

Output: Internal Facility & Safety Discussion Notes (Quality Record 7.8)

Template: Internal Facility & Safety Discussion Notes Template

**6.9 Complete EHS Analysis**

The development team will complete the Environmental Health and Safety Analysis form.

Output: EHS Form (Quality Record 7.9)

Template: EHS Form Template

**6.10 Analyze & Engineer Concept(s)**

The Development Team further analyzes the high level concept(s) from Stage 1 and performs engineering analysis before proof of concept testing occurs.

Output: Concept Evaluation Report (Quality Record 7.10)

Template: Concept Evaluation Report Template

**6.11 Concept(s) Review Meeting(s)**

The Development Team presents their recommended concept(s) with more engineering analysis to support the pros and cons of each. The purpose of this meeting is to review the concepts the team would like to move forward with into the proof of concept testing phase. Possible attendees include subject matter experts, development managers, application engineers, staff engineers, etc.

Output: Concept(s) Review Notes (Quality Record 7.11)

Template: Concept(s) Review Notes Template

**6.12 Have Concept(s) Been Selected for High Risk Items?**

If No, return to Analyze & Engineer Concept(s) (6.10) or Update Combined Product Requirements & Design Specifications. (6.4)

If Yes, Document the Chosen Concept(s) (7.12) and continue to Are the Selected Concept(s) Still Valid? (6.13)


Output: Document Chosen Concept(s) for High Risk Items (Quality Record 7.12)

Template: Document Chosen Concept(s) for High Risk Items Template

**6.13 Are the Selected Concept(s) Still Valid?**

If No, return to Analyze & Engineer Concept(s) (6.10) or Update Combined Product Requirements & Design Specifications (6.4).

If Yes, continue to Are Proof of Concept(s) Needed? (6.14)

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Output: None  
Template: None

**6.14 Are Proof of Concept(s) Needed?**

If No, continue to Industrial Design Language Considerations Meeting (6.17).  
If Yes, continue to Design, Build, and Test Proof of Concept(s) (6.15).

Output: None  
Template: None

**6.15 Design, Build or Analyze, and Test Proof of Concept(s)**

The Development Team designs, builds or uses analysis, and tests the Proof of Concept(s) for each high risk item (subsystem or component). The Proof of Concept(s) memo identifies where the Proof of Concept(s) documentation is located.

Output: Proof of Concept(s) Memo (Quality Record 7.15)  
Template: Proof of Concept(s) Memo Template

**6.16 Were Proof of Concept(s) Successful?**

If No, return to Analyze & Engineer Concept(s) (6.10) or Update Combined Product Requirements & Design Specifications (6.4).  
If Yes, continue to Design Language Considerations (6.17).

Output: None  
Template: None

**6.17 Industrial Design Language Considerations Meeting**

The Development Team, Product Management, and Marketing-Communications will meet to discuss the industrial design language for the product. This includes items like product colors, ergonomics, shapes, labels, etc.

Output: Industrial Design Language Notes (Quality Record 7.17)  
Template: Industrial Design Language Notes Template

**6.18 Document Product Cost Estimate**


The Development Team estimates the cost of the product (offerings, accessories, and options).

Output: Product Cost Estimate (Quality Record 7.18)  
Template: Product Cost Estimate Template

**6.19 Create Stage 3 & 4 Program Plan**

The Program Leader creates a Program Plan that contains the estimates of the required resources (people, time, and budget) to complete Stages 3 & 4.

Output: Stage 3 & 4 Program Plan (Quality Record 7.19)  
Template: Stage 3 & 4 Program Plan Template

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**6.20 Final Concept(s) & Program Plan Review Meeting**

The Development Team presents the final concept and the proposed program schedule for Stages 3 & 4. Possible attendees include: subject matter experts, development managers, application engineers, staff engineers, etc.

Output: Final Concept(s) & Program Plan Review Notes (Quality Record 7.20)

Template: Final Concept & Program Plan Review Notes Template

**6.21 Do Concept(s) Meet Product Requirements?**

The Program Leader, Product Manager, Hardware Development Manager and Market or Group Product Manager will sign off on this decision.

If No, continue to Can the Concepts Change? (6.22)

If Yes, continue to Ensure Product Compliance Process is Complete for Stage 2 (6.26).

Output: Concept(s) Signoff (Quality Record 7.21)

Template: Concept(s) Signoff Template

**6.22 Can Concept(s) Change?**

If No, continue to Can Product Requirements Change? (6.24)

If Yes, continue to Determine Where to Re-enter the Process (6.23).

Output: None

Template: None

**6.23 Determine where to Re-Enter the Process**

The Program Leader and Product Manager decide where to re-enter the process.

Output: None

Template: None

**6.24 Can Product Requirements Change?**

If No, continue to Document Reason(s) for Program Stop (6.25).

If Yes, return to Update Combined Design Specifications & Product Requirements (6.4).

Output: None

Template: None


**6.25 Document Reason(s) for Program Stop**

The Program Leader documents why the program cannot continue.

Output: Reason(s) for Program Stop Document (Quality Record 7.25)

Template: Reason(s) for Program Stop Document Template

**6.26 Ensure Product Compliance Process is Complete for Stage 2**

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The Program Leader ensures the Product Compliance Process is complete for Stage 2.

Output: None


Template: None

**6.27 Create Stage 3 Request**

The Program Leader generates a Stage 3 request that contains the estimates of the required resources (people, time, and budget) to complete Stage 3 and describes the goals of the development program.

Output: Stage 3 Request (Quality Record 7.27)

Template: Stage 3 Request Template

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## 7 Associated Quality Records – as stated in the Quality Records List


	Required Record
7.1	Stage 2 Approval Email
7.2	Development Team Checklist
7.4	Product Req & Design Specs Document
7.5	Physical Diagram
7.6	Functional Diagram
7.7	Workflow Diagram
7.8	Internal Facility & Safety Discussion Notes
7.9	EHS Form
7.10	Concept Evaluation Report
7.11	Concept(s) Review Notes
7.12	Document Chosen Concept(s) for High Risk Items
7.15	Proof of Concept(s) Memo
7.17	Industrial Design Language Notes
7.18	Product Cost Estimate
7.19	Stage 3 & 4 Program Plan
7.20	Final Concept(s) & Program Plan Review Notes
7.21	Concept(s) Signoff
7.25	Reasons(s) for Program Stop
7.27	Stage 3 Request

## 8 Reference Forms / Templates / Documents

## 9 Current Revision's Training Requirements

Training requirements are determined by the document owner – either awareness or formal.

Select One (mark X)	Training Type	Training Definition
X (general)	Awareness	Awareness training is conducted by communication, which is sent/delivered by the approver/author/owner of the document to the affected employees/groups.
Hardware Development Team	Formal	Formal training requires the approver/author/owner to collect/store evidence that the affected employees/groups were trained.

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## 10 Revision History & Approval

REVISION HISTORY			
Rev	Description of Change	Author	Effective Date
A	Initial release	S. Firman	2/27/2009
B	Updated Format	S. Firman	5/10/2010
C	Updated to meet Rev. B of R&D Stage Gate and CE Process	S. Firman	8/27/2012
D	Updated procedure owner, training requirements, and records location	S. Firman	5/17/2013
F	Updated process to better fit Hardware Development objectives.	S. Firman	11-20-2015

APPROVAL OF CURRENT REVISION		
Name / Function	Signature	Date
Scott Firman, Director of Solutions Engineering		