Raytheon
Raytheon Systems Company

MTI

Manufacturing
Training Interactive

Phase 1 Detailed Outline

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CONFIDENTIAL

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innovations

Portfolio Note*: Due to the classified nature of the content of this curriculum, this document has been edited to represent only materials generic in nature. Since the basic soldering module was based on industry-standard terminology, it will be the only outline represented.*

Overview and Scope   This document represents the navigational structure of the Raytheon Manufacturing Training Interactive (MTI) online training curriculum. This curriculum will consist of the following subject areas:

- Basic Solder Skills
- Rework Skills
- Wire/Cables
- Discrete Wiring
- Bond/Cement/Coat
- Additional Modules
- Mechanical Skills

Curriculum   The MTI curriculum consists of individual "modules" targeted to three levels of manufacturing expertise. Each module begins at the intermediate level and is designed to provide additional levels of understanding of the subject matter as illustrated below:

- <u>Beginner Level</u> - Personnel with little-to-no familiarity or experience. Additional detailed information is provided by clicking on a "tell me more" button and is presented in a more detailed form and slower pace.

- <u>Intermediate Level</u> - Personnel with some familiarity or experience. Provides a level of understanding and instruction at a reasonable pace.

- <u>Advanced Level</u> - Personnel with some-to-much familiarity or experience. Designed with re-certification in mind, this level accommodates students who require an abbreviated version of the curriculum. This may be accessed by clicking on the "review" button found at each module's main menu.

Targeted Access   The MTI curriculum has been designed with an open navigation which allows Training personnel to target and assign individual or combinations of modules in a student's training program. For example, students may be assigned to take only the Pierced Turret Wiring module, or the entire   Working with Wire curriculum.

The MTI on-line program will feature a <u>Directory</u> button, visible at all times, which provides access to a listing of every module in the Soldering Skills curriculum. Students may simply click on a specific module and bypass all introductions or hyperlinks.

Testing & Verification   This curriculum will implement both <u>accountability</u> and <u>testing</u> into the learning process in an effort to increase retention of material and provide a benchmark for success. Each lesson module will provide appropriate review and testing segments throughout the lesson as a

benchmark of learner's progress.

Formal testing of the MTI modules will consist of:
- Computer-based testing
- Bench exercises

It must be noted that the compiling of testing results into a final report requires CMI managed instruction software and programming which is not in the scope of the original proposal.

Actual verification of participation in the training will occur at the end of each module and consist of a document with the learner's name and employee number that is printed and submitted to facilitator.

Employee Workbook The Employee Workbook will be designed to follow the curriculum closely and work as a supplement to the on-line course. References to the Workbook will be made throughout the coursework and will require the learner to have an appropriate environment in which to work with this workbook open.

The Workbook will also function as a resource. The on-line course will direct the learner to various indexes in the Workbook throughout the training. This will serve to reinforce the Workbook's role as secondary learning experience and a resource for future questions.

Presentation The MTI curriculum will use a technique involving two voice characters to present the material. The primary character (the professor-type) delivers the content in a similar manner to a traditional voice-over. The secondary character (the ever-attentive sidekick) becomes the inquisitive "student" who both validates the information and asks real-world questions at key points throughout the training.

The purpose of the secondary character is to provide a reiteration of the material in a way Raytheon trainees may relate to. The secondary character will also become important in the Beginner Level instruction by taking a somewhat confused point of view that is resolved by the primary character's explanation of the material.

From this banter, a series of "good work habits" reminders will be identified at key points throughout the training. These will be highlighted in the computer training by an on-screen graphic and jingle, and highlighted in the workbook using the same graphic symbol.

Basic Soldering

The following represents the structural outline of the Basic Soldering Skills curriculum. This outline describes the subject matter contained in each section, and is to be viewed in conjunction with the navigation chart included with this document.

The MTI program consists of 5 main areas of concentration which are composed of individual curriculum modules described below.

Basic Soldering:
Handling Components

This area of concentration covers all aspects of handling materials and components in the production area. From this coursework, the student will develop good work habits and proper techniques for handling of boards, components and tools.

This coursework will also serve to reinforce the practices of ESD prevention in the workplace. At the conclusion of the coursework, the student will be tested on the material and required to perform several techniques for handling materials.

This area of concentration is targeted to the first-time employee with little-to-no manufacturing environment experience.

Overview - Provides an overview of **Handling Components** in a production environment. This movie will use strong visual pictures and video of actual products in the field to bridge a relationship between handling components and products used by real people in the field.

Grounding to Bench - Reinforces the grounding necessity in the workplace and provides a review of ESD including grounding wrist straps, lotions, lubricants and circuit contact.

Handling the Board - Covers techniques and procedures for handling boards:
- Grounded and ungrounded surfaces
- Stacking
- Single hand technique
- Bench vice technique
- In-chassis technique
- Storage of the board - Racks, totes and anti-stat bags

Handling Components - Covers techniques, procedures and tools for handling components:
- Touching leads
- Handling components with leads
- Handling J-Lead & Gull wing components
- Handling components with no leads

Basic Soldering:
Tools and Materials

This area of concentration covers all tools and manufacturing materials in the production area. From this coursework, the student will develop good work habits and proper techniques for using the various hand and bench tools in the manufacturing process.

At the conclusion of the coursework, the student will be tested on the material and required to perform several techniques for handling and using tools. This area of concentration is targeted to the first-time employee with little-to-no manufacturing environment experience.

Overview - Provides an overview of **Tools & Materials** in a production environment. This movie will use strong visual pictures and video of actual products in the field to bridge a relationship between handling Tools & Materials and products used by real people in the field.

Bench Tools - Provides specific information and techniques for care and usage of the tools:
- Orientation to your bench
- Good work habits

Cutting & Stripping Tools - Provides specific information and techniques for care and usage of the tools. Includes basic cutting & stripping principals (for beginners)
- Overview of cutting & stripping tools
- Individual tool specifications & techniques
- Good work habits

Other Tools - Provides specific information and techniques for care and usage of other tools specific to bench areas.
- Wave soldering overview
- Good work habits

Soldering Tools - Provides specific information and techniques for care and usage of the tool.
- Electronic irons
- Starting and heating
- Tips & temperatures
- Tip changing
- Tip cleaning and wetting
- Basic soldering techniques - 525 degrees
- Good work habits

Solder - Provides specific information and principals for usage.
- What solder does - fusing metals together
- Types of solder
- Solder melting & temperatures
- Cleanliness using lead materials
- Good work habits

Solder Pots - Provides specific information and techniques for care, preparation and usage of the pots. Includes basic soldering principals (for beginners)

- Solder Pot overview
- Preparation and heat specifications
- Techniques of tinning
- Good work habits

Cleaners and Solvents - Provides specific information and techniques for care, preparation and usage of solvents and cleaners.

- Why clean?
- Types of cleaners
- Cleaning tools & techniques
- Good work habits

Basic Soldering:
PTH Components

This area of concentration covers all production aspects of installing through-hole components. From this coursework, the student will develop good work habits and proper techniques for using the various hand and bench tools for installing & soldering. At the conclusion of the coursework, the student will be tested on the material and required to perform component installations.

DIP & IC - This launches the **DIP & IC** curriculum. This will consist of a continuous series of instructional screens that concludes at the end of the section.

- What it is and how it is used
- General specifications & component identification
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- DIP inserter - solder stick
- Clinching & tacking
- Soldering leads
- Cleaning
- Inspection & verification - dealing with rejects

Transistors - This launches the **Transistors** curriculum. This will consist of a continuous series of instructional screens that concludes at the end of the section.

- What it is and how it is used
- General specifications & component identification - different types
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Spacer application & board insertion - solder stick

- Clinching & tacking
- Cutting leads
- Soldering leads
- Cleaning
- Inspection & verification - dealing with rejects

Axial Capacitors - This launches the **Axial Capacitors** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.
- What it is and how it is used
- General specifications & component identification - different types
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Forming leads & board insertion - solder stick
- Clinching & tacking
- Cutting leads
- Soldering leads
- Cleaning
- Inspection & verification - dealing with rejects

Resistors - This launches the **Resistors** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.
- What it is and how it is used
- General specifications & component identification - different types
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Forming leads & board insertion - solder stick
- Clinching & tacking
- Cutting leads
- Soldering leads
- Cleaning
- Inspection & verification - dealing with rejects

Diodes - This launches the **Diodes** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.
- What it is and how it is used
- General specifications & component identification - different types
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review

- Forming leads & board insertion - solder stick
- Clinching & tacking
- Cutting leads
- Soldering leads
- Cleaning
- Inspection & verification - dealing with rejects

Basic Soldering:
SMT Components

This area of concentration covers all production aspects of installing surface mount components. From this coursework, the student will develop good work habits and proper techniques for using the various hand and bench tools for installing & soldering. At the conclusion of the coursework, the student will be tested on the material and required to perform component installations.

Chip Resistors - This launches the **Chip Resistor** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.
- What it is and how it is used
- General specifications & component identification - different types
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Installation techniques - tweezers
- Tacking
- Soldering the component
- Cleaning
- Inspection & verification - dealing with rejects

Chip Capacitors - This launches the **Chip Capacitors** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.
- What it is and how it is used
- General specifications & component identification - different types
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Installation techniques - tweezers
- Tacking
- Soldering the component
- Cleaning
- Inspection & verification - dealing with rejects

SOTs - This launches the **SOT** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.
- What it is and how it is used
- General specifications & component identification - different types
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Installation techniques - tweezers
- Tacking
- Soldering the component
- Cleaning
- Inspection & verification - dealing with rejects

J-Lead Components - This launches the **J-Lead** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.
- What it is and how it is used
- General specifications & component identification - different types
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Installation techniques - tweezers
- Tacking
- Soldering the component
- Cleaning
- Inspection & verification - dealing with rejects

Basic Soldering:
Working With Wire

This area of concentration covers all production aspects of skills and techniques for working with wire elements and components. From this coursework, the student will develop good work habits and proper techniques for using the various hand and bench tools for handling small and delicate wire components. At the conclusion of the coursework, the student will be tested on the material and required to perform component installations.

Stripping - This launches the **Stripping** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.
- Principals of stripping
- General specifications & types of wire
- Procedure sheet – router
- Material handling/ESD review
- Stripping techniques - strippers
- Inspection & verification - dealing with rejects

Tinning - This launches the **Tinning** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.

- Principals of tinning
- Solder pot review
- Procedure sheet – router
- Material handling/ESD review
- Tinning techniques
- Inspection & verification - dealing with rejects

Turret Terminals - This launches the **Turret Terminals** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.

- What it is and how it is used
- General specifications & component identification
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Soldering the wire
- Cleaning
- Inspection & verification - dealing with rejects

Pierced Terminals - This launches the **Pierced Terminals** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.

- What it is and how it is used
- General specifications & component identification
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Soldering the wire
- Cleaning
- Inspection & verification - dealing with rejects

Gold Cup Terminals - This launches the **Gold Cup Terminals** curriculum. This will consist of a <u>continuous</u> series of instructional screens that concludes at the end of the section.

- What it is and how it is used
- General specifications & component identification
- Procedure sheet – router
- Polarity and reference designator
- Material handling/ESD review
- Soldering the wire
- Cleaning
- Inspection & verification - dealing with rejects