EET-1180: SURFACE MOUNT SOLDERING

Cuyahoga Community College

Viewing: EET-1180 : Surface Mount Soldering

Board of Trustees:

December 2022

Academic Term:

Fall 2023

Subject Code

EET - Electrical/Electronic Engineer

Course Number:

1180

Title:

Surface Mount Soldering

Catalog Description:

Develop skills using surface mount technology (SMT), through hole technology (THT), and connectors using soldering equipment and techniques to facilitate design, construction and rework of circuit boards.

Credit Hour(s):

1

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

None.

Outcomes

Course Outcome(s):

Solder surface mount technology (SMT) components to printed circuit boards and re-work printed circuit boards with SMT to make them functional.

Objective(s):

1. Build SMT printed circuit boards using surface mount equipment.
2. Take effective preventive action against electrostatic discharge (ESD) by using ESD protection when working on projects.
3. Repair surface mount printed circuit boards using surface mount equipment.
4. Use proper soldering procedures and eliminate related circuit failures.
5. Utilize safety glasses when soldering or working with chemicals.

Course Outcome(s):

Comply with Restriction on Hazardous Material (RoHM) and Restriction of Hazardous Substances (RoHS) regulations when working on soldering projects.

Objective(s):

1. Discuss and explain international laws regarding hazardous materials.
2. Discuss the principles of soldering using lead and non-lead based alloys.

Course Outcome(s):

Solder through hole technology (THT) components to printed circuit boards and re-work printed circuit boards with THT to make them functional.

Objective(s):

1. Repair THT printed circuit boards.
2. Use proper soldering procedures and eliminate related circuit failures.
3. Utilize safety glasses when soldering or working with chemicals.
4. Build THT printed circuit boards.
5. Take preventive action against electrostatic discharge (ESD) by using ESD protection when working on THT projects.

Course Outcome(s):

Solder connectors and conductors to printed circuit boards.

Objective(s):

1. Connect wiring harnesses, jacks, or other conductors to printed circuit boards using various types of connectors.
2. Repair or replace connectors on printed circuit boards.

Methods of Evaluation:

a. Inspect and test layout design and look for design rule errors
b. Tests
c. Quizzes

Course Content Outline:

a. Concepts
    i. Direct and alternating current laws
    ii. ROHS (Restriction on Hazardous Substances)
    iii. WEEE (Waste Electrical and Electronic Equipment)
    iv. Characteristics of different circuit boards
        1. Flex
        2. Ridged
            a. Single layer
            b. Multilayer
    v. Air exclusion
    vi. Effect of ESD
    vii. Principals of soldering
b. Skills
    i. Troubleshooting
    ii. Dexterity to use the equipment
    iii. Reading technical documents and applying the concepts
    iv. Develop the dexterity to use tools and handle small parts
    v. Evaluate, analyze, and troubleshoot circuit boards
    vi. Repair surface mount printed circuit boards
    vii. Build surface mount printed circuit boards
    viii. Reduce circuit failures
    ix. Soldering
    x. Criteria for choosing size and/or types of solder
c. Issues
    i. Safety concerns
    ii. Environmental concerns
    iii. Procedural concerns
    iv. Regulation concerns

Resources

Robert S. Villanucci, Alexander W. Avtgis,William F. Megow. *Electronic Techniques: Shop Practices and Construction.* 7th Edition. Upper Saddle River, NJ: Prentice Hall, 2001.

Soldering equipment manufacturer. *How to use soldering and rework equipment*.

HAKKO Corporation. *SMD Rework Station*,

NASA. NASA-STD 8739.3 (Soldered Electrical Connections).

NASA. (1999-08-30 22:00:00.0) NASA-STD 8739.2 (Workmanship Standard for Surface Mount Technology).

Resources Other

a. HAKKO FX-888D Instruction Manual, HAKKO CORPORATION, https://www.hakko.com, Copyright 2012-2021 HAKKO Corporation, Updated August 2, 2021.
b. Printed Circuit Board Designer's Reference; Basics, Chris Robertson, 1st Edition, Upper Saddle River, NJ: Prentice Hall, ISBN-13: 9780130674814, 2003
c. Signal Integrity Issues and Printed Circuit Board Design, Douglas Brooks, 1st edition, Upper Saddle River, NJ: Prentice Hall, ISBN-13: 978-0133359473, 2003
d. Heat Transfer Calculations, Myer Kutz, 1st Edition, New York, NY: McGraw-Hill, ISBN-13: 9780071410410, 2005
e. Green Electronics Design and Manufacturing: Implementing Lead-Free and RoHS Compliant Global Products, Sammy G. Shina, 1st Edition, New York, NY: McGraw-Hill, ISBN-13: 9780071642675, 2008
f. Printed Circuits Handbook; Clyde F. Coombs, 7th Edition, New York, NY: McGraw-Hill, ISBN-13: 9780071833950, 2016
g. Quality Hand Soldering and Circuit Board Repair, H. Smith, 6th Edition, Clifton Park, NY: Delmar Cengage Learning, ISBN-13: 9781111642662, 2012
h. Soldering in Electronics Assembly, Mike Judd and Keith Brindley, Second Edition, Boston, MA: Newnes (Elsevier, Inc.), ISBN-13: 9780750635455, 1999
i. Joint Industry Standard: Space Applications Hardware Addendum to IPC J-STD-001F Requirements for Soldered Electrical and Electronic Assemblies, IPC J-STD-001FS WAM1 January 2017, Supersedes IPC-J-STD-001FS, NASA Technical Standards 4/99972545004, IPC.
j. Joint Industry Standard: Requirements for Soldered Electrical and Electronic Assemblies, IPC J-STD-001, Revision F with Amendment 1, February 2016, Supersedes IPC J-STD-001F, NASA Technical Standards 4/9972545004, IPC.

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