

# ***SMT Engineer Level Training Program***

## **Overview**

This unit is about engineer's (level-2) training of Surface Mount Technology PCB assembly process, which covers the loading of bare PCB to un-loading of completed product and its management work details as per SMT standards.

### **Operate & Manage SMT Line**

Unit Title (Task)	Manage SMT line
<b>Description</b>	This OS unit is about Surface Mount Technology process & Operating of the SMT machines & management of SMT full line.
<b>Scope</b>	<p><b>This unit/ task covers the following:</b></p> <ul style="list-style-type: none"> <li>• Understand what is SMT</li> <li>• Basics of SMT</li> <li>• New Manpower Training (For operator &amp; inspector)</li> <li>• Understanding SMT full line process from loading Bare PCB to un-loading mounted PCB</li> <li>• Management of Loader, Un-loader and link</li> <li>• Management of Screen Printer</li> <li>• Management of Pick &amp; Place Moulder</li> <li>• Management of Reflow oven</li> <li>• Management of AOI/SPI</li> <li>• Material control</li> <li>• Consumable control</li> <li>• Equipment list with spare part control</li> <li>• Production Plan</li> <li>• Quality Control</li> <li>• Monitoring the PCBA quality at each stages at SMT line</li> <li>• Maintenance of SMT machines</li> <li>• Managing the total assembly process</li> <li>• Documentation</li> <li>• Following the standard safety procedures</li> </ul>
Element	Performance Criteria
<b>Understand what is SMT</b>	PC1. What is SMT? PC2. Why SMT is needed? PC3. Definition of SMT PC4. Growth History of SMT PC5. Advantages & Disadvantages of SMT
<b>Basics of SMT</b>	PC6. Part code reading PC7. R-L-C Value Calculation PC8. Introduction to other SMT Components

	<p>PC9. SMT Defects</p> <p>PC10. Introduction to SMT Product Parts</p> <p>PC11. 5S &amp; ESD Measures</p>
<b>New Manpower Training (For operator &amp; inspector)</b>	<p>PC12. Conduct basic training to new manpower</p> <p>PC13. Take exams</p> <p>PC14. Segregate the manpower as per the ability</p> <p>PC15. Allocate the position/stage</p> <p>PC16. Provide training</p>
<b>Understanding SMT full line process</b>	<p>PC17. SMT line Configuration</p> <p>PC18. Bond + AI line</p> <p>PC19. SMT + AI + Bond line</p> <p>PC20. SMT + SMT line</p>
<b>Management of Loader, Un-loader and link conveyor</b>	<p>PC21. Vacuum Loader</p> <p>PC22. Magazine loader &amp; Un-loader</p> <p>PC23. Magazine loading &amp; Un-loading Process Flow</p> <p>PC24. PCB Loading Position</p> <p>PC25. Operating Process Flow</p> <p>PC26. How to do setting for production</p> <p>PC27. Model changeover procedure</p> <p>PC28. Operating check point</p> <p>PC29. Make related documents &amp; working procedures/Work</p>
<b>Management of Screen Printer</b>	<p>PC30. Printing method of Screen Printer</p> <p>PC31. Types of Screen Printer</p> <p>PC32. Operating Process</p> <p>PC33. Screen Printer parameters</p> <p>PC34. Types of defective</p> <p>PC35. Stencil mask cleaning process</p> <p>PC36. PCB Cleaning process</p> <p>PC37. In screen printer solder past controlling specification</p> <p>PC38. Screen Printer Setup Chart &amp; Parameter explanation</p> <p>PC39. How to set the machine for production</p> <p>PC40. Model changeover procedure</p> <p>PC41. Operating check point</p> <p>PC42. Maintenance of Screen Printer</p> <p>PC43. How to make specs of Stencil Mask &amp; its check</p> <p>PC44. Make related documents &amp; working procedures/Work</p>
<b>Management of Pick &amp; Place Mounter</b>	<p>PC45. Operating method of Pick &amp; Place Mounter</p> <p>PC46. Types of Mounter</p> <p>PC47. Programming Procedure</p> <p>PC48. Program Name</p> <p>PC49. Part Data Name</p> <p>PC50. Program control process flow</p> <p>PC51. Fiducial Mark explanation</p> <p>PC52. Part data making</p> <p>PC53. Feeder &amp; Nozzle selection</p> <p>PC54. Shift data making</p>

	<p>PC55. Optimization</p> <p>PC56. Mounting Procedure</p> <p>PC57. Part/Component change procedure (Reel &amp; Tray components)</p> <p>PC58. Drop component use procedure</p> <p>PC59. Production Report</p> <p>PC60. How to set the machine for production</p> <p>PC61. Model changeover procedure</p> <p>PC62. Operating check point</p> <p>PC63. Maintenance of Mounter</p> <p>PC64. Make related documents &amp; working procedures/Work Instructions</p>
<b>Management Reflow oven</b>	<p>PC65. Operating method of Reflow oven</p> <p>PC66. Types of Reflow oven</p> <p>PC67. Dummy PCB making</p> <p>PC68. Temperature Profile setting</p> <p>PC69. Glue, Pb &amp; Pb free Solder paste Profile Graph explanation</p> <p>PC70. Difference between Pb solder and Pb free solder paste</p> <p>PC71. Examples of how to control quality of product by setting profile temperature</p> <p>PC72. Why taking profile is needed?</p> <p>PC73. Practice for how to set profile</p> <p>PC74. Work Instruction of Reflow profile</p> <p>PC75. N2 reflow oven explanation</p> <p>PC76. How to set the machine for production</p> <p>PC77. Model changeover procedure</p> <p>PC78. Operating check point</p> <p>PC79. Maintenance of Reflow Oven</p> <p>PC80. Make related documents &amp; working procedures/Work Instructions &amp; Temp. setup</p>
<b>Management of AOI/SPI</b>	<p>PC81. Operating method of AOI</p> <p>PC82. Inspection check points</p> <p>PC83. Programming Procedure of AOI</p> <p>PC84. Debugging Procedure of AOI</p> <p>PC85. Working of SPI</p> <p>PC86. Work Instruction of SPI</p> <p>PC87. How to set the machine for production</p> <p>PC88. Model changeover procedure</p> <p>PC89. Operating check point</p> <p>PC90. Maintenance of AOI/SPI</p> <p>PC91. Make related documents &amp; working procedures/Work Instructions</p>
<b>Material Control</b>	<p>PC92. Types of material supply</p> <p>PC93. Understand Bill of material</p> <p>PC94. Material In/Out Process Flow</p> <p>PC95. Advantages of kitting system</p> <p>PC96. Material control process</p>
<b>Consumable control</b>	<p>PC97. Types of consumables</p>

	<p>PC98. In/Out Process Flow</p> <p>PC99. Storage check point</p> <p>PC100. Consumable control Procedure</p>
<b>Equipment list with spare part control</b>	<p>PC101. Line setup &amp; Equipment installation</p> <p>PC102. Equipment Levelling</p> <p>PC103. IQC Process</p> <p>PC104. History Card</p> <p>PC105. Master list</p> <p>PC106. Equipment &amp; Spares Management</p>
<b>Production Plan</b>	<p>PC107. Line production capability</p> <p>PC108. Line capacity including operational loss</p> <p>PC109. Product model wise production plan</p> <p>PC110. Down time control</p> <p>PC111. Efficiency control</p> <p>PC112. Product Capa. Control (Operational efficiency)</p>
<b>Quality Control</b>	<p>PC113. Importance of Quality Management</p> <p>PC114. Quality Data Management</p> <p>PC115. Criteria for SMT defective</p> <p>PC116. Quality level in points</p> <p>PC117. Data Accumulation Management</p> <p>PC118. Quality Report</p> <p>PC119. Quality management</p>
<b>Monitoring the PCBA quality</b>	<p>PC120. Avoid quality defects and achieve the highest quality standards</p> <p>PC121. Monitor the PCBA quality at each stage of production</p> <p>PC122. Immediate feedback of any quality accidents</p> <p>PC123. Corrective measure on the defectives</p>
<b>Maintenance</b>	<p>PC124. Maintenance Procedure</p> <p>PC125. Machine break down Procedure</p> <p>PC126. Maintenance Planning</p> <p>PC127. Maintenance Preparation</p> <p>PC128. No shut down of machine due to improper maintenance</p> <p>PC129. Perform regular cleaning &amp; lubrication process and methodology as prescribed by manufacturer of the machine</p>
<b>Managing the full line assembly process</b>	<p>PC130. Monitor &amp; manages the full line assembly process</p> <p>PC131. Immediate corrective action of any accidents</p>
<b>Documentation</b>	<p>PC132. Maintain properly all the reports like Production, Part change, Stencil Cleaning, etc.</p> <p>PC133. Work Instruction, Process Flow and Procedure</p> <p>PC134. Ensure that correct &amp; accurate production qty is entered in the reports.</p>
<b>Following the standard safety procedures</b>	<p>PC135. Follow the safely standards described by the company</p>

Knowledge and Understanding (K)	
<p><b>A. Organizational Context (Knowledge of the company / organization and its processes)</b></p>	<p><b>The individual on the job needs to know and understand:</b></p> <p>KA1. Company's policies on: incentives, delivery standards, and personnel management</p> <p>KA2. Work flow involved in assembly process of the company</p> <p>KA3. Importance of the individual's role in the workflow</p> <p>KA4. Reporting structure</p> <p>KA5. Profile of customers</p>
<p><b>B. Technical Knowledge</b></p>	<p><b>The individual on the job needs to have:</b></p> <p>KB1. Basic knowledge on electronics</p> <p>KB2. Ability to read part code of SMT material.</p> <p>KB3. Ability to calculate RLC value and to read their polarity</p> <p>KB4. Knowledge of Material handling &amp; requirements</p> <p>KB5. Ability to identifying the component locations &amp; type on PCB</p> <p>KB6. Ability to identify the defects</p> <p>KB7. Ability to take corrective action</p> <p>KB8. Knowledge of product parts of SMT</p> <ol style="list-style-type: none"> <li>1. UV Bond/ SMD Adhesive</li> <li>2. Solder Paste</li> <li>3. Under-fill</li> <li>4. Printed Circuit Board (PCB)</li> <li>5. Stencil Mask</li> <li>6. Squeegee</li> <li>7. Magazine Rack</li> </ol> <ul style="list-style-type: none"> <li>➤ Types</li> <li>➤ IQC Process</li> <li>➤ Storage condition</li> <li>➤ Handling Process</li> <li>➤ Application Methods</li> <li>➤ Direction for use</li> </ul> <p>KB9. Basic knowledge of SMT machines</p> <ol style="list-style-type: none"> <li>1. Loader/Un-loader/Conveyor</li> <li>2. screen printer</li> <li>3. Mounter</li> <li>4. Reflow oven</li> <li>5. AOI</li> </ol> <ul style="list-style-type: none"> <li>➤ Product setup</li> <li>➤ Operating</li> <li>➤ Programming &amp; its procedure</li> <li>➤ Product model changeover</li> <li>➤ Work Procedure</li> <li>➤ Machine Parameter</li> <li>➤ Trouble shooting</li> <li>➤ Maintenance</li> </ul> <p>KB10. Ability to recruit New Manpower</p> <ul style="list-style-type: none"> <li>➤ Interview Procedure</li> <li>➤ Basic Training &amp; Testing</li> <li>➤ Separate position-wise training</li> <li>➤ On Job Training</li> <li>➤ Final Selection</li> </ul>

	<p>KB11. Ability to control material for production</p> <ul style="list-style-type: none"> <li>➤ IQC Process</li> <li>➤ Recording of each stage data</li> <li>➤ Trunkey material process</li> <li>➤ Half Kitting process</li> <li>➤ Full Kitting process</li> <li>➤ Inventory- Monthly/Yearly</li> </ul> <p>KB12. Ability to control consumable parts</p> <ul style="list-style-type: none"> <li>➤ IQC Process</li> <li>➤ Consumption of the material</li> <li>➤ In/Out control</li> </ul> <p>KB13. Ability to control Equipment list with spare parts</p> <ul style="list-style-type: none"> <li>➤ Line layout &amp; installation</li> <li>➤ IQC Process</li> <li>➤ Equipment management</li> <li>➤ Spare Part management</li> </ul> <p>KB14. Ability to make Production Plan</p> <ul style="list-style-type: none"> <li>➤ Understand, How to make Standard Capacity</li> <li>➤ According to Std., How to make target.</li> <li>➤ How to make Production Plan as per capa.</li> <li>➤ Down time control</li> <li>➤ Efficiency control</li> <li>➤ Loss Improvement</li> </ul> <p>KB15. Knowledge of Quality Control.</p> <p>KB16. Ability to perform visual inspection of the PCBA</p> <p>KB17. Knowledge of data management</p> <ul style="list-style-type: none"> <li>➤ Data control</li> <li>➤ Make Work Instruction , Procedure &amp; Process Flow</li> </ul> <p>KB18. Knowledge of 5S &amp; ESD</p> <p>KB19. Ability to monitor entire assembly process</p> <p>KB20. Knowledge and awareness of all safety rules, policies and procedures, Quality standards to be followed in the process</p>
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Skills (S)	
<b>A. Core Skills/Generic Skills</b>	<b>Reading and Writing Skills</b>
	The user/individual on the job needs to know and understand how: SA1. to read job and specification sheet and technical writing SA2. to use computers SA3. to document the completed work in report SA4. to learn SMT standard language SA5. to read work instructions, procedures for different product models
	<b>Communication Skills</b>
	The user/individual on the job needs to know and understand how: SA6. to effectively communicate, speak clearly and persuasively in positive or negative situations SA7. to listen intently to others and provide clear responses
<b>B. Management Skills</b>	<b>Teamwork and some multitasking</b>
	The user/individual on the job needs to know and understand how: SA8. To share work load as required SA9. To deliver frame to next work process on time
<b>C. Professional Skills</b>	The user/individual on the job needs to know and understand how: SB1. to load Program in machine SB2. to do set the machine for production SB3. to do Model changeover SB4. to do maintenance of machine SB5. to make work procedure & process flow.
	<b>Reflective thinking</b>
	The user/individual on the job needs to know and understand how: SC1. to improve work processes SC2. to reduce errors
	<b>Using tools and machines</b>
	The user/individual on the job needs to know and understand how: SC3. to operate SMT machines for achieving the required outcome SC4. to operate tools for machine maintenance SC5. to use LCR meter for measuring component value
	<b>Critical thinking</b>
	The user/individual on the job needs to know and understand how: SC6. To spot process disruptions and delays SC7. To detect abnormalities in machine performance and prevent major machine malfunctioning SC8. To be prompt to respond to machine errors to improve product quality and enhancement of machine performance