Model Curriculum

Telecom Surface Mount Technology (SMT) Technician

SECTOR: TELECOM
SUB-SECTOR: HANDSET
OCCUPATION: COMMUNICATION ELECTRONICS
REF ID: TEL/Q2501, V1.0
NSQF LEVEL: 4

Skill India

Telecom Sector Skill Council

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Certificate

COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

TELECOM SECTOR SKILL COUNCIL

for

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Telecom Surface Mount Technology (SMT) Technician'
QP No. **'TEL/Q2501 NSQF Level 4'**

Date of Issuance: **Nov 10th, 2017**

Valid up to*: **Nov 10th , 2021**

**Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier)*

Authorised Signatory
(Telecom Sector Skill Council)

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Telecom Surface Mount Technology (SMT) Technician

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Telecom Surface Mount Technology (SMT) Technician", in the "Telecom" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Telecom Surface Mount Technology (SMT) Technician**		
Qualification Pack Name & Reference ID. ID	TEL/Q2501, v1.0		
Version No.	1.0	**Version Update Date**	24-01-2018
Pre-requisites to Training	ITI		
Training Outcomes	**After completing this programme, participants will be able to:** • **Screen printing of telecom boards:** Screen printing of telecom boards and associated processes with the aim to achieve uniform deposition of solder paste on the required positions in the boards. • **Component placement on telecom boards:** Screen printing of boards and associated processes with the aim to achieve uniform deposition of solder paste on the required positions of components on the board using chip shooter and pitch placer equipment. • **Reflow soldering on telecom boards:** re-flow soldering of telecom boards including all related processes and operations. • **Cleaning and inspection of telecom boards:** cleaning and inspection of completed telecom boards. • **Health and Safety:** understand and compliance to the industry norms wrt. the safety of self and equipment's.		

This course encompasses 5 out of 5 National Occupational Standards (NOS) of 'Telecom Surface Mount Technology (SMT) Technician" Qualification Pack issued by "Telecom Skill Council of India".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction to basic electronics and PCB** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 00:00 Corresponding **NOS Code** NA	• Understand the fundamentals of electronics • Understanding various Active & Passive components including Resistors, capacitors, inductors and colour coding of capacitors and resistors. • Understand Diode – Switch and rectifier, Transistor – amplifier and switch, Logic Gates • Basic knowledge of electronic circuits and functions (transmitters, receivers, switches, power supplies, amplifiers, multiplexers, couplers, registers, memory and all RF circuits in telecom equipment • Introduction to PCB • Multi layered PCB – important concepts • Understanding the properties of copper – clad laminates (CCL), layout design and planning • Cleaning of Boards before pattern transfer	NA
2	**Screen Printing of telecom Boards** **Theory Duration** (hh:mm) 25:00 **Practical Duration** (hh:mm) 25:00 **Corresponding NOS Code** TEL/N2503	• Ascertain baking requirements as per customer Specifications / Industrial Standards • selection of correct tools and components/accessories • Cleaning process of stencil before and after use • Selecting proper squeeze as per the PCB size • As per the parameters solder paste is to be applied. • Selection of Correct Squeeze equipment • Proper Positioning of the stencil, Solder paste, squeeze in the Screen printer • Setting Parameters and operating screen printing Equipment/ Machinery	Baking oven, Stencils, Screens, PC Boards, Solder paste, squeezers, Screen Printers, ink
3	**Component placement on telecom boards** **Theory Duration** (hh:mm) 35:00 **Practical Duration** (hh:mm) 55:00	**Feeding Placement Data** • Feeding Gerber data - using in PCB fabrication System • Feeding X- Y Co ordinate Data - Setting Horizontal and vertical Addresses on Computer Screen • Working with UI - User interface • Concept of Data entry / Loading of placement Program to the chip shooter • Mapping Program and board **Loading of Chip Component Rolls**	Pick & Place M/c, electronic component rolls/modules

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code TEL/N2504	• Check the Operation of the Roll Feeder Mechanism • Identify the slot numbers vis - a - vis (in relation to) feeder rolls to be loaded • Verify Component Rolls as per the PART no. / Work Specification • Loading Chip component rolls in Right feeders **Loading of Chip Component Trays** • Verify the board and Corresponding Placement of DATA • Verify Components vis a vis as per the PART no. / Work Specification • Loading Component's on the Tray as per the Placement Program • Placing the Component's in the with Correct orientation in the Feeder Trays • Checking the operation of the Mechanism including vision cameras **Operating Chip Shooter and fine pitch placer and Functional/QA checks on the PCB** • Verifying Correct loading of boards , Program and component rolls/trays • Check the Placement of Vacuum Pressure • Checking the function of the feed Mechanism and ensure error free operation • Operate the component Placement Equipment • Use Tape Board Technique to verify the Placement Accuracy • Use Microscope to check the correctness of components placement for sample boards	
4	**Reflow soldering on telecom boards** **Theory Duration** (hh:mm) 30:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** TEL/N2505	**Preparing the Re-flow Machine** • Get the solder paste parameters from Data Sheet • Get the Suggested Setting Parameters • Load the parameters in the re flow Machine • Record the readings as it is passing one sample board into reflow machine • Matching the readings with desired Outcome • Undertake Corrective action, if problem persists **Reflow operation on the PCB**	Solder Mixer/Paste, Reflow M/c

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Undertake setting of machines is set as per the parameters as ascertained during the preparatory process • Prepare and pass the loaded PCB (with solder and components placed) through the re-flow machine • Safely remove the PCB at the end of the cycle **QA Checks on the Re-flow Out come** • Check for any dry solder • Check to ascertain even reflow, any voids and tomb stone • Check for De- lamination • Check for any Mis - alignment and/ or disturbed components • Check for any damage on the PCB	
	Cleaning and inspection of telecom boards **Theory Duration** (hh:mm) 5:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** TEL/N2502	**Cleaning of PCBs** • Making the PCB Free from flux residues • Making the PCB Free from White patches / powder • Cleaning the PCB with Specified - Solvent / Agent • Ensuring Safe and proper storage of Cleaned PCBs • Operate vapour de-greaser (boil, rinse, vaporize and dry) to clean the boards **Inspection - QA/QC** • Checking PCB for any missing components, wrongly placed components • Check the soldering workmanship and defects • Check the PCB assembler, if any defects. • Check the completeness of requirement specifications and documentation • Check for all available infrastructure and test equipment • Check for complaint handling and escalation process • Check for Proper Jigs and settings	Board Cleaning solvents/solutions, De-Greasers, PCB Storage system (ESD Compliant)
5	**Health & Safety** **Theory Duration** (hh:mm) 5:00 **Practical Duration** (hh:mm) 10:00	• Understand different safety Equipment's • Organizational set up for safety and responsible officer • Cause of accident and hazards and their causes	Health and safety Kit

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code TEL/N2509	• Importance of Safe working practice and followed in respect to health and safety • Importance of General health • Reporting Procedure for safety hazards • Use work safety in different work place • Housekeeping and 5 s • Different types of firefighting Equipment's • Rescue techniques • Electrical safety • Read Instructions and charts and signage • Knowledge of ESD, Basics of ESD control, Antistatic Wrist strap	
6	**Industrial Education** **Theory Duration** (hh:mm) 5:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** NA	• Communicate with Colleagues, peers and supervisor and stake holders • Liaising and Coordination skills • Listen effectively and orally communicate information accurately • QC Tools • Maintenance procedures and basic maintenance management \Objectives • Routine, Preventive Predictive, and Break down maintenance • Basic Store management • Industrial Act, Company Standards • ERP and Log sheet / Log book • Importance of standard operating procedure	NA
7	**Soft Skills** **Theory Duration** (hh:mm) 5:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** NA	• Outline and explain grooming guidelines with respect to a handset repair engineer • Understand the importance of grooming • Understand and demonstrate effective process of communication at your work place • Demonstrate different types of communication and effective listening skills in your day-to-day life • Effective time management techniques and its benefits • Identify time wasters time wasters • Understand & Demonstrate effective time management skills	NA
	Total Duration	**Unique Equipment Required:**	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Theory Duration 120:00 **Practical Duration 180:00**	Laptop/PC, white board, marker, projector, first aid kit	

Grand Total Course Duration: **300Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **Telecom Sector Skill Council)***

Trainer Prerequisites for Job role: "Telecom Surface Mount Technology (SMT) Technician" mapped to Qualification Pack: "TEL/Q2501, v1.0"

Sr. No.	Area	Details
1	**Description**	Telecom SMT Technician is responsible for handling end-to- end SMT process. Core functionality includes, screen printing, component placement, reflow soldering, cleaning and inspection, including re-work to address defects. The technician will be handling high end machinery/ equipment towards achieving the above functionality.
2	**Personal Attributes**	This job requires the individual to have technical appreciation of the processes, analytical skills, eye for details and work towards optimal throughput. Individual needs to be focused, process oriented and should have ability to work with concentration during the shift hours.
3	**Minimum Educational Qualifications**	ITI
4a	**Domain Certification**	Certified for Job Role: "Telecom Surface Mount Technology (SMT) Technician "mapped to QP: "TEL/Q2501, Version No. 1.0". Minimum accepted score as per respective TSSC guidelines.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q0102, Version No. 1.0". Minimum accepted score as per respective SSC guidelines.
5	**Experience**	• The trainer should be certified by TSSC as 'Train the Trainer' and Assessor. • Worked on the shop floor of mobile manufacturing plant i.e. assembly of products for a minimum of one years.

Annexure: Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role : **Telecom Surface Mount Technology Technician**
Qualification Pack : **TEL/Q2501**
Sector Skill Council : **Telecom Sector Skill Council**

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/ set of NOS.
4. Individual assessment agencies will create unique question papers for theory and skill practical part for each candidate at each examination/ training center.
5. To pass the Qualification Pack, every trainee should score a minimum 70% of aggregate marks to successfully clear the assessment.
6. In case of unsuccessful completion, the trainee may seek re-assessment on the Qualification Pack.

Compulsory NOS		Total Marks: 400		Marks Allocation	
Assessable Outcomes	**Assessment criteria for outcomes**	**Total Marks (400)**	**Out of**	**Theory**	**Skills Practical**
TEL/N2503 Baking of boards	PC1. ascertain the baking requirements as per the customer specifications or standard processes	100	8	5	3
	PC2. demonstrate proper stacking/ placement of boards in the oven rack		9	4	5
	PC3. demonstrate setting of temperature and timer of the over as per the requirement		14	5	9
Screen printing process	PC4. select correct tools and accessories (stencil matching the part/ pattern number vis-à-vis the PCB for screen printing, squeegee as per PCB size, correct solder paste/ combination as per the specifications)		12	4	8
	PC5. demonstrate proper cleaning of the stencil, before and after use, using the specified process and solvents		8	2	6
	PC6. demonstrate process for even deposition of paste on boards		9	3	6
	PC7. demonstrate process of properly thawing the solder pastes and setting of solder paste parameters as per the specifications		14	5	9
	PC8. demonstrate correct positioning of stencil, solder paste & squeeze and related parameters in the screen printer and undertake screen printing operation		12	4	8
	PC9. carry out paste thickness measurement as part of post printing process and check the thickness for conformance to the specification		14	3	11
	Total	100	**100**	**35**	**65**

TEL/N2504 Feeding placement data	PC1. read specifications of board and map to the correct software version of chip shooter/ pitch placer	100	5	0	5
	PC2. read and interpret Gerber data, x-y coordinate data		5	0	5
	PC3. work with user interface and features of the machine/ equipment software and demonstrate the same		6	3	3
	PC4. demonstrate data entry/ loading of component placement program to the chip shooter/ fine pitch placer		6	4	2
Loading of chip component rolls	PC5. check operation of the roll feeder mechanism		4	1	3
	PC6. feed Gerber data and insert feeder rolls on the suggested slots of the chip shooter		4	2	2
	PC7. verify component rolls as per the Part number/ work specification		7	2	5
	PC8. demonstrate loading of chip component rolls in the feeder		6	2	4
	PC9. demonstrate manual data entry of X-Y co-ordinates		5	2	3
Loading of chip component trays	PC10. load components on the tray as per the placement program		5	2	3
	PC11. place the components with correct orientation in the feeder tray		6	2	4
	PC12. check operation of the mechanism including vision cameras		7	1	6
Operating chip shooter and fine pitch placer and functional/ QA checks on the PCB	PC13. verify correct loading of boards, program and component rolls/ trays		6	2	4
	PC14. check placement vacuum pressure		4	2	2
	PC15. check for feeder mechanism functions and ensure its error free operation		6	0	6
	PC 16. operate the component placement equipment		5	2	3
	PC17. use tape board technique to verify the placement accuracy		7	2	5
	PC18. verify the correctness of components and placement (under microscope) for the first sample board		6	4	2
	Total	**100**	**100**	**33**	**67**
TEL/N2505 Preparing the re-flow machine	PC1. interpret solder paste parameters from the datasheet and suggested parameters from re-flow machine	100	12	5	7
	PC2. demonstrate loading of parameters in the re-flow machine		10	4	6

	PC3. demonstrate passing a sample PCB through the re-flow machine, with reading being recorded using thermal probes		16	8	8
	PC4. match the readings with the desired outcome and undertake corrective settings		12	4	8
Re-flow operation on the PCB and its QA checks	PC5. undertake setting of machines is set as per th parameters as ascertained during the preparato process		10	5	5
	PC6. prepare and pass the loaded PCB (with solder and components placed) through the re-flow machine		14	7	7
	PC7. safely remove the PCB at the end of the cycle		12	4	8
	PC8. check for any dry solder, ascertain even reflow, tombstone, de-lamination, mis-alignment and/ or disturbed components and any other damage to PCB		14	6	8
	TOTAL	**100**	**100**	**43**	**57**
TEL/N2502 Cleaning of telecom boards	PC1. demonstrate ability to clean the board from flux residues, white patches and/ or powder, using correct and specified solvent	100	15	5	10
	PC2. operate vapour de-greaser (boil, rinse, vapourise and dry) to clean the boards		15	7	8
	PC3. demonstrate safe packaging and storage of telecom boards, using the specified wrapping material		15	4	11
Inspection - QA/QC	PC4. demonstrate ability to check telecom boards for any missing components, wrongly mounted components (location, value) or improper placement, vis-à-vis the specifications		12	7	5
	PC5. demonstrate ability to check the telecom boards for soldering workmanship and defects, proper placement of board identifier, adherence to specifications, conformal coatings		13	6	7
	PC6. demonstrate complaint handling and escalation processes		15	8	7
	PC7. undertake checks of shop floor with respect to adherence to the processes and parameters (temperature, humidity)		15	7	8
	Total	100	**100**	**44**	**56**
TEL/N2509 Health & safety compliance and emergency procedures	PC1. ensure that work is carried out in accordance with the laid down safety, security policies and procedures of the organization	100	10	6	4
	PC2. ensure that site is assessed for safety and emergen readiness compliance as per company's guidelines		12	6	6
	PC3. ensure electrical safety compliances and EMI/EMC hygiene requirements are met as per the guidelines		15	9	6

	PC4. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		15	10	5
	PC5. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		12	7	5
	PC6. follow your organizations 's emergency procedures promptly, calmly and efficiently		12	6	6
	PC7. identify and recommend opportunities for improving health, safety, security to the designated person		14	8	6
	PC8. complete any health and safety records legibly and accurately		10	5	5
	Total	100	**100**	**57**	**43**