

CONTENTS

Chapter	Page
PREFACE	ix
1. THE BASIC STORY OF PRINTED CIRCUITS <i>The Two Principles—The Proximity Fuse—Design Re-orientation</i>	7
2. THE CONFUSED START OF A NEW TECHNOLOGY <i>Selection of Papers of Dr. C. Brunetti, J. A. Sargrove and C. W. A. Dummer</i>	7
3. THE PRINCIPLES OF METHOD SELECTION AND THE FOIL TECHNIQUE <i>Principles of Method Selection for the Production of Printed Circuits—Production Methods of Printed Circuits made from Metal Foil</i>	28
4. WATCHING PRINTED CIRCUIT PRODUCTION <i>A Visit to a Printed Circuit 'Factory' Production Line</i>	42
5. FROM THE DRAWING TO THE PHOTO-STENCIL <i>The Photographing of the Master Drawing—The Photo-stencil—Detailed Working Instructions—Some Troubles and their Causes—Choice of Gauze</i>	72
6. LITHO PRINTING <i>Preparation of the Litho Plate—The Printing Machine—Dusting and Fusing—Running Two Printing Shops</i>	90
7. PHOTOMECHANICAL PRINTING PROCESSES <i>Present Practice—Developments in Photo-printing</i>	96
8. PLATING AND THE FOIL TECHNIQUE <i>Plating Copper Foil Conductors with Other Metals—Plating in Transfer Processes—Plating through Holes—Fully Plated Circuits—Method Selection</i>	111
9. ANCILLARY OPERATIONS <i>Protective Coatings—Tinning—Preparation of Components and of Assembly Jigs—Flush Circuits—Punching—Dip- and Flow-soldering—Potting</i>	132
10. LABORATORY ROUTINE <i>Premises, Layout and Equipment—The Kodak Process—Retouching—Etching</i>	146

THE TECHNOLOGY OF PRINTED CIRCUITS

Chapter	Page
11. DESIGN <i>Drawing Rules—Design Parameters—Materials—Tolerances—Beginner's Guide—Step-by-Step Guide—Shortcuts</i>	159
12. CONVENTIONAL COMPONENTS FOR ASSEMBLY WITH PRINTED CIRCUITS	185
13. PRINTED CIRCUIT TROUBLE SHOOTING <i>Servicing Precautions, Tools and Materials—Replacing Components</i>	192
14. AUTOMATIC ASSEMBLY IN THE ELECTRONICS INDUSTRY <i>Product Design—Defence Aspect—The In-Line System—Automatic Dip- and Flow-soldering Machines—Modules Design—The Level of Competence—Automation and the Small Batch</i>	205
15. REGENERATION OF FERRIC CHLORIDE	223
16. WEIGHT SAVING AND HEAT DISSIPATION <i>Weight-saving Principles</i>	232
17. MINIATURIZATION <i>Basic Considerations—A Second Degree of Miniaturization—The Three-dimensional (foldable) Printed Circuit—Maintenance of Miniaturized Equipment—Mechanical Structure—Summary</i>	242
18. PRINTED COMPONENTS <i>The Industrial Set-up Reflected in Design—Components made from Commercial Copper Foil-clad Laminates—Complete System of Component Integration—'Components' made from Foil-clad Flexible Material</i>	253
19. MICROWAVE PRINTED CIRCUITS: A SHORT SURVEY <i>Introduction—History—Planar or 'Flat Strip' Transmission Systems—Application of Microwave Printed Circuit Techniques to Practical Microwave Structures</i>	281
20. PRINTED CIRCUITS AND THE ELECTRONICS INDUSTRY <i>Present Uses of Printed Circuits—The Concept of Printed Circuits—The Electronics Industry—The Dominant Influence of the Mass Producer—The Printed Circuit Machine—Stock Material and Specialization—Quality Presented by Thin Strip Material—Conclusion</i>	303
APPENDIX 1: EXAMPLES OF COMMERCIALY AVAILABLE ADHESIVES FOR FOIL BONDING	321

CONTENTS

	<i>Page</i>
ING SOLUTIONS	4
PPENDIX 3: DOUBLE LAYER PROCESS	3
PPENDIX 4: PRINCIPLES OF THE AUTOMATIC PLATING PLANT ...	3
PPENDIX 5: DESCRIPTION OF R.C.A. PROGRAMMED PUNCHING MACHINE	3
PPENDIX 6: APPROXIMATE ANALYSIS OF THE CHARACTERISTIC IMPEDANCE OF FLAT-STRIP TRANSMISSION LINES	3
PPENDIX 7: CHARACTERISTICS OF FLAT-STRIP TRANSMISSION LINES OF VARIOUS TYPES	41
BIBLIOGRAPHY OF PRINTED CIRCUITS	50
INDEX	00