

ALEXIS
ENGINEERING

ELECTRICAL WORKSHOP PRACTICES



• STEPHEN MADDOX •

ELECTRICAL WORKSHOP PRACTICES

Stephen Maddox





ALEXIS PRESS

Published by: Alexis Press, LLC, New York, USA
www.alexispress.us

© RESERVED

This book contains information obtained from highly regarded resources.
Copyright for individual contents remains with the authors.
A wide variety of references are listed. Reasonable efforts have been made
to publish reliable data and information, but the author and the publisher
cannot assume responsibility for the validity of
all materials or for the consequences of their use.

No part of this book may be reprinted, reproduced, transmitted,
or utilized in any form by any electronic, mechanical, or other means,
now known or hereinafter invented, including photocopying,
microfilming and recording, or any information storage or retrieval system,
without permission from the publishers.

For permission to photocopy or use material electronically
from this work please access alexispress.us

*This Low Priced Edition is printed in India for Sale in Asia and Africa Only.
Circulation of this edition outside Asia and Africa is Unauthorized and Strictly Prohibited.*

First Published 2023

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication Data

Includes bibliographical references and index.

Electrical Workshop Practices by Stephen Maddox

ISBN 978-1-64532-727-1

Contents

Preface

vii

Chapter 1	Electronic Materials	1
	Electrical Conductor	1
	Resistance and Conductance	3
	Conductor Materials	4
	Wire Size	4
	Conductor Ampacity	4
	Isotropy	4
	Electrical resistance and conductance	12
	Insulator	28
	Semiconductor Materials	28
Chapter 2	Cables	39
	Electrical Cable	39
	Uses	41
	Characteristics	42
	Fire Protection	42
	Hybrid Cables	42
	Characteristic Impedance	46
	Ampacity	48
	Types of cables	48
Chapter 3	Connectors	102
	Electrical Connector	102
	Electrical Contact	117
	Contact Resistance	121
	Breakdown Voltage	124
	Megohmmeter	126
	Electrical Safety Testing	130
	Circuit Diagram	134
	BNC Connector	140
	D-subminiature	140

Audio and Video Interfaces and Connectors	147
Edge Connector	159
Phone Connector (Audio)	160
Telephone Jack and Plug	177
Chapter 4	
Switches	181
Description	181
Contacts	182
Actuator	186
Special Types	186
Slide Switches	187
Electronic Switches	187
Toggle Switch	188
Diamond Turning	189
SCSI Pass-Through Direct	192
Light Switch	192
Rotary Switch	201
Push Switch	202
Touch Switch	203
Miniature Snap-action Switch	204
Limit Switch	207
DIP Switch	208
Membrane Switch	211
Chapter 5	
Electrical Installations	214
Electrical Wiring in North America	214
Electrical Wiring in the United Kingdom	220
Regulation of Electrical Installations	238
Cabling and Accessories	249
Bibliography	279
Index	281

Index

A

Actuator 114, 115, 181, 183, 186, 190,
194, 196, 197, 198, 204, 205, 206,
207
Amorphous 31, 36
Ampacity 4, 18, 46, 47, 48, 216, 249, 275,
278
Applications 3, 12, 17, 19, 33, 38, 41, 42,
48, 49, 51, 55, 57, 59, 60, 61, 66, 67,
70, 71, 72, 78, 80, 82, 87, 88, 90, 98,
102, 103, 104, 106, 107, 108, 109,
111, 131, 135, 137, 138, 140, 142,
153, 154, 155, 161, 164, 165, 167,
169, 173, 176, 177, 188, 200, 207,
213, 218, 219, 247, 253, 259, 269,
272, 273, 274, 277
Armoured Cable 67, 68, 69, 232

B

Backshells 103, 104, 106
BNC Connector 98, 134, 135, 136, 137,
138, 139, 140, 146, 153
Breakdown 12, 13, 14, 15, 16, 17, 18, 19,
22, 25, 55, 56, 120, 121, 122, 123,
184

C

Characteristic Impedance 42, 43, 45, 46,
49, 51, 52, 54, 55, 58, 90, 91, 92, 93,
94, 95, 134, 136

Circuit Diagram 130, 131, 132, 133, 134
Coaxial Cable 18, 48, 49, 50, 51, 52, 54,
55, 56, 57, 58, 59, 60, 61, 62, 64, 65,
67, 70, 77, 88, 92, 93, 94, 98, 134,
135, 150, 152, 153
Communications 23, 37, 51, 60, 65, 68, 69,
80, 81, 95, 142, 154, 163, 176, 177,
188, 225, 243, 245, 268, 272, 275
Conductor Ampacity 4
Conductor Materials 29, 30, 33, 103
Conductors 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12,
13, 17, 18, 19, 20, 24, 29, 30, 31, 32,
33, 35, 36, 37, 39, 40, 42, 43, 45, 46,
47, 49, 51, 54, 57, 58, 61, 67, 68, 69,
71, 72, 73, 74, 75, 76, 78, 81, 86, 87,
88, 89, 92, 96, 98, 104, 111, 112, 121,
127, 128, 130, 161, 176, 178, 179,
181, 185, 191, 194, 196, 199, 206,
210, 231, 236, 238, 239, 241, 244,
248, 249, 253, 260, 261, 264, 267,
268, 270, 278
Connectors 3, 39, 48, 52, 54, 56, 57, 58,
59, 64, 71, 74, 75, 76, 77, 78, 80, 88,
89, 98, 102, 103, 104, 105, 106, 107,
108, 109, 110, 111, 112, 134, 135,
136, 137, 138, 139, 140, 141, 142,
143, 144, 145, 146, 147, 148, 149,
150, 151, 153, 154, 155, 156, 158,
159, 160, 161, 162, 163, 164, 165,
167, 168, 169, 170, 171, 172, 173,

175, 176, 177, 178, 179, 193, 216,
232, 248, 256, 263, 268, 273, 276

D

Debouncing 184
Description 49, 134, 140, 181, 221
Dimmer Switch 193, 194, 200
Doping 18, 29, 30, 32, 33, 35
DVI Connector 148, 157

E

Early Transistors 37
Electrical Connector 102
Electrical Connector 102, 104, 107, 111,
140, 155, 160, 162, 177
Electrical Insulation 12, 15, 271
Excited Electrons 30
Explanation 13, 36, 96, 246

F

Fire Protection 42, 215, 244, 278
Footswitch 187
Frequency Dependence 9

H

HDMI 148, 149, 150, 151
Heterojunctions 30
Hybrid Cables 42
Hyperboloid 106, 108

I

Illuminated Switch 197
Illumination 11, 261
Insulation of Antennas 28
Insulator 4, 6, 8, 10, 11, 12, 13, 14, 15, 16,
18, 19, 20, 21, 22, 23, 24, 25, 26, 27,
28, 32, 33, 36, 48, 49, 50, 51, 53, 54,
55, 92, 98, 103, 119, 121, 122, 124,
125, 175, 200, 220
Interference 42, 49, 56, 57, 61, 64, 76, 77,
78, 92, 95, 96, 97, 100, 106, 140, 148,
176, 184, 185, 210, 272

Interoperability 173
Isotropy 4, 189

J

Joule Heating 10, 11, 15

L

Lampholder Plug 267
Lossless Line 45, 46

M

Measurement 8, 11, 118, 119, 122, 126,
129, 138, 140
Mechanism 13, 14, 16, 17, 34, 82, 105,
117, 120, 136, 181, 182, 183, 184,
185, 187, 194, 195, 196, 197, 198,
199, 201, 202, 205, 207
Megohmmeter 124, 125

O

Orientation 105, 140, 194

P

Parameters 44, 54, 119, 147
Physical Construction 103
Power Switching 185

R

Resistance and Conductance 4, 5, 7, 9
Resistors 7, 10, 11, 36, 131, 209

S

Signal Propagation 51
Static Resistance 5, 9
Strain Dependence 11
Superconductivity 11, 12, 16
Surge Impedance 42, 43, 46

T

Telegrapher 44
Terminology 182, 224, 250
Triaxial 61, 139, 140