

CLAUSE	PAGE
Introduction	1
A1 Scope	1
A2 Arrangement.....	2
A3 Application.....	2
A4 Drafting Practices Applicable to Graphic Symbols	3
Section 1 Qualifying Symbols	5
1.1 Adjustability	
Variability	5
1.2 Special-Property Indicators.....	7
1.3 Radiation Indicators (electromagnetic and particulate)	8
1.4 Physical State Recognition Symbols.....	9
1.5 Test-Point Recognition Symbol.....	10
1.6 Polarity Markings.....	10
1.7 Direction of Flow of Power, Signal, or Information.....	12
1.8 Kind of Current (General).....	13
1.9 Connection Symbol.....	14
1.10 Envelope	
Enclosure.....	17
1.11 Shield	
Shielding	18
1.12 Special Connector or Cable Indicator.....	19
1.13 Electret (shown with electrodes).....	19
Section 2 Graphic Symbols for Fundamental Items (not included in other sections).....	19
2.1 Resistor.....	19
2.2 Capacitor	24
2.3 Antenna	28
2.4 Attenuator.....	32
2.5 Battery	33
2.6 Delay Function	
Delay Line	
Slow-Wave Structure	34
2.7 Oscillator	
Generalized Alternating-Current Source	35
2.8 Permanent Magnet	35
2.9 Pickup	
Head	35
2.10 Piezoelectric Crystal Unit (including Crystal Unit, Quartz).....	36
2.11 Transducer	
Accelerometer	
Motional Pickup Transducer	36
2.12 Squib, Electric	37
2.13 Thermocouple (dissimilar-metals device).....	37
2.14 Thermal Element	
Thermomechanical Transducer	38
2.15 Spark Gap	
Igniter Gap	38

CLAUSE	PAGE
2.16 Continuous Loop Fire Detector (temperature sensor).....	38
2.17 Ignitor Plug	38
Section 3 Graphic Symbols for Transmission Path	39
3.1 Transmission Path	
Conductor	
Cable	
Wiring.....	39
3.2 Distribution Lines	
Transmission Lines	45
3.3 Alternative or Conditional Wiring	47
3.4 Associated or Future	47
3.5 Intentional Isolation of Direct-Current Path in Coaxial or Waveguide Applications	48
3.6 Waveguide	48
3.7 Strip-Type Transmission Line	49
3.8 Termination.....	49
3.9 Circuit Return.....	50
3.10 Pressure Tight Bulkhead Cable Gland	
Cable Sealing End.....	51
Section 4 Graphic Symbols for Contacts, Switches, Contactors, and Relays.....	52
4.1 Switching Function	52
4.2 Electrical Contact	52
4.3 Basic Contact Assemblies.....	54
4.4 Magnetic Blowout Coil	57
4.5 Operating Coil	
Relay Coil.....	57
4.6 Switch.....	58
4.7 Pushbutton, Momentary or Spring-Return.....	59
4.8 Two-circuit, Maintained or Not Spring-Return	60
4.9 Nonlocking Switch, Momentary or Spring-Return.....	60
4.10 Locking Switch	61
4.11 Combination Locking and Nonlocking Switch.....	62
4.12 Key-Type Switch	
Lever Switch	62
4.13 Selector or Multiposition Switch	63
4.14 Limit Switch	
Sensitive Switch	66
4.15 Safety Interlock.....	67
4.16 Switches with Time-Delay Feature.....	68
4.17 Flow-Actuated Switch.....	69
4.18 Liquid-Level-Actuated Switch.....	69
4.19 Pressure- or Vacuum-Actuated Switch	69
4.20 Temperature-Actuated Switch	70
4.21 Thermostat	70
4.22 Flasher	
Self-Interrupting Switch	71
4.23 Foot-Operated Switch	
Foot Switch	72

CLAUSE	PAGE
4.24 Switch Operated by Shaft Rotation and Responsive to Speed or Direction	72
4.25 Switches with Specific Features	73
4.26 Telegraph Key	73
4.27 Governor (Contact-making)	
Speed Regulator.....	74
4.28 Vibrator, Interrupter	74
4.29 Contactor.....	74
4.30 Relay	76
4.31 Inertia Switch (operated by sudden deceleration).....	78
4.32 Mercury Switch.....	78
4.33 Aneroid Capsule (air pressure) Operated Switch.....	79
 Section 5 Graphic Symbols for Terminals and Connectors.....	 79
5.1 Terminals	79
5.2 Cable Termination.....	81
5.3 Connector	
Disconnecting Device	
Jack	
Plug	81
5.4 Connectors of the Type Commonly Used for Power-Supply Purposes	84
5.5 Test Block	86
5.6 Coaxial Connector	
Coaxial Junction.....	86
5.7 Waveguide Flanges	
Waveguide Junction.....	87
 Section 6 Graphic Symbols for Transformers, Inductors, and Windings	 88
6.1 Core.....	88
6.2 Inductor	
Winding (machine or transformer)	
Reactor Radio-Frequency Coil	
Telephone Retardation Coil	89
6.3 Transducer	
Saturable-Core Inductor	
Saturable-Core Reactor.....	90
6.4 Transformer	
Telephone Induction Coil	
Telephone Repeating Coil	92
6.5 Linear Coupler	100
 Section 7 Graphic Symbols for Electron Tubes and Related Devices	 100
7.1 Electron Tube	100
7.2 General Notes.....	104
7.3 Typical Applications.....	105
7.4 Solion	
Ion-Diffusion Device	109
7.5 Coulomb Accumulator	
Electrochemical Step-Function Device	110

CLAUSE	PAGE
7.6 Conductivity Cell	110
7.7 Nuclear-Radiation Detector (gas-filled)	
Ionization Chamber	
Proportional Counter Tube	
Geiger-Müller Counter Tube	110
Section 8 Graphic Symbols for Semiconductor Devices	111
8.1 Semiconductor Device	
Transistor	
Diode	111
8.2 Element Symbols	111
8.3 Special-Property Indicators.....	116
8.4 Rules for Drawing Style 1 Symbols.....	117
8.5 Typical Applications, Two-Terminal Devices.....	118
8.6 Typical Applications, Three- (or more) Terminal Devices.....	123
8.7 Photosensitive Cell.....	129
8.8 Semiconductor Thermocouple	130
8.9 Hall Element	
Hall Generator	130
8.10 Photon-Coupled Isolator	130
8.11 Solid-State Thyatron (replacement type).....	131
Section 9 Graphic Symbols for Circuit Protectors.....	132
9.1 Fuse (one-time thermal current-overload device).....	132
9.2 Current Limiter (for power cable).....	133
9.3 Lightning Arrester	
Arrester (electric surge, etc)	
Gap	134
9.4 Circuit Breaker	135
9.5 Protective Relay	136
Section 10 Graphic Symbols for Acoustic Devices	140
10.1 Audible-Signaling Device.....	140
10.2 Microphone	
Telephone Transmitter.....	142
10.3 Handset	
Operator's Set.....	142
10.4 Telephone Receiver	
Earphone	
Hearing-Aid Receiver.....	143
Section 11 Graphic Symbols for Lamps and Visual-Signaling Devices	144
11.1 Lamp	144
11.2 Visual-Signaling Device	146
Section 12 Graphic Symbols for Readout Devices	148
12.1 Meter	148

CLAUSE	PAGE
12.2 Electromagnetically Operated Counter Message Register.....	149
Section 13 Graphic Symbols for Rotating Machinery	150
13.1 Rotating Machine.....	150
13.2 Field, Generator or Motor	151
13.3 Winding Connection Symbols	152
13.4 Applications: Direct-Current Machines	153
13.5 Applications: Alternating-Current Machines.....	158
13.6 Applications: Alternating-Current Machines with Direct-Current Field Excitation	161
13.7 Applications: Alternating- and Direct-Current Composite.....	162
13.8 Synchro	163
Section 14 Graphic Symbols for Mechanical Functions.....	164
14.1 Mechanical Connection Mechanical Interlock.....	164
14.2 Mechanical Motion	165
14.3 Clutch Brake	166
14.4 Manual Control	167
Section 15 Graphic Symbols Commonly Used in Connection with VHF, UHF, SHF Circuits.....	168
15.1 Discontinuity (Introducing intentional wave reflection).....	168
15.2 Coupling.....	170
15.3 Directional Coupler	172
15.4 Hybrid Directionally Selective Transmission Devices.....	173
15.5 Mode Transducer	174
15.6 Mode Suppressor.....	175
15.7 Rotary Joint (radio-frequency rotary coupler)	175
15.8 Nonreciprocal Devices.....	176
15.9 Resonator Tuned Cavity	177
15.10 Resonator (cavity-type) Tube.....	178
15.11 Magnetron	178
15.12 Velocity-Modulation (velocity-variation) Tube.....	179
15.13 Transmit-Receive (TR) Tube	179
15.14 Traveling-Wave-Tube	180
15.15 Balun	182
15.16 Filter	182
15.17 Phase Shifter (matched)	182
15.18 Ferrite Bead Ring.....	183
15.19 Line Stretcher (with female connectors shown)	183

CLAUSE	PAGE
Section 16 Graphic Symbols for Composite Assemblies	184
16.1 Circuit Assembly	
Circuit Subassembly	
Circuit Element	184
16.2 Amplifier	185
16.3 Rectifier.....	187
16.4 Repeater (includes Telephone Repeater)	187
16.5 Network	
Artificial Line (other than delay line).....	188
16.6 Phase Shifter	
Phase-Changing Network.....	188
16.7 Chopper	189
16.8 Diode-Type Ring Demodulator	
Diode-Type Ring Modulator	190
16.9 Gyro	
Gyroscope	
Gyrocompass	190
16.10 Position Indicator	190
16.11 Position Transmitter.....	191
16.12 Fire Extinguisher Actuator Heads.....	191
Section 17 Graphic Symbols for Analog and Digital Logic Functions	192
17.1 Operational Amplifier.....	192
17.2 Summing Amplifier	192
17.3 Integrator (Amplifier)	192
17.4 Electronic Multiplier	193
17.5 Electronic Divider.....	193
17.6 Electronic Function Generator.....	193
17.7 Generalized Integrator.....	193
17.8 Positional Servomechanism	193
17.9 Function Potentiometer	193
Section 18 Graphic Symbols for Digital Logic Functions.....	194
18.1 Digital Logic Functions	194
Section 19 Graphic Symbols for Special-Purpose Maintenance Diagrams	194
19.0 Introduction.....	194
19.1 Data-Flow Code Signals	195
19.2 Functional Circuits.....	197
Section 20 Graphic Symbols Commonly Used on System Diagrams, Maps, and Charts	198
20.1 Radio Station.....	198
20.2 Space Station.....	200
20.3 Exchange Equipment	201
20.4 Telegraph Repeater	201
20.5 Telegraph Equipment.....	203
20.6 Telephone Set.....	206

CLAUSE	PAGE
Section 21 Graphic Symbols Commonly Used on System Diagrams, Maps, and Charts	208
21.1 Generating Station.....	208
21.2 Hydroelectric Generating Station.....	208
21.3 Thermoelectric Generating Station	209
21.4 Prime Mover (qualifying symbols)	210
21.5 Substation.....	210
Section 22 Class Designation Letters	211
22.1 Class Designation Letter	211
22.2 Special Considerations for Class Designation Letter Assignment.....	211
22.3 Item Names	212
22.4 Class Designation Letters: Alphabetical List.....	212
22.5 Item Names: Alphabetical List	220
22.6 Item Designations, IEC 113-2.....	220
Section 23 Referenced Standards and Canadian Standard Z99 Modifications.....	220
23.1 Referenced Standards	220
100 Canadian Standard Z99 Modifications to American National Standard Y32.2-1975 (IEEE Std 315-1975).....	221
Annex A (Informative) Cross Reference List of Changed Item Numbers	222
Annex B (Informative) Reference Data International Electrotechnical Commission (IEC) Publication 117: Recommended Graphical Symbols.....	223
Annex C (Informative) Revised or Deleted Symbols	225
Annex D (Informative) Revised or Deleted Symbols	226
Annex E (Informative) Revised or Deleted Symbols	236
Annex F (Informative) Cross-Reference List of Class Designation Letters	241