APPENDIX I

GLOSSARY

NOTE

When entering a new occupation, you must learn the vocabulary of the trade to understand your fellow workers and to make yourself understood by them. Shipboard life requires that Navy personnel learn a relatively new vocabulary. The reasons for this need are many, but most of them boil down to convenience and safety. Under certain circumstances, a word or a few words mean the exact thing or a certain sequence of actions, making it unnecessary to give a lot of explanatory details. An incorrectly interpreted instruction can cause confusion, breakage of machinery, or even loss of life. Avoid the confusion and avoid the danger by learning the meaning of terms common to the occupation. This glossary is not all-inclusive, but it does contain many terms that every craftsman should know. The terms given in this glossary may have more than one definition; only those definitions as related to drafting are given.

ALIGNED SECTION—A section view in which some internal features are revolved into or out of the plane of the view.

ANALOG—The processing of data by continuously variable values.

ANGLE—A figure formed by two lines or planes extending from, or diverging at, the same point.

APEX—The highest point or peak.

APPLICATION BLOCK—A part of a drawing of a subassembly showing the reference number for the drawing of the assembly or adjacent subassembly.

ARC—A portion of the circumference of a circle.

ARCHITECT'S SCALE—Scale used when dimensions or measurements need to be expressed in feet and inches.

AUXILIARY VIEW—An additional plane of an object, drawn as if viewed from a different location. It is used to show features not visible in the normal projections.

AXIS—The center line running lengthwise through a screw.

AXONOMETRIC PROJECTION—A set of three or more views in which the object appears to be rotated at an angle, so that more than one side is seen.

BAR JOISTS—Light steel joists of open-web construction with a single zigzag bar welded to upper and lower chords at the points of contact. Bar joists are used as floor and roof supports.

BATTER BOARDS—Pairs of horizontal boards nailed to wood stakes adjoining an excavation. Used with strings as a guide to elevation and to outline a proposed building.

BEAM—Any horizontal load-bearing structural member that spans a space and is supported at both ends.

BEARING CAPACITY—The maximum unit pressure that soil or other material can withstand without failure or excessive settlement.

BENCH MARK—A mark made by a surveyor or contractor that is used as a reference point when measuring the elevation or location of other points.

BEND ALLOWANCE—An additional amount of metal used in a bend in metal fabrication.

BILL OF MATERIAL—A list of standard parts or raw materials needed to fabricate an item.

BISECT—To divide into two equal parts.

BLOCK DIAGRAM—A diagram in which the major components of a piece of equipment or a system are represented by squares, rectangles, or other geometric figures, and the normal order of progression of a signal or current flow is represented by lines.

BLUEPRINTS—Copies of mechanical or other types of technical drawings. Although blueprints used to be blue, modern reproduction techniques now permit printing of black-on-white as well as colors.

BORDER LINES—Dark lines defining the inside edge of the margin on a drawing.

BREAK LINES—Lines to reduce the graphic size of an object, generally to conserve paper space. There are two types: the long, thin, ruled line with freehand zigzag and the short, thick, wavy freehand line.

BROKEN-OUT SECTION—Similar to a half section; used when a partial view of an internal feature is sufficient.

CANTILEVER—A horizontal structural member supported only by one end.

CAST—A metal object made by pouring melted metal into a mold.

CENTER LINES—Lines that indicate the center of a circle, arc, or any symmetrical object; consist of alternate long and short dashes evenly spaced.

CHORDS—The basic components of a roof truss are the top and bottom chords and the web members. The top chords serve as roof rafters. The bottom chords act as ceiling joists.

CIRCLE—A closed plane figure having every point on its circumference (perimeter) equidistant from its center.

CIRCUMFERENCE—The length of a line that forms a circle.

CLEVIS—An open-throated fitting for the end of a rod or shaft, having the ends drilled for a bolt or a pin. It provides a hinging effect for flexibility in one plane.

COLUMN—High-strength vertical structural members.

COMPUTER LOGIC—The electrical decision process used by a computer to perform calculations and other functions.

COMPUTER NUMERICAL CONTROL—A process in which a machine is controlled by the input media from a computer to produce machined parts.

COMPUTER-AIDED DRAFTING (CAD)—A process in which engineering drawings are developed using a computer.

COMPUTER-AIDED MANUFACTURING (CAM)—A method by which a computer uses a design to guide a machine that produces parts.

CONE—A solid figure that tapers uniformly from a circular base to a point.

CONSTRUCTION LINES—Lightly drawn lines used in the preliminary layout of a drawing.

CORNER POSTS—Vertical members located at the corners of a timber structure.

CORNICE—The projecting or overhanging structural section of a roof.

CREST—The surface of the thread corresponding to the major diameter of an external thread and the minor diameter of an internal thread.

CUBE—Rectangular solid figure in which all six faces are square.

CUTTING PLANE LINE—A line indicating a plane or planes from which a sectional view is taken.

CYLINDER—A solid figure with two equal circular bases.

DEAD LOAD—A calculation of the weight of a building's structural components, fixtures, and permanently attached equipment, used in designing a building and its foundations.

DEPTH—The distance from the root of a thread to the crest, measured perpendicularly to the axis.

DEVELOPMENT—The process of making a pattern from the dimensions of a drawing, used in fabricating sheet metal objects.

DIGITAL—The processing of data by numerical or discrete units.

DIMENSION LINE—A thin broken line (except in the case of structural drafting) with each end terminating with an arrowhead; used to define the dimensions of an object.

DRAWING NUMBER—An identifying number assigned to a drawing or a series of drawings.

DRAWINGS—The original graphic design from which a blueprint may be made; also called plans.

ELECTROMECHANICAL DRAWING—A special type of drawing combining electrical symbols and mechanical drawing to show the position of equipment that combines electrical and mechanical features.

ELEMENTARY WIRING DIAGRAM—A wiring diagram that shows the electrical connections and functions of a specific circuit arrangement. Elementary wiring diagram is sometimes used interchangeably with schematic diagram, especially for a simplified schematic diagram.

ELEVATION—A drawing showing the front, rear, and sides of a structure, as they would appear projected on vertical planes.

EXPLODED VIEW—A special view of a device that shows the relative location of part. An exploded view can be particularly helpful in assembling complex objects.

EXTERNAL THREAD—A thread on the outside of a member. For example, the thread of a bolt.

FALSEWORK—Temporary supports of timber or steel sometimes required in the erection of difficult or important structures.

FILLET—A concave internal corner of a metal component.

FINISH MARKS—Marks used to indicate the degree of finish to be achieved on surfaces to be machined.

FOOTINGS—Weight-bearing elements at the lower end of a wall used to distribute a load to a wider area of supporting soil.

FORMAT—The general makeup or style of a drawing.

FRENCH CURVE—An instrument used to draw smooth irregular curves.

FRUSTUM—A truncated cone or pyramid in which the plane cutting off the apex is parallel to the base.

FULL SECTION—A sectional view that passes entirely through the object.

GIRDER—A large principal beam of steel, reinforced concrete, wood, or a combination of these, used to support other structural members at isolated points along its length.

GUSSET PLATES—A plate fastened across a joint for reinforcement in wood or steel framework members.

HALF SECTION—A combination of an orthographic projection and a section view to show two halves of a symmetrical object.

HATCHING—Lines that are drawn on the internal surface of sectional views. Hatching is used to define the kind or type of material the section surface consists of.

HELIX—The curve formed on any cylinder by a straight line in a plane that is wrapped around the cylinder with a forward progression.

HIDDEN LINES—Medium, short, dashed lines that indicate the hidden features of the object being drawn.

INTERCONNECTION DIAGRAM—Used to show the cabling between electronic units and to indicate the terminal connections.

INTERNAL THREAD—A thread on the inside of a member. For example, the thread inside a nut.

ISOMETRIC DRAWING—A type of pictorial drawing. See **ISOMETRIC PROJECTION**.

ISOMETRIC PROJECTION—A form of graphical projection, or more specifically, a form of axonometric projection; a method of visually representing three-dimensional objects in two dimensions, in which the three coordinate axes appear equally foreshortened and the angles between any two of them are 120 degrees.

ISOMETRIC WIRING DIAGRAM—A diagram showing the outline of a ship, an aircraft, or other structure, and the location of equipment such as panels and connection boxes and cable runs.

JOIST—A horizontal supporting member that runs from wall to wall, wall to beam, or beam to beam to support a ceiling, roof, or floor.

KEY—A small wedge or rectangular piece of metal inserted in a slot or groove between a shaft and a hub to prevent slippage.

KEYSEAT—A slot or groove into which the key fits.

KEYWAY—A slot or groove within a cylindrical tube or pipe into which a key fitted into a key seat will slide.

LEAD—The distance a screw thread advances in one turn, measured parallel to the axis. On a single-thread screw the lead and the pitch are identical; on a double-thread screw the lead is twice the pitch; on a triple-thread screw the lead is three times the pitch.

LEADER LINES—Thin lines used to connect numbers, references, or notes to appropriate surfaces or lines.

LEGEND—A description of any special or unusual marks, symbols, or line connections used in the drawing.

LINTEL—A horizontal beam used in the construction of buildings. It usually supports the masonry above a window or door opening, and is also known as a header.

LOGIC DIAGRAM—A type of schematic diagram using special symbols to show components that perform a logic or information processing function.

MAJOR DIAMETER—The largest diameter of an internal or external thread.

MILITARY STANDARD (MIL-STD)—A formalized set of standards for supplies, equipment, and design work purchased by the United States Armed Forces.

MINOR DIAMETER—The smallest diameter of an internal or external thread.

NOTES—Descriptive writing on a drawing to give verbal instructions or additional information.

OBLIQUE PROJECTION—A view produced when the projectors are at an angle to the plane of the object illustrated. Vertical lines in the view may not have the same scale as horizontal lines.

OFFSET SECTION—A section view of two or more planes in an object to show features that do not lie in the same plane.

ONBOARD PLANS—See **SHIP'S PLANS.**

ORTHOGRAPHIC PROJECTION—A means of representing a three-dimensional object in two dimensions; with multiview orthographic projections, up to six pictures of an object are produced, with each projection plane parallel to one of the coordinate axes of the object.

PARTIAL SECTION—A sectional view consisting of less than a half section, which is used to show the internal structure of a small portion of an object, also known as a broken section.

PERPENDICULAR—The line or view from an object at 90 degrees.

PERSPECTIVE—The visual impression that, as parallel lines project to a greater distance, the lines move closer together.

PHANTOM LINES—Lines showing the alternate position of a movable object.

PHASE—An impulse of alternating current. The number of phases is dependent on the generator windings. Most large generators produce a three-phase current that must be carried on at least three wires.

PICTORIAL DRAWING—A drawing that gives the real appearance of the object, showing general location, function, and appearance of parts and assemblies.

PICTORIAL WIRING DIAGRAM—A diagram showing various parts of a piece of equipment or system and the electrical wiring between the parts.

PIER—A vertical support for a building or structure, usually designed to hold substantial loads.

PILASTERS—Columns built within a wall, usually projecting beyond the wall.

PILLAR—A high-strength vertical structural member.

PITCH—The distance from a point on a screw thread to a corresponding point on the next thread, measured parallel to the axis.

PLAN VIEW—A view of an object or area as it would appear from directly above.

PLANE—A longitudinal section through the axis of an object.

PLOT PLAN—A map or plan view of a lot showing the survey marks, including the bench mark (BM), with the elevations and the grading requirements.

POLARITY—The direction of magnetism or direction of flow of current.

PROJECTION—A technique for showing one or more sides of an object to give the impression of a drawing of a solid object.

PROJECTOR—The theoretical extended line of sight used to create a perspective view or pictorial drawing of an object.

RADIUS—A straight line from the center of a circle or sphere to its circumference or surface.

RAFTER—The horizontal or inclined members that provide support to a roof.

RAFTER PLATES—Horizontal members that support the wall ends of rafters.

REFERENCE DESIGNATION—A combination of letters and numbers to identify parts on electrical and electronic drawings, diagrams, parts lists.

REFERENCE NUMBERS—Numbers used on a drawing to refer the reader to another drawing for more detail or other information.

REMOVED SECTION—A special view to illustrate a particular cross section of an object.

REVISION BLOCK—This block is located in the upper right corner of a print. It provides a space to record any changes made to the original print.

REVOLVED SECTION—A drawing of an object's internal cross section superimposed on the basic drawing of the object.

RIDGE—The lengthwise member at a right angle to the rafters, which supports the peak ends of the rafters in a roof.

RIDGEBOARD—The longitudinal board, set on edge, used to support the upper ends of the rafters, also known as a ridgepole.

ROOT—The area at the bottom of the thread. This area of the thread corresponds to the minor diameter of an external thread and the major diameter of an internal thread.

ROUND—The outside corners of a metal object that have been rounded to prevent chipping and to avoid sharp edges.

SCALE—The relationship between the measurement used on a drawing and the measurement of the actual object. Also a measuring device, such as a ruler, having special graduations.

SCHEMATIC DIAGRAM—A picture of a circuit that uses symbols to represent the components in the circuit.

SECTION—A view showing a clearer view of interior or hidden features of an object that cannot be observed in conventional outside views.

SECTION LINES—Thick solid lines with an arrowhead used to indicate the direction in which a section or plane is viewed or taken.

SECTIONAL VIEWS—Provide important information about the height, materials, fastening and support systems, and concealed features of a structure.

SHIP'S PLANS—A set of drawings that show all of the significant construction features and equipment needed to operate and maintain a ship, also known as onboard plans.

SILL—A horizontal structural member that supports the ends of floor beams or joists in wood frame construction.

SINGLE-LINE DIAGRAM—A diagram using single lines and graphic symbols to show all components in a circuit or system.

SITE PLAN—Shows the contours, boundaries, roads, utilities, trees, structures, and any other significant physical features on or near the construction site.

SOLEPLATE—A horizontal structural member used as a base for studs or columns.

SPECIFICATION—A detailed description or identification describing items so they can be manufactured, assembled, and maintained according to their performance requirements.

SPREAD FOOTINGS—Generally rectangular prisms of concrete, larger in lateral dimensions than the column or wall they support; used to distribute the load of a column or wall to the subgrade.

STATION NUMBERS—Designations of reference lines used to indicate linear positions along a component such as an airframe or a ship's hull.

STEEL PLATE—Flat steel that has a width of greater than 8 inches and a thickness of 1/4 inch or greater.

STUD—The chief vertical structural members in light frame construction, used as part of a wall and for supporting moderate loads.

SUPERSTRUCTURE—The part of a bridge above the beam seats or the spring line of an arch.

SYMBOL—A graphical representation of the component or part shown in a drawing.

TEMPLATE—A piece of thin material used as a true-scale guide or as a model for reproducing various shapes.

TITLE BLOCK—A blocked area in the lower right corner of the print. Provides information to identify the drawing number, name of the part or assembly that it represents, and all information required to identify the part or assembly.

TOLERANCE—The amount that a manufactured part may vary from its specified size.

TOP PLATE—A horizontal member at the top of an outer building wall; used to support a rafter.

TOTAL DEAD LOAD—The total weight of the structure, which gradually increases as the structure rises and remains constant once it is complete.

TOTAL LIVE LOAD—The total weight of movable objects, such as people, furniture, and bridge traffic, the structure happens to be supporting at a particular instant.

TRACING PAPER—High-grade, white, translucent paper that takes pencil well; can be used to make reproductions of drawings.

TRIANGULATION—A technique for making developments of complex sheet metal forms using geometrical constructions to translate dimensions from the drawing to the pattern.

TRUSS—A beam of given strength without intermediate supports. A truss can support a given load over a specific maximum span.

TRUSS—A combination of members, such as beams, bars, and ties, usually arranged in triangular units, that forms a rigid framework for supporting loads over a span.

UTILITY PLAN—A floor plan that shows the layout of heating, electrical, plumbing, or other utility systems.

VERTEX—A corner or a point where lines meet.

VIEW—A drawing of a side or plane of an object as seen from one point.

WIRING (CONNECTION) DIAGRAM—A detailed diagram of each circuit installation showing all of the wiring, connectors, terminal boards, and electrical or electronic components of the circuit.

ZONE NUMBERS—Numbers and letters printed on the borders of maps used to locate a particular point or part on the map.

APPENDIX II

GRAPHIC SYMBOLS FOR HYDRAULIC AND PNEUMATIC SYSTEMS

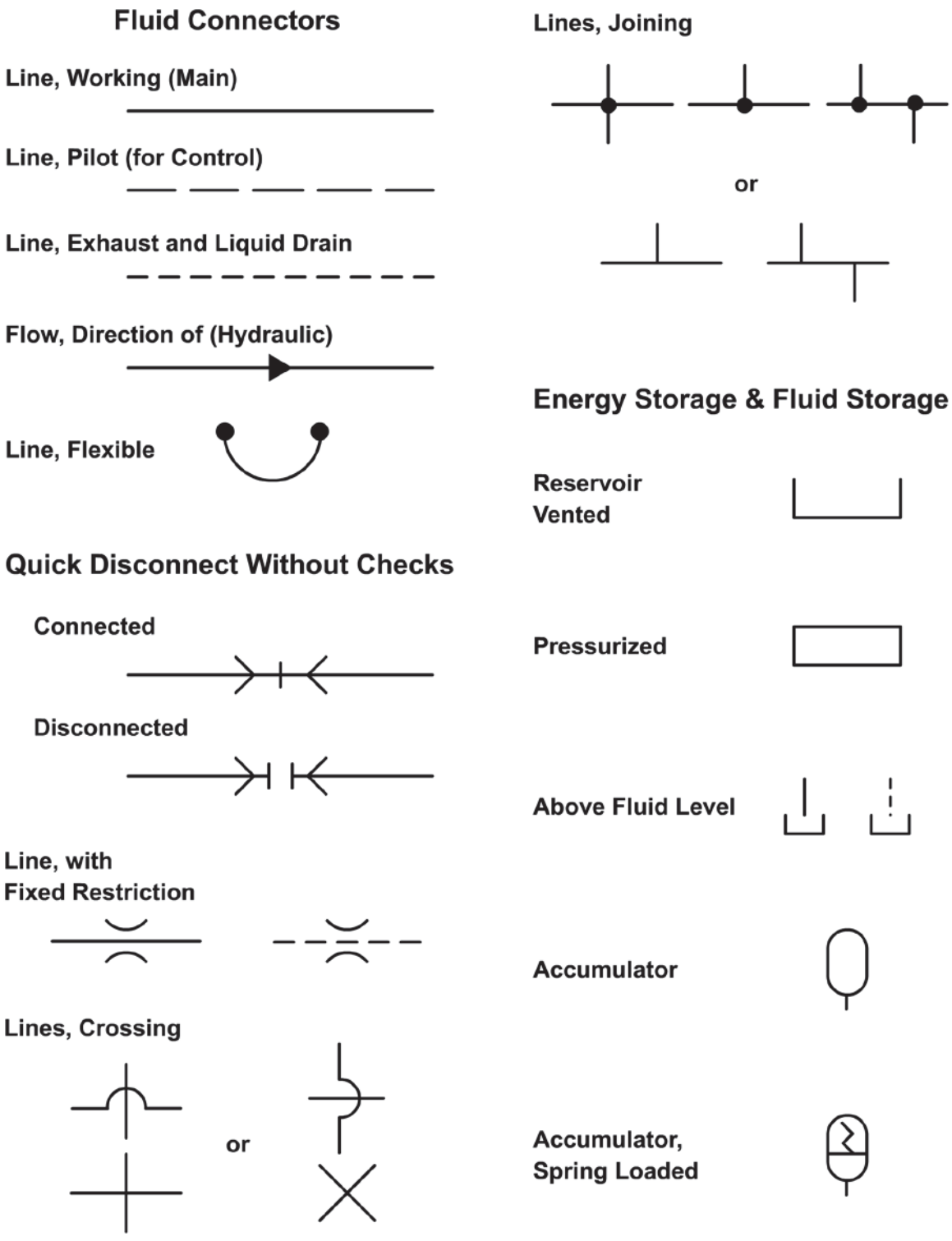


Figure AII-1 — Hydraulic and pneumatic graphic symbols.

Accumulator, Gas Charged

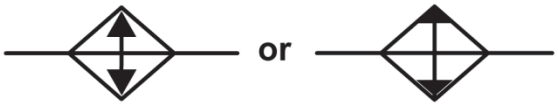
Accumulator, Weighted

Energy Source, Hydraulic

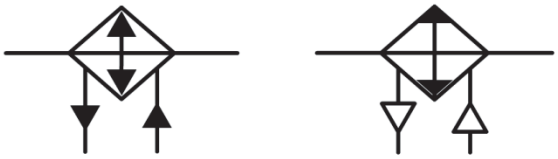
Fluid Conditioner

Filter-Strainer

Cooler



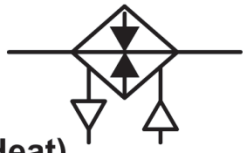
Inside Triangles Heat Dissipation



Heater

(Heat Introduction)

(Liquid-medium Heat)



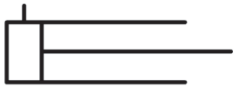
(Gas-medium Heat)

Desiccator (Chemical Dryer)

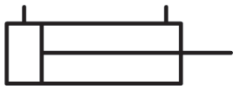
Linear Devices

Cylinders, Hydraulic & Pneumatic

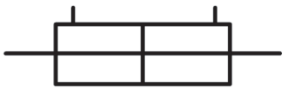
Single Acting



Double Acting
Single End Rod



Double End Rod



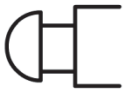
Actuators and Controls

Spring

Manual

Figure AII-1 — Hydraulic and pneumatic graphic symbols (continued).

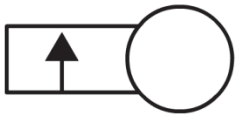
Push Button



Mechanical

Detent

Pressure Compensated

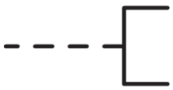


Electrical

Solenoid (Single Winding)

Pilot Pressure

Remote Supply



Internal Supply

Solenoid or Pilot

External Pilot Supply

Internal Pilot

Supply and Exhaust

Rotary Devices

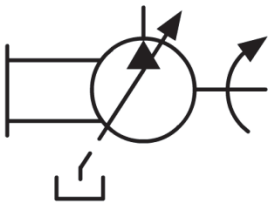
Hydraulic Pump

Fixed Displacement
Unidirectional

Bidirectional

Variable Displacement,
Non Compensated

Unidirectional



Bidirectional

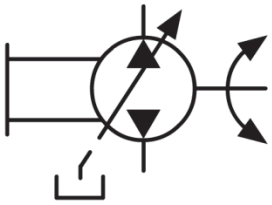
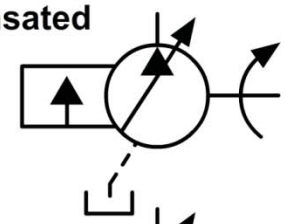


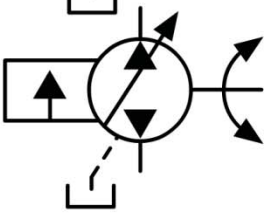
Figure AII-1 — Hydraulic and pneumatic graphic symbols (continued).

Variable Displacement, Pressure Compensated

Unidirectional

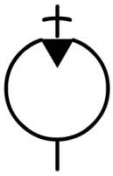


Bidirectional



Hydraulic Motor

Fixed Displacement



Motors, Engines

Electric Motor

Heat Engine (E.G. Internal Combustion Engine)

Instruments & Accessories

Indicating & Recording

Pressure

Temperature

Flow Rate

Flow Meter

Pressure Switch

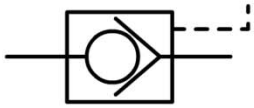
Valves

Two Way Valves (2 Ported Valves)

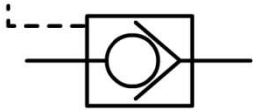
On-Off (Manual Shut-Off)

Check

Check, Pilot Operated to Open

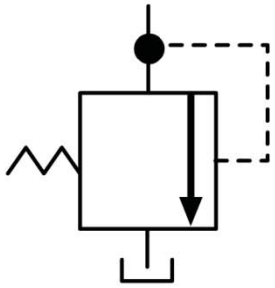


Check, Pilot Operated to Close



Pressure Control Valves

Pressure Relief



Sequence

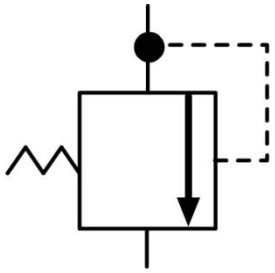


Figure AII-1 — Hydraulic and pneumatic graphic symbols (continued).

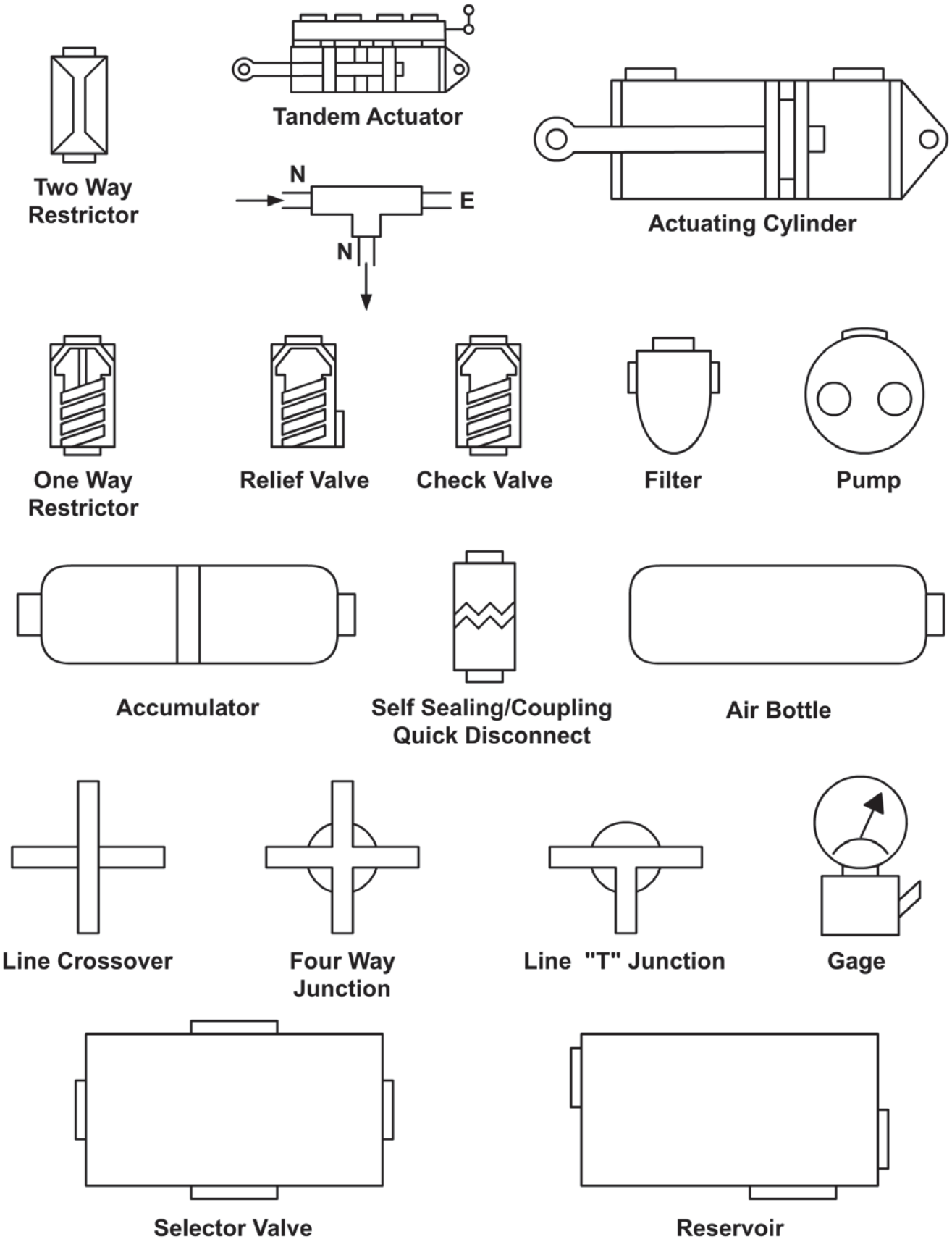
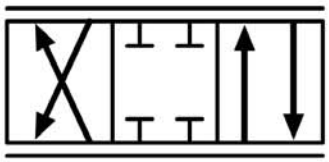


Figure AII-1 — Hydraulic and pneumatic graphic symbols (continued).

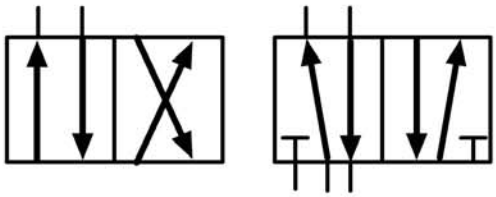
Servovalve, Variable Position
(Indicated by Parallel lines)



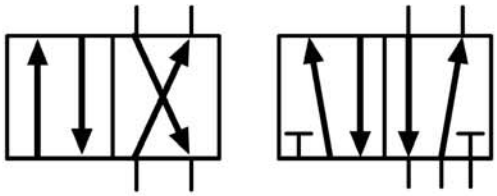
Four Way Valves

Two Position

Normal

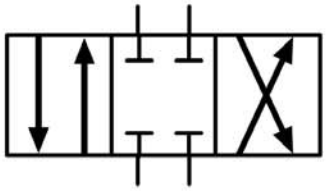


Actuated

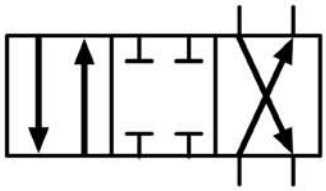


Three Position

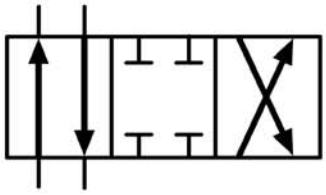
Normal



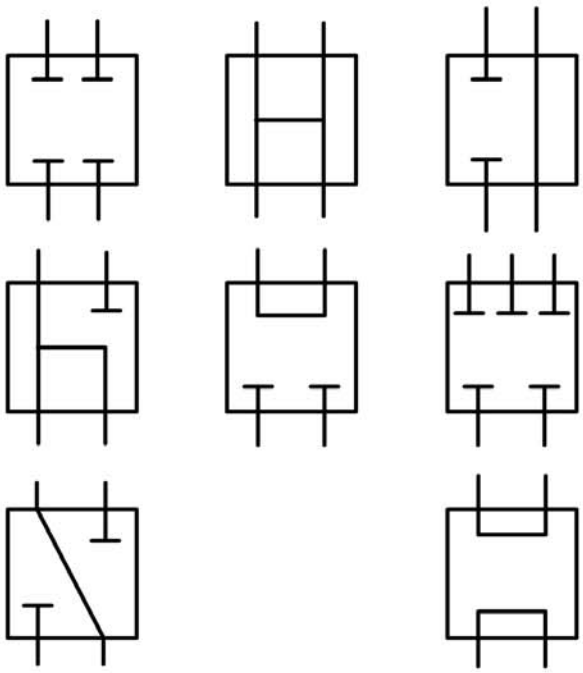
Actuated Left



Actuated Right



Typical Flow Paths for Center
Condition of Three Position Valves



Flow Control Valves

Adjustable, Non Compensated
(Flow Control in Each Direction)

Adjustable, Temperature &
Pressure Compensated

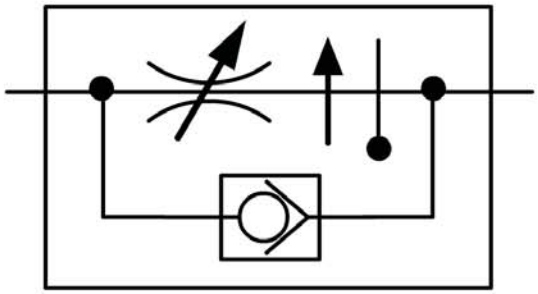


Figure AII-1 — Hydraulic and pneumatic graphic symbols (continued).

APPENDIX III

GRAPHIC SYMBOLS FOR ELECTRICAL AND ELECTRONICS DIAGRAMS

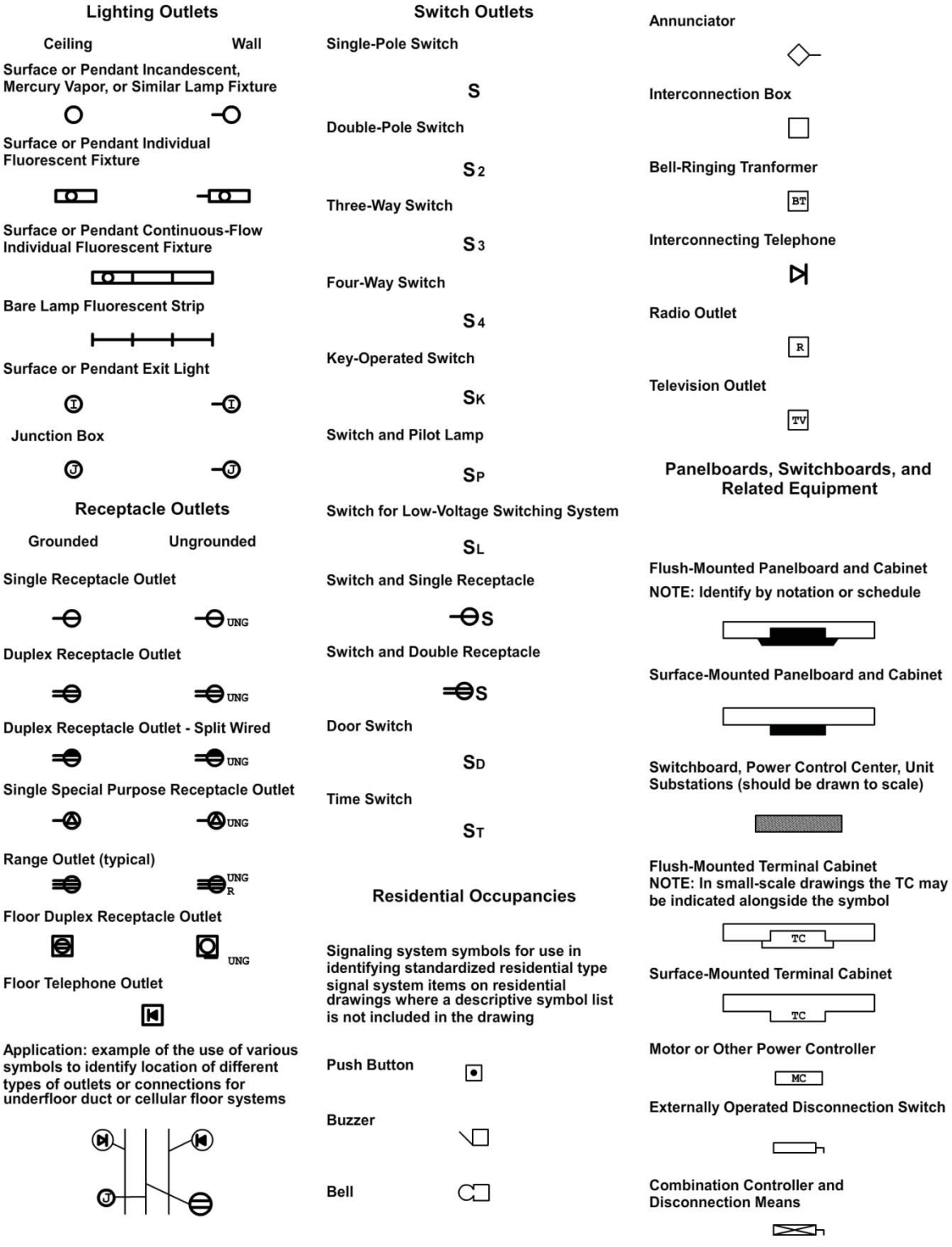
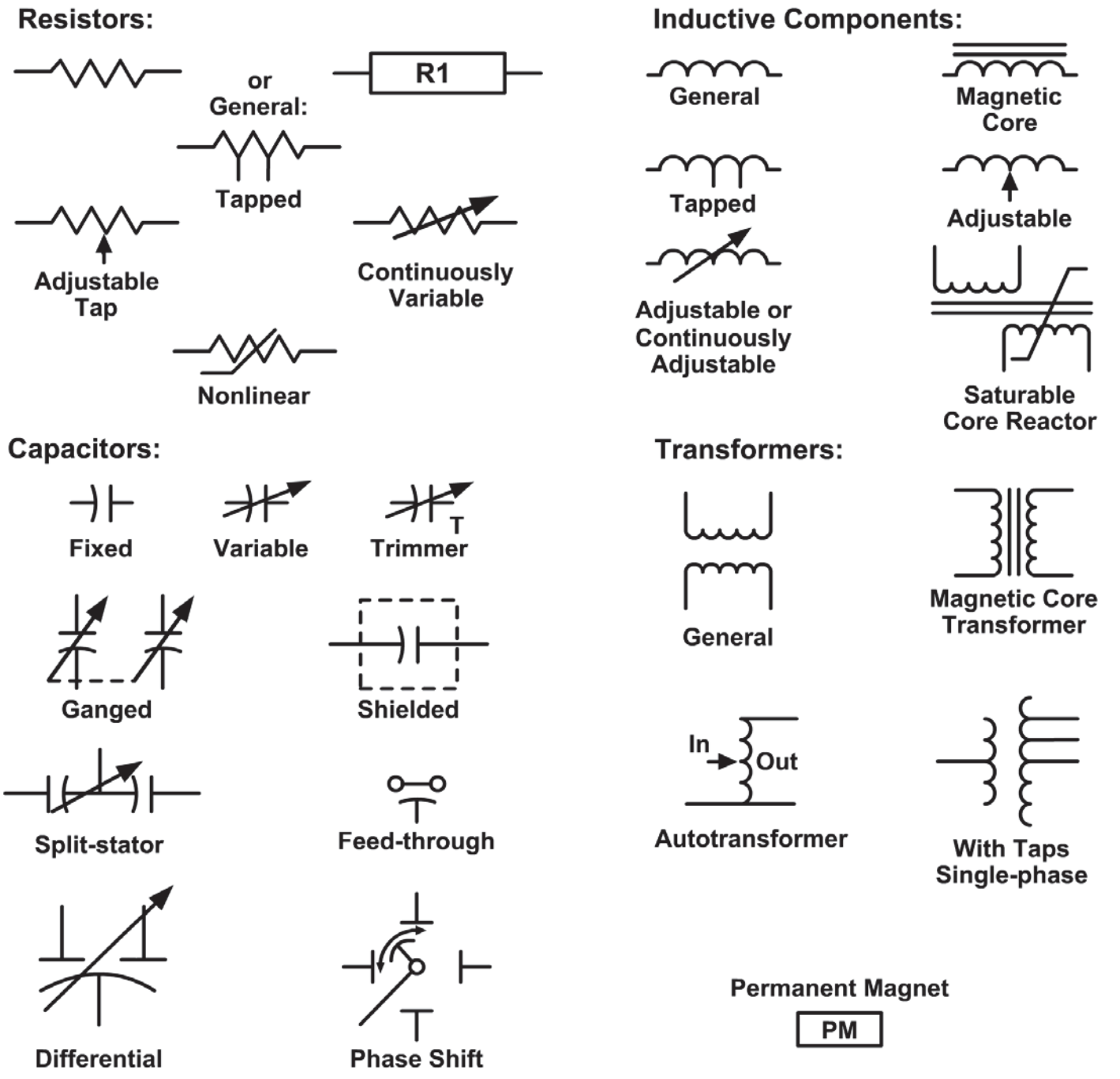


Figure AIII-1 — Electrical and Electronic graphic symbols.



(When Capacitor Electrode Identification Is Necessary, the Curved Element Shall Represent the Outside Electrode Electrode In Fixed Paper-dielectric and Ceramic-dielectric; The Negative Electrode In Electrolytic Capacitors; The Moving Element In Variable and Adjustable Capacitors, and the Low Potential Element In Feed-through Capacitors.)

Note: For Further Information Concerning Symbols Refer to IEEE Standards and American National Standard Graphics Symbols For Electrical and Electronics Diagrams, ANSI Y32 2/IEEE No. 315, Which Has Been Adopted For Mandatory Use By the DoD.

Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

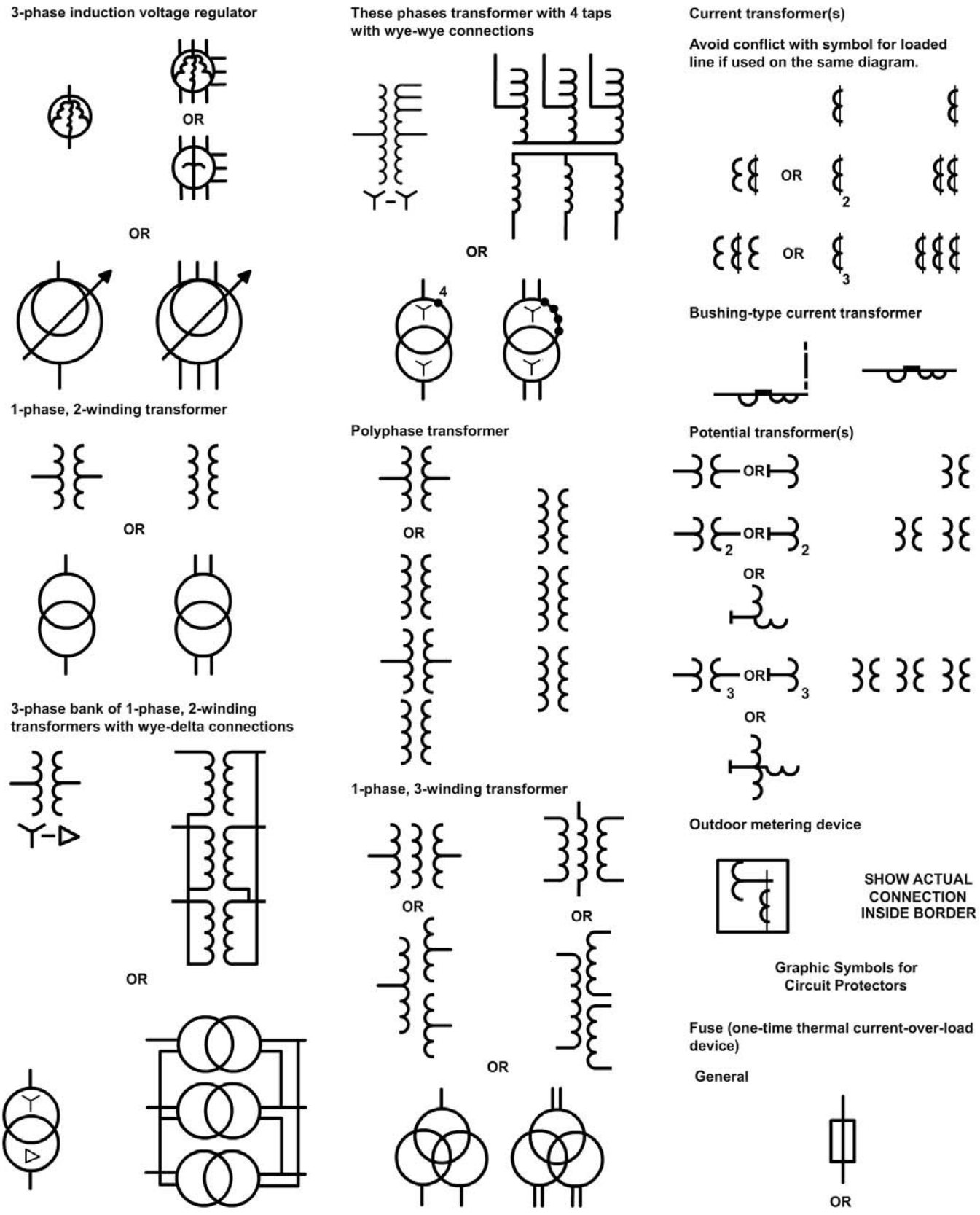


Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

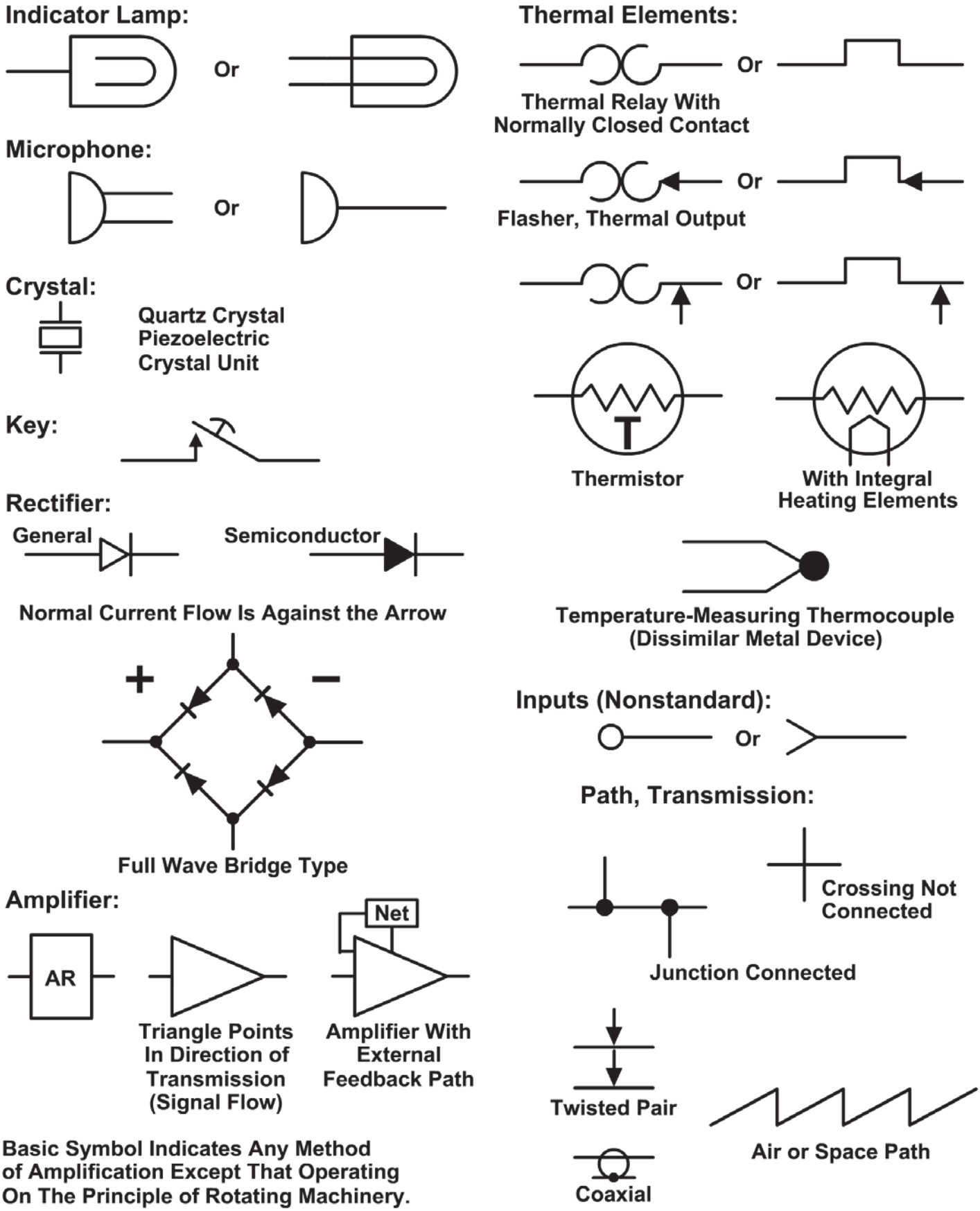


Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

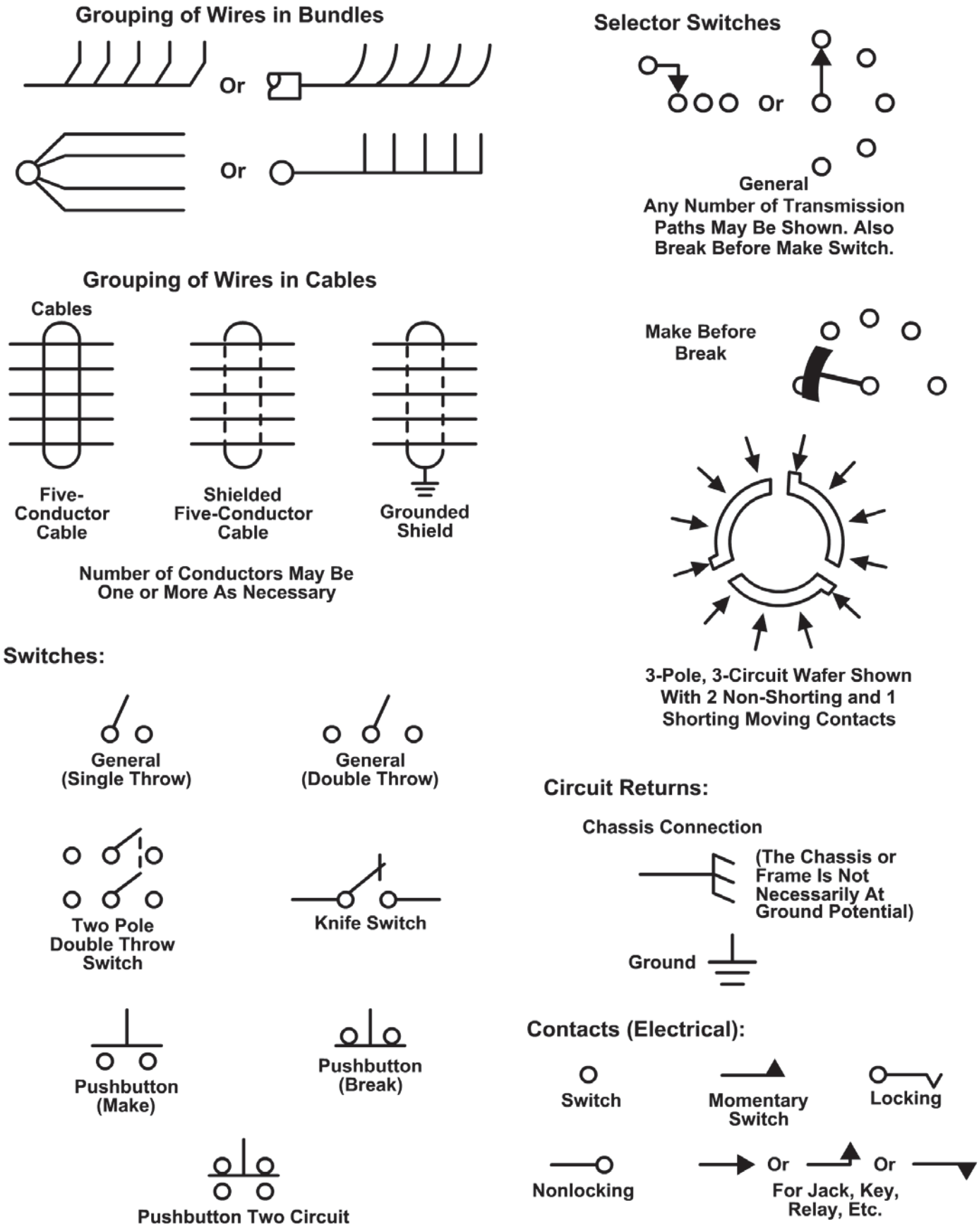


Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

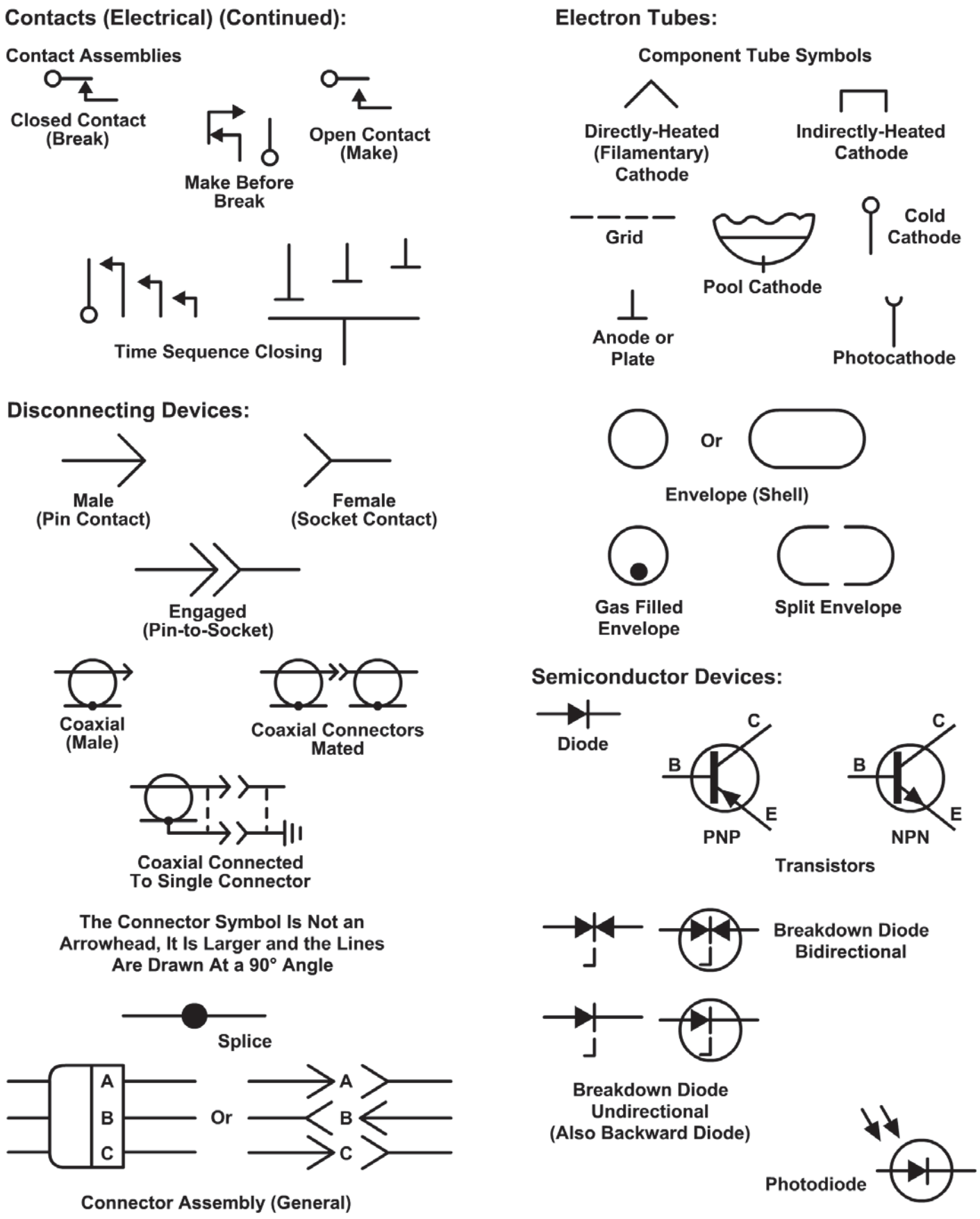


Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

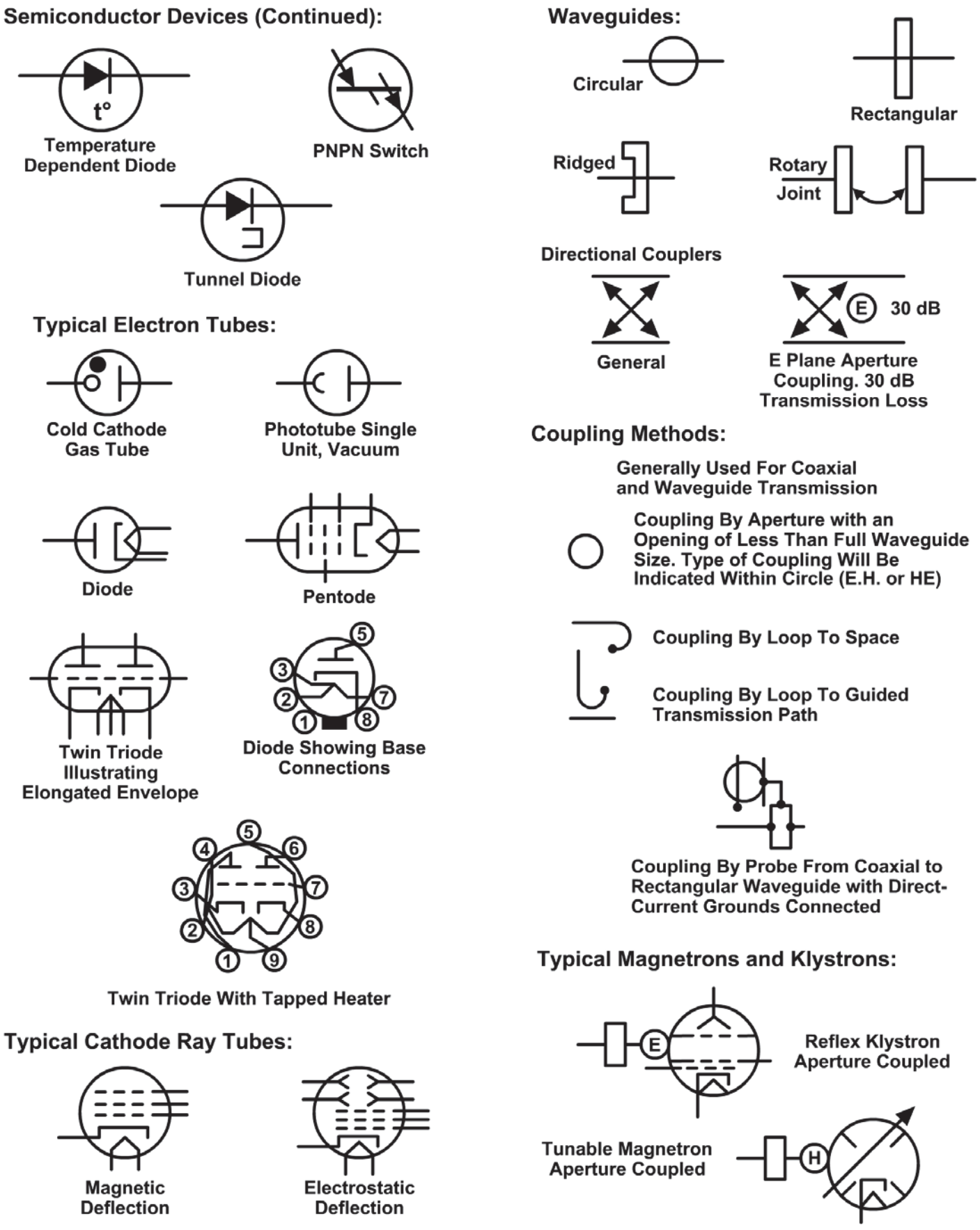


Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

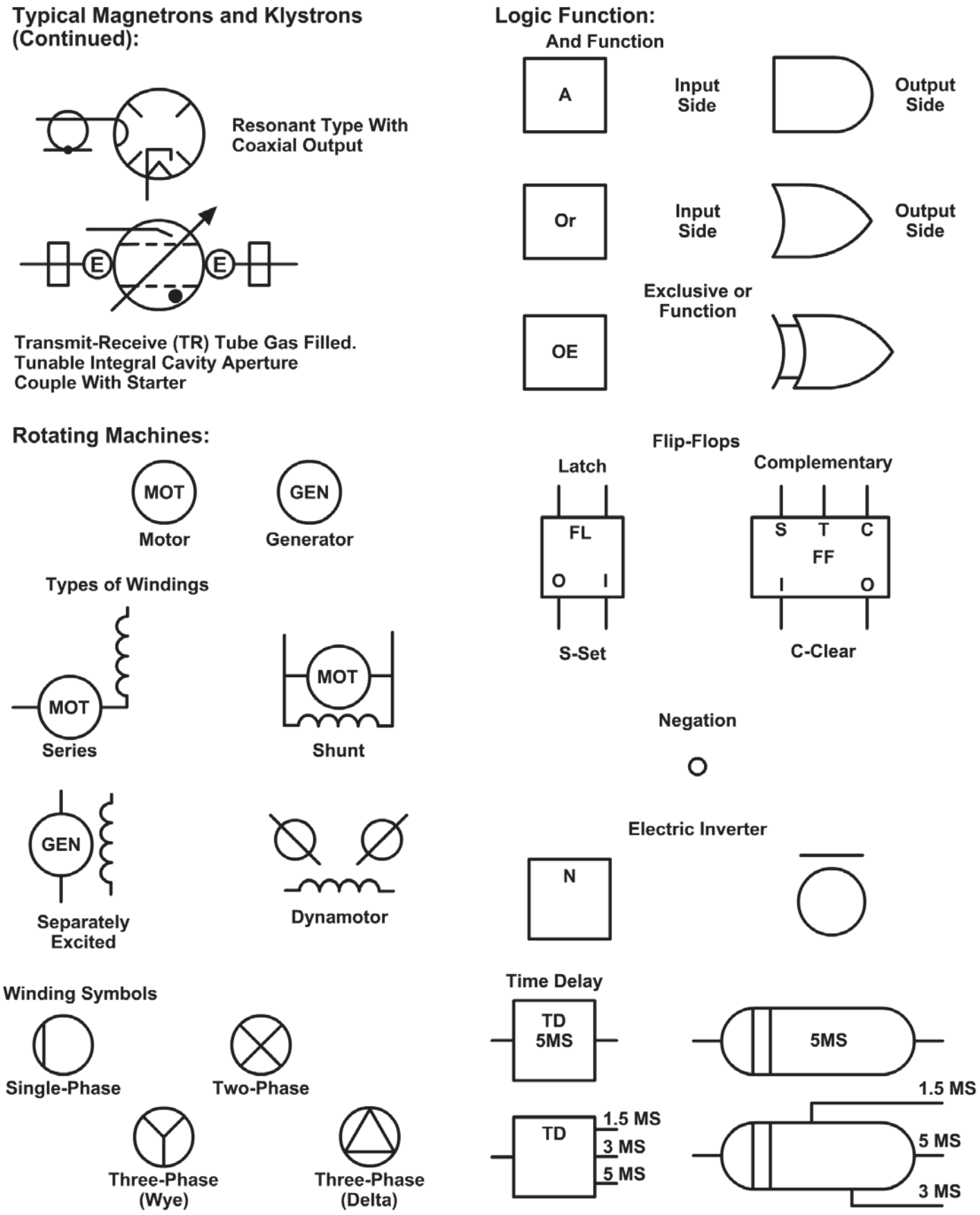


Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

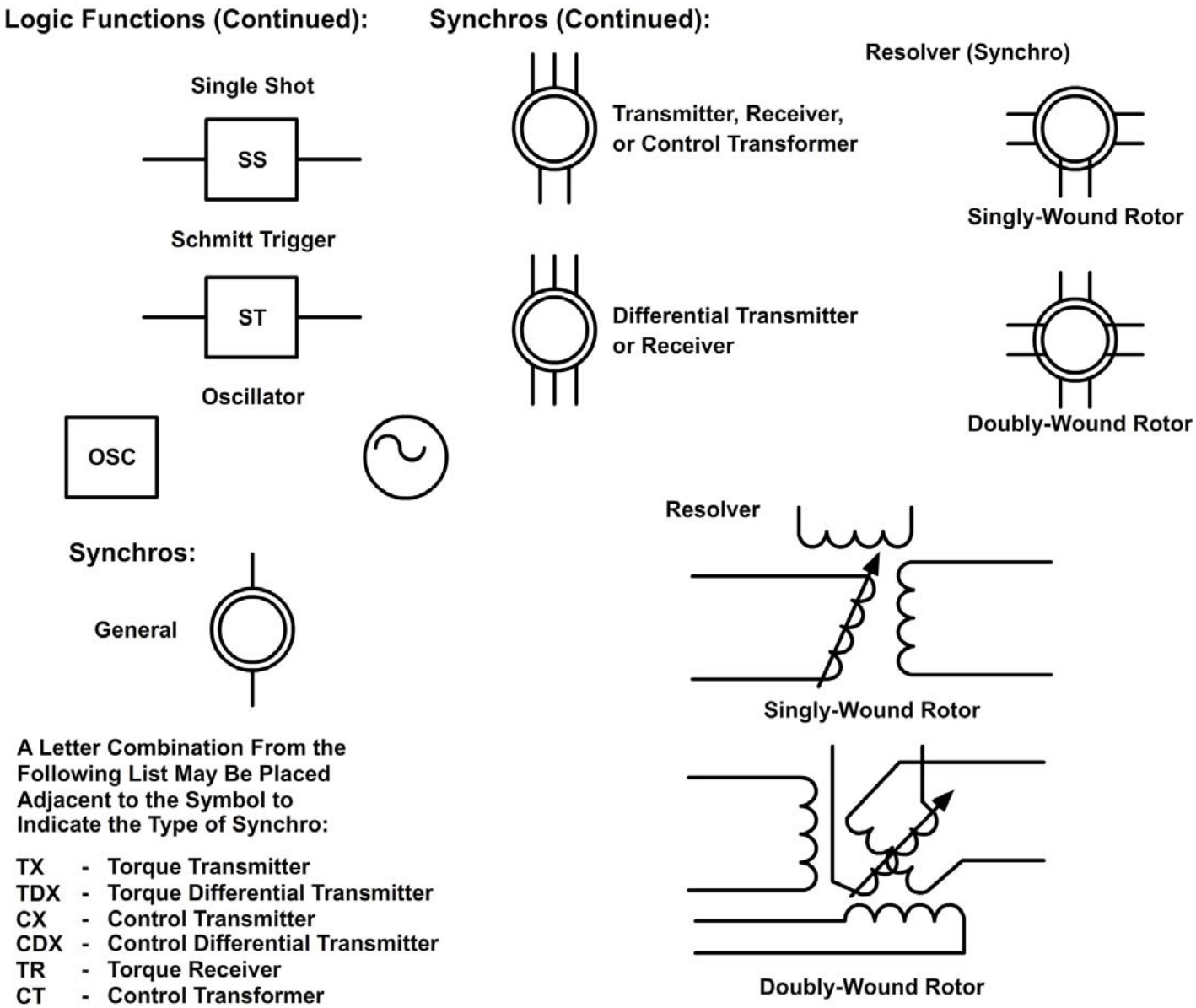


Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

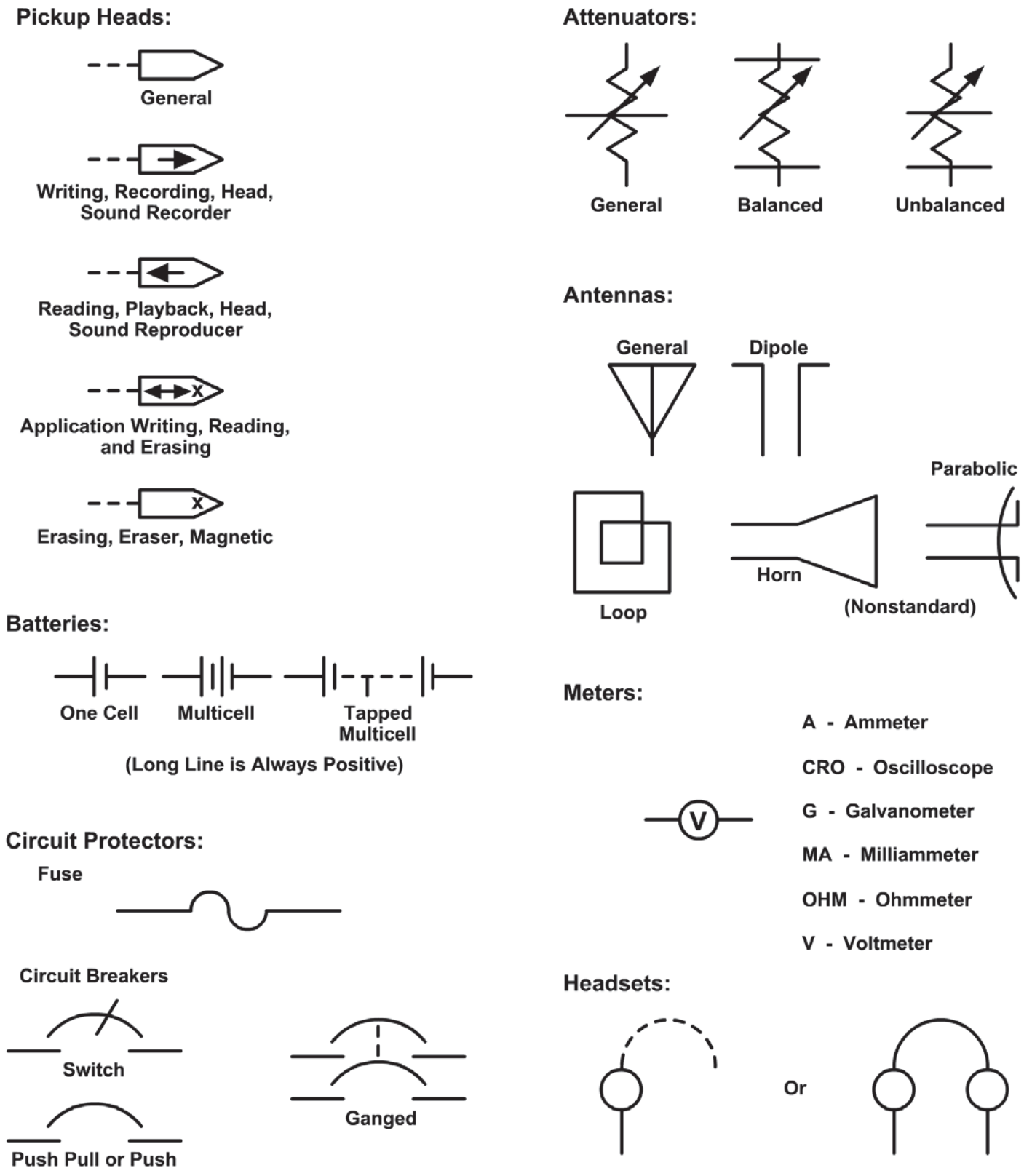


Figure AIII-1 — Electrical and Electronic graphic symbols (continued).

APPENDIX IV

REFERENCES

NOTE

Although the following references were current when this NRTC was published, their continued currency cannot be assured. When consulting these references, keep in mind that they may have been revised to reflect new technology or revised methods, practices, or procedures; therefore, you need to ensure that you are studying the latest references.

If you find an incorrect or obsolete reference, please use the Rate Training Manual User Update Form provided at the end of each chapter to contact the SWOS Rate Training Manager.

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Drawing, Pictorial, ASME Y14.4M-1989, The American Society of Mechanical Engineers (ASME), 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900.

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Chapter 2

Dimensioning and Tolerancing, ASME Y14.5-2009, The American Society of Mechanical Engineers (ASME), 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900.

Engineering Drawing Practices, ASME Y14.100-2004, The American Society of Mechanical Engineers (ASME), 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900.

Line Conventions and Lettering, ASME Y14.2-2014, The American Society of Mechanical Engineers (ASME), 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900.

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Branoff, T. J., *Interpreting Engineering Drawings*, 8th Ed., Cengage Learning, Stamford, CT, 2014.

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APPENDIX V

Answers to End of Chapter Questions

Chapter 1 – Blueprints

1-1.	A
1-2.	D
1-3.	D
1-4.	A
1-5.	C
1-6.	A
1-7.	B

1-8.	B
1-9.	D
1-10.	D
1-11.	A
1-12.	B
1-13.	B
1-14.	C

1-15.	C
1-16.	B
1-17.	B
1-18.	C
1-19.	A
1-20.	D

Chapter 2 – Technical Sketching

2-1.	D
2-2.	A
2-3.	A
2-4.	B
2-5.	C
2-6.	D
2-7.	C

2-8.	B
2-9.	A
2-10.	D
2-11.	C
2-12.	A
2-13.	B
2-14.	C

2-15.	D
2-16.	A
2-17.	B
2-18.	C
2-19.	C
2-20.	D
2-21.	B

Chapter 3 – Projections and Views

3-1.	B
3-2.	D
3-3.	D
3-4.	C
3-5.	C

3-6.	A
3-7.	A
3-8.	B
3-9.	C
3-10.	A

3-11.	C
3-12.	D
3-13.	C
3-14.	B
3-15.	A

Chapter 4 – Machine Drawing

4-1.	D
4-2.	B
4-3.	A
4-4.	A
4-5.	D
4-6.	A
4-7.	C
4-8.	B
4-9.	D

4-10.	B
4-11.	A
4-12.	A
4-13.	C
4-14.	A
4-15.	D
4-16.	A
4-17.	C
4-18.	C

4-19.	D
4-20.	B
4-21.	D
4-22.	C
4-23.	A
4-24.	D
4-25.	C

Chapter 5 – Piping Systems

5-1.	D
5-2.	B
5-3.	B
5-4.	A
5-5.	B

5-6.	B
5-7.	D
5-8.	C
5-9.	A
5-10.	C

5-11.	A
5-12.	D
5-13.	D
5-14.	A
5-15.	A

Chapter 6 – Electrical and Electronic Prints

6-1.	B
6-2.	A
6-3.	C
6-4.	D
6-5.	C
6-6.	D

6-7.	C
6-8.	B
6-9.	A
6-10.	B
6-11.	A
6-12.	B

6-13.	D
6-14.	A
6-15.	D
6-16.	C
6-17.	B
6-18.	C

Chapter 7 – Structural and Architectural Drawings

7-1.	C
7-2.	D
7-3.	D
7-4.	A
7-5.	B
7-6.	C
7-7.	D
7-8.	B
7-9.	C

7-10.	C
7-11.	A
7-12.	A
7-13.	D
7-14.	D
7-15.	A
7-16.	B
7-17.	A
7-18.	C

7-19.	B
7-20.	B
7-21.	D
7-22.	A
7-23.	C
7-24.	B
7-25.	A

Chapter 8 – Developments and Intersections

8-1.	C
8-2.	C
8-3.	B
8-4.	B
8-5.	D
8-6.	A

8-7.	A
8-8.	B
8-9.	C
8-10.	C
8-11.	C
8-12.	A

8-13.	D
8-14.	D
8-15.	B
8-16.	C
8-17.	D
8-18.	A

End of Book Questions Chapter 1

Blueprints

1-1. What term describes showing the construction details of parts, machines, ships, aircraft, buildings, and so on?

A. Blueprint
B. Design
C. Diagram
D. Schematic

1-2. What copy of the drawing is rarely sent to a shop or site?

A. Architect
B. Customer
C. Machinist
D. Master

1-3. What type of patented paper produces black lines on a white background?

A. BG
B. BM
C. BW
D. RW

1-4. What standard describes engineering drawing practices?

A. ANSI Y32.9
B. ASME Y14.100-2013
C. ASME Y14.38-2007
D. IEEE-315-1975

1-5. What standard describes welded joint designs?

A. ANSI Y32.9
B. ASTM F1000-13
C. MIL-STD-22D
D. MIL-STD-25B

1-6. What standard describes the ship’s structural symbols for use on ship drawings?

A. ANSI Y32.9
B. ASTM F1000-13
C. MIL-STD-22D
D. MIL-STD-25B

1-7. What information block contains the drawing number, name of the part or assembly, and all information required to identify the part?

A. Application
B. Bill of material
C. Legend
D. Title

1-8. What number in the title block refers to other blueprints?

A. Drawing
B. Reference
C. Station
D. Zone

1-9. What block on a blueprint shows the size of the drawing compared with the actual size of the part?

A. Application
B. Bill of material
C. Revision
D. Scale

1-10. What block on blueprints identifies directly or by reference the larger unit that contains the part or assembly on the drawing?

A. Application
B. Bill of material
C. Revision
D. Scale

1-11. What indication used on machine drawings shows surfaces to be finished by machining?

A. Finish marks
B. Note
C. Specification
D. Symbol

1-12. What type of information describes items so they can be manufactured, assembled, and maintained according to their performance requirements?

A. Finish marks
B. Note
C. Specification
D. Symbol

1-13. What line characteristic is used to indicate visible edges of an object?

A. Center lines
B. Dimension lines
C. Leader lines
D. Visible lines

1-14. What line characteristic is used to indicate distance measured?

A. Center lines
B. Dimension lines
C. Leader lines
D. Visible lines

1-15. What type of plan illustrates design features of the ship subject to development?

A. Contract guidance
B. Contract
C. Onboard
D. Working

1-16. What type of plan is considered necessary as reference materials in the operation of a ship?

A. Contract guidance
B. Contract
C. Onboard
D. Working

1-17. In the current and earlier shipboard plan, what block number indicates the size of the plan?

A. 1
B. 2
C. 3
D. 4

1-18. In the current and earlier shipboard plan, what block number indicates the version of the plan?

A. 2
B. 3
C. 4
D. 5

1-19. On tenders and repair ships, what personnel file and maintain the plans?

A. Supply
B. Operations
C. Engineering log room
D. Technical library

1-20. What action occurs if the prints become wet or smudged with oil or grease?

A. Prints will fade
B. Prints will wrinkle
C. Prints will become unreadable
D. White lines will become brighter

End of Book Questions Chapter 2

Technical Sketching

2-1. Which of the following codes identifies the hardest grade of pencil lead?

A. 9H
B. 5H
C. 2H
D. 6B

2-2. What type of eraser is used by artists?

A. Kneaded
B. Pink pearl
C. Plastic
D. Ruby red

2-3. When erasing lines, what sketching instrument prevents erasing other lines?

A. Electric eraser
B. Eraser guide
C. Erasing shield
D. Steel ruler

2-4. What common length, in inches, is the T-square?

A. 18
B. 24
C. 36
D. 72

2-5. How many basic types of drafting triangles are used?

A. 1
B. 2
C. 3
D. 4

2-6. What instrument is used to produce irregular curves?

A. A combination triangle
B. A French curve
C. A protractor
D. A T-square

2-7. What instrument is used to ink small circles with a diameter of less than 1/4 inch?

A. Adjustable compass
B. Drop bow pen
C. Proportional divider
D. Protractor

2-8. What instrument is used to transfer measurements from one scale to another?

A. Beam compass
B. Compass
C. Proportional divider
D. T-square

2-9. Which of the following lines is used to indicate symmetry about an axis of an object?

A. Center
B. Hidden
C. Phantom
D. Stitch

2-10. Which of the following lines is terminated with arrow heads at each end?

A. Break
B. Dimension
C. Extension
D. Leader

2-11. Which of the following lines is used to indicate concealed edges?

A. Center
B. Dimension
C. Hidden
D. Visible

2-12. What type of line indicates a short break?

A. Heavy unbroken line
B. Medium line with evenly spaced dashes
C. Thick, solid freehand zigzags
D. Thin solid line with arrowhead at one end

2-13. What part of a project is often the bottleneck?

A. Approval
B. Drafting
C. Ordering supplies
D. Printing the blueprint

2-14. Which of the following CAD components allows the operator to move from one command to another without the use of the function keys?

A. The computer program
B. The digitizer tablet
C. The plotter
D. The printer

2-15. The drawings from a plotter are high quality, uniform, and what other characteristic?

A. Cheap
B. Precise
C. Sectional
D. Three-dimensional

2-16. Which of the following is an advantage of producing prints on a printer?

A. The print will be in color
B. The print will be in high definition
C. The printer can be stopped and checked for accuracy
D. The speed is faster than on a plotter

2-17. What computer-aided drafting component produces the drawing after it has been completed on the computer screen?

A. The computer numerical control computer
B. The digitizer
C. The numerical control machine
D. The plotter

2-18. What is the main advantage of using numerical control machines rather than manually operated machines?

A. They are operated by skilled machinists
B. They can only be operated when an operator is changing the switches
C. They are only used for mass production
D. They allow unerring and rapid positioning movements

2-19. Which of the following best describes direct numerical control?

A. Allows the technician to program the computer to operate various machines used to produce the final print
B. Stores instructions in a central computer memory for direct transfer to one or more machines that will make the part
C. Acts as a central file where all drawings may be stored without having to store a large number of prints
D. Provides more rapid and precise manufacturing of parts

2-20. Which of the following best describes the computer-aided design/computer-aided manufacturing systems used in manufacturing?

A. CAD controls the machine used to make the part; CAM is the drawing medium used to convert instructions to the machine making the part
B. CAD draws the part and defines the tool path; CAM converts the tool path into codes the machine's computer understands
C. CAD is the process in which all instructions are sent to the DNC operating stations; CAM is the receiving station that converts instructions from the CAD to the machine used to make the part
D. CAD uses the input from the engineer to relay design changes to the print; CAM receives those changes and converts them to codes used by the machine that makes the part

2-21. What types of training are required to operate computer-aided drafting and computer-aided manufacturing systems?

A. Specialized and formal
B. Correspondence courses provided by the manufacturer of the system
C. Formal and on-the-job
D. On-the-job training and correspondence courses

End of Book Questions Chapter 3

Projections and Views

3-1. While learning to read a blueprint, you need to develop which of the following abilities?

A. Computer skills
B. Memorization
C. Technical sketching
D. Visualizing

3-2. To understand the object to be made from a blueprint, you should take what step first?

A. Interpret each line on the notes section
B. Look at the front view only
C. Look at the top and right side view only
D. Study all views

3-3. What type of projection is assumed most for technical drawings?

A. Central
B. Parallel
C. Perpendicular
D. Perspective

3-4. Oblique and axonometric projections show which of the following dimensions?

A. Height and width only
B. Length only
C. Width only
D. Height, width, and length

3-5. What term means one-scale?

A. Isometric
B. Oblique
C. Orthographic
D. Trimetric

3-6. Which of the following statements best describes non-isometric lines?

A. Lines that are not parallel to any one of the three legs of the isometric axis
B. Lines that are parallel to each other
C. Lines that form dimensions for isometric views
D. Normal lines in a normal multi-view projection of the object

3-7. What occurs to angles in isometric drawing?

A. All angles appear as 90-degree corners.
B. All angles appear as obtuse angles.
C. The angles appear distorted.
D. The degrees are divided in half prior to drawing.

3-8. What total number of views do complex drawings normally have?

A. Two
B. Four
C. Six
D. Eight

3-9. A three-view drawing is drawn by eliminating which of the following views from the three-view orthographic projection?

A. Right side, bottom, and rear
B. Left side, top, and bottom
C. Left side, rear, and top
D. Left side, bottom, and rear

3-10. Of all three-dimensional, single-plane drawings, what type of drawings look the most natural?

A. Auxiliary
B. Detailed
C. Orthographic
D. Perspective

3-11. What special view is identical to the other half of the object?

A. Exploded
B. Half-section
C. Removed
D. Section

3-12. What special view may be shown by removing the outside surface?

A. Aligned
B. Broken-out
C. Exploded
D. Partial section

3-13. What special view is drawn as if the part were rotated into or out of the cutting plane?

A. Aligned
B. Broken-out
C. Exploded
D. Partial section

3-14. What special view is drawn to show relative location of parts?

A. Aligned
B. Broken-out
C. Exploded
D. Partial section

3-15. A detail drawing includes which of the following characteristics of an object?

A. Delivery date
B. Machine setup
C. Manufacturing steps
D. Tolerance

End of Book Questions Chapter 4

Machine Drawings

4-1. What method of indicating tolerance allows a variation from design specifications in one direction only?

A. Unilateral
B. Bilateral
C. Limited dimension
D. Minimum value

4-2. What letters of the alphabet may NOT be used in a datum reference?

A. A, C, and D
B. F, I, and O
C. I, H, and P
D. I, O, and Q

4-3. In what location are rounds placed to prevent chipping and to avoid sharp edges?

A. Exterior surfaces of all joints
B. Inside corners
C. Interior surfaces of all joints
D. Outside corners

4-4. Which of the following terms describes specially shaped parts that are mated together but still movable?

A. Fillets
B. Rounds
C. Slots and slides
D. Key

4-5. What item is placed in a groove or slot between a shaft and a hub to prevent slippage?

A. Slots and slides
B. Key
C. Keyway
D. Keyseat

4-6. What term defines a slot or groove on the inside of a cylinder, tube, or pipe?

A. Slots and slides
B. Key
C. Keyway
D. Keyseat

4-7. Which of the following thread dimensions shows a 1/4-20 left-hand National Coarse screw with a tolerance or fit of 2?

A. 1/4-20 UNC
B. 1/4-20-RH-UNC
C. 1/4-20 UNC-2 LH
D. 1/4-20

4-8. Classes of threads are different from each other in which of the following characteristics?

A. Specified tolerance and/or allowance
B. Minimum and maximum pitch
C. Major diameter only
D. Major diameter and root clearance

4-9. The thread on the outside of a bolt is an example of what type of thread?

A. Axial
B. Diametral
C. External
D. Internal

4-10. The center line that runs lengthwise through a screw is known by what term?

A. External thread
B. Major diameter
C. Axis
D. Crest

4-11. Which of the following terms describes the area of the thread corresponding to the major diameter of an external thread and minor diameter of the internal thread?

A. Major diameter
B. Axis
C. Crest
D. Root

4-12. The pitch is the distance from a point on a screw thread to what other location?

A. Center point of the screw
B. Corresponding point on the next thread
C. Corresponding point on the opposite side of the screw
D. The root of the thread

4-13. Which of the following terms describes the number of teeth on the gear divided by the pitch diameter?

A. Diametral pitch
B. Root diameter
C. Clearance
D. Whole depth

4-14. Which of the following terms expresses the diametral pitch multiplied by the pitch diameter?

A. Pitch diameter
B. Outside diameter
C. Number of teeth
D. Addendum circle

4-15. The addendum is the height of the tooth between the pitch circle and what other location?

A. Base of the tooth
B. Bottom of the tooth of the mating gear
C. Center of the adjacent tooth
D. Top of the tooth

4-16. The dedendum is the length of the portion of the tooth from the pitch circle to what other location?

A. Base of the tooth
B. Bottom of the tooth of the mating gear
C. Center of the adjacent tooth
D. Top of the tooth

4-17. The outside diameter contains which of the following circles?

A. Addendum
B. Dedendum
C. Pitch
D. Root diameter

4-18. Circular pitch is the distance from center to center of teeth measured along what axis?

A. Addendum circle
B. Diametral pitch
C. Pitch circle
D. Root diameter

4-19. Chordal point is the distance from center to center of teeth measured along what axis?

A. Addendum circle
B. Diametral pitch
C. Pitch circle
D. Root diameter

4-20. The root diameter is the diameter of the gear measured at what location?

A. Across the center of the gear
B. Center of the teeth
C. Root of the teeth
D. Top of the teeth

4-21. Which of the following terms defines the distance from top of the tooth to the bottom, including the clearance?

A. Root diameter
B. Clearance
C. Whole depth
D. Face

4-22. Which of the following terms describes the greatest depth to which a tooth of one gear extends into the tooth space of another gear?

A. Thickness
B. Pitch circle
C. Working depth
D. Rack teeth

4-23. The thickness of the tooth is the width taken at what location?

A. Diameter of the gear
B. Pitch circle of the tooth
C. Root of the tooth
D. Top of the tooth

4-24. The acceptable roughness of a part depends on which of the following requirements?

A. How the part will be used
B. The type of equipment used to make the finish
C. The method used to achieve the desired roughness
D. The designer's personal preference

4-25. What information does the number within the angle of a finish mark symbol provide?

A. The degree of finish
B. The roughness height in thousandths
C. The roughness height in hundred-thousandths
D. The ability to adhere to its mating part

End of Book Questions Chapter 5

Piping Systems

5-1. Piping can be used as which of the following types of structural element?

A. Hand rail
B. Framing
C. Girders
D. Trusses

5-2. What method of drawing is used for complicated piping systems?

A. Isometric
B. Orthographic
C. Topographic
D. View

5-3. What method of drawing is used to show a three-dimensional view of an object in a single plane?

A. Isometric
B. Orthographic
C. Topographic
D. View

5-4. What type of pipe drawing is generally used for catalogs where visual appearance is more important than drawing time?

A. Double-line
B. Projections
C. Schematics
D. Single-line

5-5. On a piping drawing, what marking indicates a permanent connection made by welding or other processes such as gluing or soldering?

A. Diamond
B. Heavy dot
C. Square
D. Triangle

5-6. What information on the drawing describes the type of connection?

A. Reference number
B. Schedule
C. Specification
D. Title block

5-7. What factor determines the piping material to be used?

A. Length of run
B. Purpose of the pipe
C. Quantity of material available
D. When the piping is installed

5-8. When an item is NOT covered in the standards, the responsible activity can design a suitable symbol and provide what information?

A. Approval letter
B. Colored drawing
C. Explanation in a note
D. Reference list

5-9. What standard color is used for flammable materials?

A. Yellow
B. Brown
C. Green
D. Red

5-10. Shipboard piping system fittings may be drawn in which of the following types of arrangements?

A. Orthographic
B. Pictorial
C. Topographic
D. View

5-11. What hydraulic line leads from the pumps to a pressure manifold and from the pressure manifold to the various selector valves?

A. Operating
B. Pressure
C. Return
D. Vent

5-12. What hydraulic line is also called a working line?

A. Operating
B. Pressure
C. Return
D. Vent

5-13. What hydraulic line directs fluid from any portion of the system to a reservoir?

A. Operating
B. Pressure
C. Return
D. Vent

5-14. In a hydraulic diagram, basic symbols are often improved by showing what section of the unit?

A. Bottom portion
B. Cutaway
C. Placement
D. Top portion

5-15. When interpreting piping designations of tees, 45-degree Y-bends, and double-branch elbows, you should read what opening first?

A. Largest
B. Smallest
C. The one facing right
D. The one facing left

End of Book Questions Chapter 6

Electrical and Electronic Prints

6-1. What type of diagram shows the various components without regard to their physical location?

A. Block
B. Isometric
C. Pictorial
D. Schematic

6-2. What diagram has the components drawn in their respective locations?

A. Block
B. Isometric
C. Pictorial
D. Schematic

6-3. What type of diagram is used primarily to present a general description of a system?

A. Block
B. Isometric
C. Pictorial
D. Schematic

6-4. The numbering of shipboard electrical units begins at what compartment?

A. Highest, aft port
B. Highest, aft starboard
C. Lowest, foremost port
D. Lowest, foremost starboard

6-5. The phase and polarity in an alternating current electrical system is designated by what type of marking?

A. Color code
B. System
C. Wire location
D. Wiring size

6-6. The wiring diagram shows the wiring between components and what type of position of the components?

A. Approximate
B. Estimated
C. Exact
D. Relative

6-7. More complicated schematic diagrams can be broken down into what type of diagrams?

A. Block
B. Connection
C. One line
D. Special

6-8. Aircraft circuit wiring diagrams show equipment part numbers, wire numbers, and what other type of information?

A. All terminal strips and plugs
B. Cable maintenance instructions
C. Electrical flow between components
D. Exact location of electrical components

6-9. The aircraft wire marking identifies the circuit the wire or cable belongs to, the gauge size, and what other information?

A. Information that relates the wire to a manufacturer
B. Information that relates the wire to a wiring diagram
C. The number of components in the circuit
D. The number of wires in the wiring bundle

6-10. What part of the aircraft wire and cable identification number identifies the material the wire is made of?

A. Circuit function code
B. Prefix
C. Segment letters
D. Suffix

6-11. In electronic equipment wiring diagrams, all terminals, wired, tube sockets, and capacitors are shown as what in the actual equipment?

A. The actual color
B. The approximate position
C. The relative position
D. They appear

6-12. In the unit numbering system, the electronic systems are broken into which of the following categories?

A. Sets, units, and assemblies
B. Sets, units, and voltages
C. Voltages, amperes, and assemblies
D. Voltages, parts, and subassemblies

6-13. Aircraft electronic detailed block diagrams that contain details of signal paths and wave shapes are usually called what?

A. Electromechanical diagrams
B. Signal flow diagrams
C. Operating diagram
D. Wiring diagrams

6-14. To understand synchros, gyros, and accelerometers adequately, what drawing should be used?

A. Electromechanical diagrams
B. Signal flow diagrams
C. Operating diagram
D. Wiring diagrams

6-15. In computer logics, Boolean algebra is based upon elements having what number of possible stable states?

A. One
B. Two
C. Three
D. Four

6-16. In computer logic, what symbol identifies the OR operation?

A. Addition
B. Division
C. Multiplication
D. Subtraction

6-17. In a logic system, a 1 indicates the presence of a signal corresponding to what type of switch?

A. Broken
B. Closed
C. Open
D. Secured

6-18. The detailed logic diagrams show what type of logic functions of the equipment concerned?

A. High voltages only
B. Input only
C. Output only
D. All

End of Book Questions Chapter 7

Structural and Architectural Drawings

7-1. A building project is divided into what phases?

A. Design and construction
B. Design and production
C. Design, presentation, and construction
D. Presentation, construction, and approval

7-2. Which of the following people will decide the structural load a proposed building will carry?

A. Building inspectors
B. Construction workers
C. Engineers
D. Shop supervisors

7-3. Which of the following symbols is used to identify American standard I-beam?

A. W
B. HP
C. S
D. C

7-4. Which of the following symbols is used to identify a structural tee?

A. WT
B. HP
C. LC
D. CM

7-5. Which of the following symbols is used to identify a plate?

A. BAR
B. HP
C. PL
D. FLAT

7-6. Which of the following structural shapes is the most widely used structural member?

A. C
B. D
C. S
D. W

7-7. Which of the following structural shapes is used in locations where a single flat face without outstanding flanges on one side is required?

A. C
B. D
C. S
D. W

7-8. What component is used to connect other structural members?

A. Girder
B. Plate
C. Tee
D. Truss

7-9. The total weight of all people and movable objects that a structure supports at any one time is what type of load?

A. Cumulative
B. Dead
C. Live
D. Transfer

7-10. In a light frame construction, what term describes the chief vertical structural members?

A. Pier
B. Pillar
C. Rafter
D. Stud

7-11. The basic components of a truss are the top and bottom chords and what other component?

A. Brace
B. Joist
C. Stud
D. Web member

7-12. What organization standardized the welding symbols?

A. American National Standards Institute
B. American Society of Mechanical Engineers
C. American Welding Society
D. Society of Automotive Engineers

7-13. Which of the following steel structural symbols is used to identify a fillet?

A. Circle
B. Rectangle
C. Square
D. Triangle

7-14. Which of the following steel structural symbols is used to identify a plug or slot?

A. Circle
B. Rectangle
C. Square
D. Triangle

7-15. Which of the following steel structural symbols is used to identify a spot or projection?

A. Circle
B. Rectangle
C. Square
D. Triangle

7-16. Blueprints for fabrication and erection of steel structures consist of layout, erection, fabrication and which other type of drawing?

A. General
B. Isometric
C. Perspective
D. Pictorial

7-17. These drawings provide information on the location, alignment, and elevation of the structure and principle parts in relation to the ground at the site.

A. Layout
B. General
C. Fabrication
D. Erection

7-18. The number of these drawings needed depends on the size and nature of the structure and the complexity of the operation.

A. Layout
B. General
C. Fabrication
D. Erection

7-19. These drawings show component parts of the members as well as dimensions and assembly marks.

A. Layout
B. General
C. Fabrication
D. Erection

7-20. These drawings contain approximate weight of heavy pieces and number of pieces.

A. General
B. Fabrication
C. Erection
D. Falsework

7-21. The corner locations relative to reference lines on a plot are shown in which type of plan?

A. Foundation
B. Framing
C. Plot
D. Site

7-22. Survey marks and bench marks with the elevations and grading requirements are shown in which of the following plans?

A. Foundation
B. Framing
C. Plot
D. Site

7-23. Which of the following plans show the lighting systems and any other electrical systems?

A. Elevation
B. Floor
C. Foundation
D. Framing

7-24. A builder decides where to leave openings for heating, electrical, and plumbing systems by using what type of plan?

A. Floor
B. Framing
C. Plot
D. Utility

7-25. Which of the following drawings are classified as typical and specific?

A. Detail
B. Floor
C. General
D. Sectional

End of Book Questions Chapter 8

Developments and Intersections

8-1. A development of an object that will be made of thin metal must include consideration of the developed surfaces, the joining of the edges, and what other characteristic?

A. Exposed edges
B. Quality of metal
C. Type of paint
D. Type of system

8-2. When drawing a grooved seam, the allowance must be how many times the width of the lock?

A. 1
B. 3
C. 5
D. 7

8-3. What axis is used to compute the bend allowance?

A. Negative
B. Neutral
C. Positive
D. Vertical

8-4. Before proceeding with any bend allowance calculations, what minimum allowance must be determined?

A. Leg
B. Mold line
C. Radius
D. Setback

8-5. What term defines a surface that a thin sheet of flexible material can be wrapped smoothly around?

A. Developable
B. Nondevelopable
C. Orthographic
D. Perspective

8-6. What term describes the process that occurs when the true size of each side of the object is known and the sides can be laid out in successive order?

A. Parallel-line development
B. Perspective drawing
C. Radial-line development
D. Triangular development

8-7. What type of instructions may be included in a parallel-line development drawing?

A. Assembly
B. Final inspection
C. Folding
D. Operator

8-8. What type of development is used for a truncated cylinder?

A. Orthographic-perspective
B. Parallel-line
C. Radial-line
D. Triangular

8-9. To avoid considerable waste of material in developing an elbow, the seams are alternately placed how many degrees apart?

A. 45
B. 90
C. 180
D. 270

8-10. Which of the following types of pyramid has lateral edges of unequal length?

A. Isometric
B. Oblique
C. Orthographic
D. Right

8-11. What types of reference lines are necessary in radial-line and parallel-line developments?

A. Dashed
B. Evenly spaced
C. Intersecting
D. Unevenly spaced

8-12. Which of the following is the first step in developing a frustum of a right cone?

A. Develop a perspective view
B. Develop an orthographic view
C. Establish reference lines
D. Establish the apex point

8-13. In a radial-line development of an oblique pyramid, what should be constructed first?

A. Orthographic view
B. Perspective view
C. The development
D. True-length diagram

8-14. What type of development is practical for many types of figures?

A. Orthographic-perspective
B. Parallel-line
C. Radial-line
D. Triangular

8-15. Transition pieces will usually fit the definition of a non-developable surface that must be developed by what means?

A. Approximation
B. Calculations
C. Imagination
D. Precise measurements

8-16. An oblique cone is generally developed by what method?

A. Orthographic-perspective
B. Parallel-line
C. Radial-line
D. Triangular

8-17. In a triangular development, at what location in relation to the front view is the true length drawing placed?

A. Adjacent
B. Behind
C. Diagonally
D. On top

8-18. For drawing a rectangular-to-round transition piece, what number of true length diagrams are drawn?

A. 1
B. 2
C. 3
D. 4