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CODE ID NO.	ISSUE DATE	PART NUMBER	REV	PAGE	OF
80009	31Ju178	062-2476-00	--	1	33

DRAFTING STANDARD

SYMBOLS AND PRACTICES FOR SCHEMATIC DIAGRAM DRAFTING OF ELECTRONIC CIRCUITS

CONTENTS OF THIS STANDARD

Issued By

TECHNICAL STANDARDS

DRAFTING STANDARD

SYMBOLS AND PRACTICES FOR SCHEMATIC DIAGRAM DRAFTING OF ELECTRONIC CIRCUITS

CONTENTS OF THIS STANDARD

Part I. Use and Contents of Standard. This standard was developed into two sections, Part I and Part II. Part I explains the use and contents of the standard. Part II deals primarily with the graphic symbols.

1. PURPOSE.
The purpose of this standard is to establish selected standards for use by Tektronix, Inc. These standards identify Reference Designations and Graphic Symbols to be used in documentation of electrical and electronic parts and equipment.

2. SCOPE.
This Tektronix Standard is intended for use as a ready reference for the drafting of electrical and electronic schematic diagrams, in conjunction with ANSI Y32.2-1975. It is not intended to replace the national standard at Tektronix. This standard includes the most frequently used symbols from ANSI Y32.2-1975, plus symbols that have been devised for use by Tektronix that are not included in the ANSI standard. Also, in some cases some symbols from the ANSI standard were not included for Tektronix use; these cases are specifically noted in this standard. Symbols used in this standard that differ from ANSI are identified by "Tek", denoting that the symbol is used by Tektronix and not necessarily by any other organization.

3. APPLICABLE DOCUMENTS.

3.1 SOURCE DOCUMENTS.

ANSI Y32.16(R-1975) Reference Designations for Electrical and Electronic Parts and Equipment. This standard is also identified as Institute of Electrical and Electronic Engineers (IEEE) Standard 200.

ANSI Y32.2-1975 Graphic Symbols for Electrical and Electronic Diagrams. This standard is also designated as IEEE Standard 315, and Canadian Standards Association (CSA) Z99.

ANSI Y14.15(R-1973) Electrical and Electronic Diagrams.

ANSI Y1.1-1972 Abbreviations for Use on Drawings and in Text.

3.2 REFERENCE DOCUMENTS.

ANSI Y10.5-1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

062-1874-00 Line Conventions and Lettering.

ANSI Y10.19-1969 Letter Symbols for Units Used in Science and Technology.

4. AUTHORITY FOR CHANGE.
Except for minor changes, revisions to this standard shall be approved by a consensus of the Ad Hoc committee that consists of a representative from each manuals group within Tektronix, Inc., and are to be implemented only by the Technical Standards Group.

5. APPLICATION.
The foregoing referenced documents are for use throughout the company. Before using a particular document, verify from Technical Standards that it is the latest edition, since the reference document current at the date of the subject drawing or text will be considered the control document.

6. SYMBOL SIZE
The symbols depicted in this standard are actual size for use on C-size drawings. Drawings larger than than C-size should not be used unless unavoidable'(Drawings are reduced and filmed on microfiche for storage, and reproducibility of details is compromised if the drawing is not C-size). These symbols were drawn by use

of 062-1193-00, Tektronix, Inc., drafting template.

7. LETTERING.

The lettering used in Part II of this standard is typeset. It is recommended, however, that all lettering on diagrams be hand-lettered, using the guidelines that appear in this standard, except when machine-drawn.

Part II. Symbols

DIAGRAM FORMAT

The following guidelines have been adopted as a standard in the preparation of Tektronix schematic diagrams.

1. The diagram must have an issue symbol located along the bottom of the diagram near the center. There will be only one issue symbol per pullout page.

2. The manual title (same as in the text running head) should appear on each diagram and be located in the lower left hand corner. For those groups that put the circuit board part number (670-XXXX-XX) on the diagram, ensure that the 670-number appears on all diagrams.

3. Diagram numbering:

   a. Each diagram is sequentially numbered; do not use letter suffixes to identify diagrams, (e.g., ◇1◇ a or ◇1◇ A).

   b. When new diagrams must be added to current manuals because of a circuit board change, the added diagram may have the same number as the existing diagram and the different board versions will be identified by the circuit board part number or serial number. The latest version of the diagram should appear first in the diagram sequence.

4. Notes should be located in one central location on the diagram, preferably, the lower right corner of the diagram.

5. Footnotes on diagrams and illustrations should be denoted by a symbol. The symbol sequence is as follows: (*) asterisk, (†) dagger, (‡) double dagger, and (§) section mark; if more than four footnotes are necessary, start over by using two asterisks, two single daggers, etc.

6. The circuit board outline should be inked on the diagram with a number 4 or 6 rapidograph pen.

7. Function blocks will be inked on the same overlay as history information with a number 4 or 6 rapidograph pen. Use the long broken line and do not run through the component or circuit number. These will be shot at 50% black.

8. History information is put on an overlay and shot in photography at 50% black. When the part number for a component is changed, the component designator for that component is boxed by drawing a box on the overlay that encloses the circuit number. When any of the circuitry on a diagram is deleted, the circuitry is drawn on the overlay in its former configuration. The following note appears on the overlay: SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GRAY.

9. Do not put the part number for a component on the diagram.

10. Referencing of signal lines—reference all signal lines to the circuit number, pin number, and diagram, (e.g., DELAY to U155-3 ◇6◇).

11. Use the oval for showing voltages on the diagram. To be drawn on the diagram with a pencil. Example: (−3.2 V).

12. A hexagon enclosing a numeral is used to reference waveforms to the test points on the diagrams, e.g., ⟨4⟩.

13. Electrical components shown on the diagrams are in the following units unless noted otherwise:

a. Capacitors: Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μF).

b. Resistors: Ohms (Ω).

DIAGRAM SIZE

The finished diagram size is approximately 10 x 15 inches.

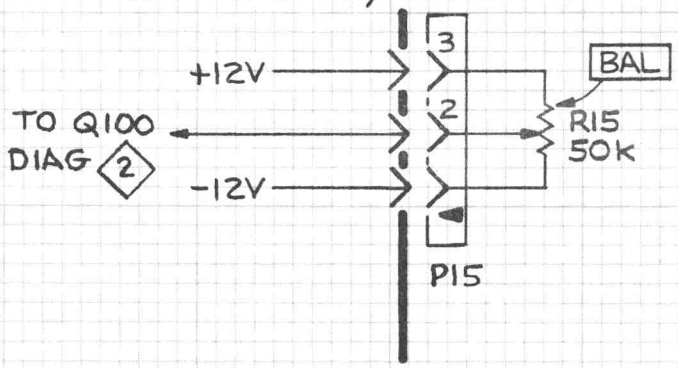
1. "C" Size (17 x 22): 59% reduction; minimum line spacing is 1/10; minimum letter size is 1/10.

2. "D" Size (22 x 34): 44% reduction; minimum line spacing is 0.15 (1 and 1/2 squares on a 10 x 10 grid); minimum letter size is 0.12 (1 and 2/10 squares on a 10 x 10 grid, or 1/8 inch).

LETTERING SIZES FOR SCHEMATIC DIAGRAMS

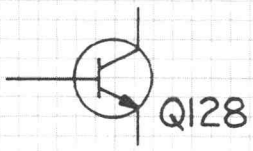
All notes, values, and circuit numbers except transistors, integrated circuits, and schematic titles are to be 1/10 inch high, as shown in this sample. Each square of 10 x 10 grid paper is 1/10 inch high. The Tektronix Schematic Drafting Template (Tektronix Part Number 002-1193-00) is scaled for use on 10 x 10 grid paper up to "C" size drawing (17 x 22 inches). If a schematic must be drawn larger than a "C" size, these standards may not be applicable because of the larger reduction percentage necessary to print the diagram on a manual pullout page.

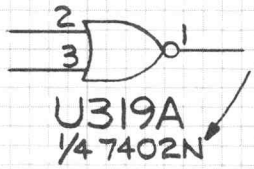
EXAMPLES OF SIZES FOR NOTES, VALUES AND CIRCUIT NUMBERS :



CIRCUIT NUMBERS FOR TRANSISTORS AND INTEGRATED CIRCUITS SHOULD BE 1 1/2 SQUARES HIGH.

EXAMPLES :

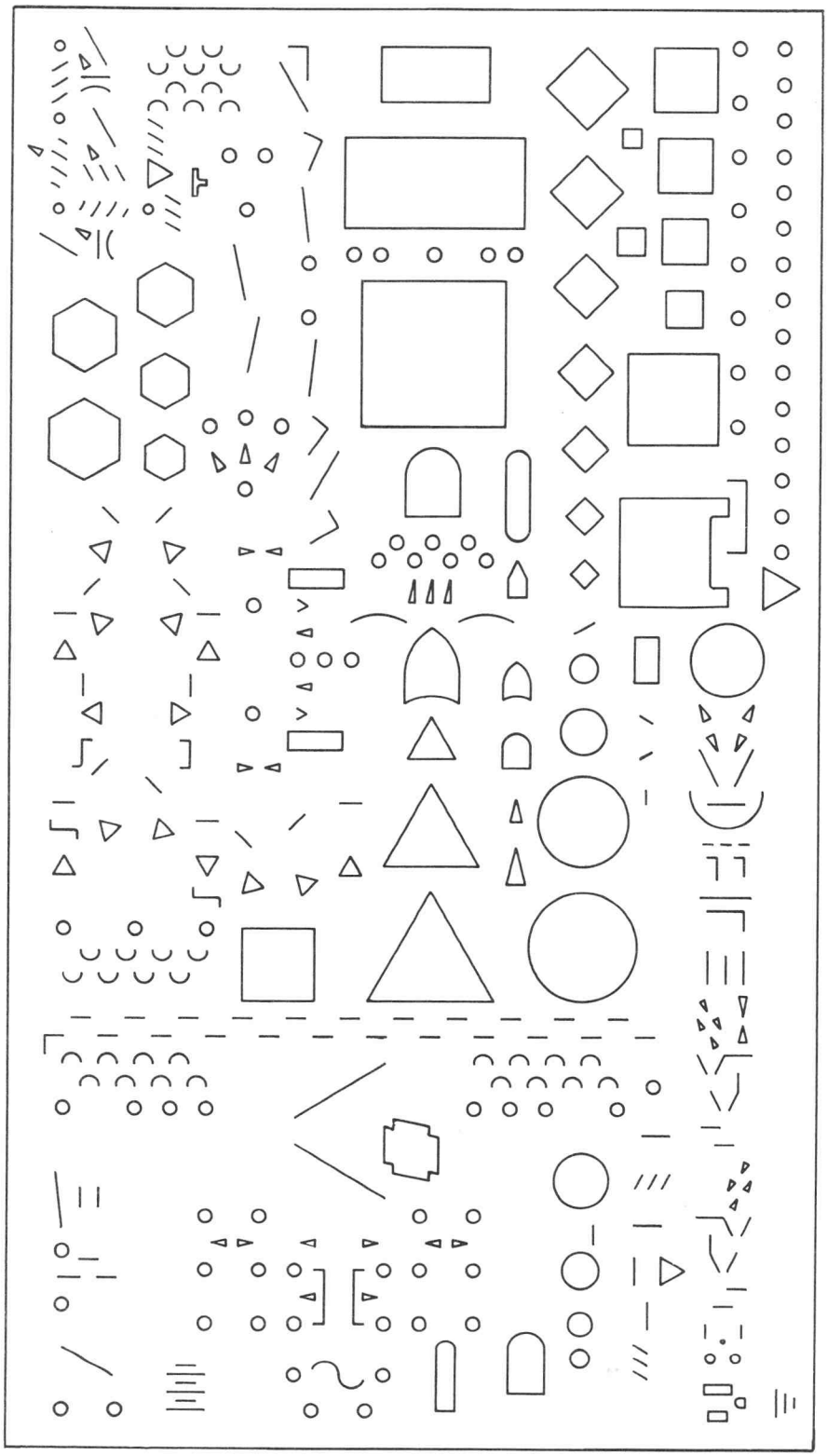




NOTE : DEVICE NUMBERS FOR IC'S ARE TO BE 1/10 INCH HIGH (ONE SQUARE)

SCHEMATIC TITLES ARE TO BE 2/10 INCH (2 SQUARES HIGH ON 10×10 GRID PAPER).

EXAMPLE : VERTICAL AMPLIFIER 2



002-1193-00

CLASS DESIGNATION LETTERS MOST COMMONLY USED AT TEKTRONIX

NOTE:

IF A PART SERVES A PURPOSE OTHER THAN ITS GENERALLY INTENDED ONE, THE FUNCTION ACTUALLY PERFORMED WILL BE REPRESENTED BY THE GRAPHIC SYMBOL USED IN THE SCHEMATIC DIAGRAM.

EXAMPLES:

A LAMP USED AS A RESISTOR WOULD BE REPRESENTED BY THE GRAPHIC SYMBOL FOR A RESISTOR BUT THE LETTER CLASS WOULD BE 'DS'. A FOUR INPUT LOGIC GATE WHOSE INPUTS ARE TIED TOGETHER WOULD BE REPRESENTED BY AN INVERTER SYMBOL.

A —separable assembly
separable subassembly

The class letter A is assigned on the basis that the item is separable. The class letter U shall be used if the item is inseparable.

For economic reasons, assemblies which are fundamentally separable may not be so provisioned but may be supplied as complete assemblies. However, the class letter A shall be retained.

AR —amplifier (other than rotating)

AT —fixed attenuator

B —blower
motor
synchro

BT —battery
battery cell

C —capacitor bushing
capacitor

CR —asymmetrical varistor
crystal diode
current regulator (semiconductor device)
diode (semiconductor type)
diode rectifier (semiconductor type)
metallic rectifier
photodiode (photosensitive type)
thyristor (semiconductor diode type)
varactor

D —breakdown diode (voltage regulator)
overvoltage absorber

DC —directional coupler

DL —delay function
delay line

DS —alphanumeric display device
general light source
indicator (excluding meter or thermometer)
lamp (excluding heating lamp)
light-emitting solid-state device
photodiode (photoemissive type)
signal light
visual alarm
visual indicator
visual signaling device

E —electrical shield
ferrite bead rings
Hall element
ignitor gap
spark gap

F —current limiter (for power cable)
fuse
fuse cutout

FL —filter

G —electronic chopper
generator

HR —heater
heating lamp
heating resistor

J —jack
receptacle (connector, stationary portion)

K —contactor (magnetically operated)

L —coil (all not classified as transformers)
inductor

LS —audible signaling device
electric bell

M —meter

P —plug (connector, movable portion)

PS —power supply

Q —semiconductor controlled rectifier
semiconductor controlled switch
phototransistor (3 terminal)
transistor

R —function potentiometer
potentiometer
resistor
rheostat

RT —ballast lamp
current-regulating resistor
resistance lamp
thermal resistor
thermistor

RV —symmetrical varistor
voltage-sensitive resistor

S —contactor (manually, mechanically, or thermally operated)
disconnecting device (switch)
electrical safety interlock
flasher (circuit interrupter)
switch
thermal cutout (circuit interrupter) (not visual)

SQ —fusible link

T —transformer

TB —connecting strip
terminal board
terminal strip
test block

TC —semiconductor thermocouple
thermocouple

TP —test point

U —inseparable assembly
integrated-circuit package
microcircuit
micromodule
photon-coupled isolator

V —electron tube

VR —induction voltage regulator
voltage regulator (excluding electron tube)

W —**wire strap**
dummy resistor
cable
cable assembly (with connectors)
coaxial cable
conductor
wire

Z —**phase shifter**
phase-changing network
resonator (tuned cavity)

For Class Designation letters of items not listed, refer to ANSI Y32.2

QUALIFYING SYMBOLS 1.

Qualifying symbols are to be used with the basic symbol to indicate a special property.

Adjustability 1.1

All screwdriver adjustments will have ⊘ symbol on schematic.

Each adjustment on the schematic should have its purpose indicated by a title.

INTENSITY TEK

Panel Knob

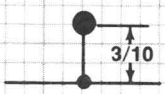
GAIN ⊘ TEK

Panel Screwdriver

⊘ TEK

Internal Screwdriver

Test Point Recognition 1.5 (TP)



Size of test point is 3/32"
Use small circle in
coaxial connector symbol

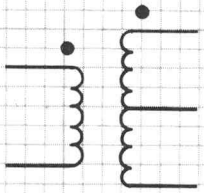
Polarity Markings 1.6

Positive +

Negative −

Note: Symbols should not exceed 1/10 inch.

Instantaneous polarity marking



(Use solder dot connection on template.)
Put this symbol outside the transformer winding when possible.

Direction of Flow, Signal or Information 1.7

From → To

Left to right or top to bottom

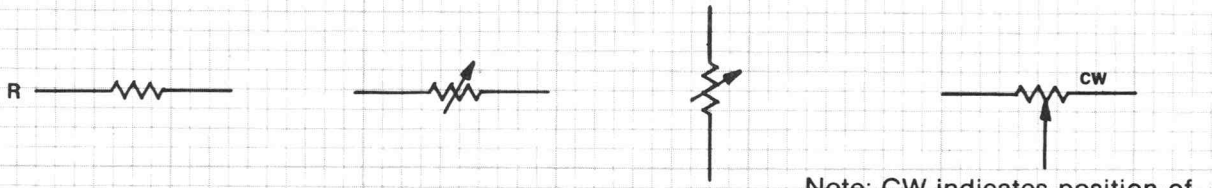
Envelope or Enclosure 1.10

Size: 13/32, use template

Shield or Shielding 1.11 (E)

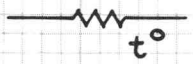
GRAPHIC SYMBOLS 2.

Resistors 2.1 (R)

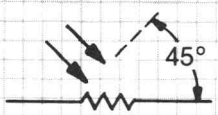


Note: CW indicates position of adjustable contact at the limit of clockwise travel viewed from knob or actuator end.

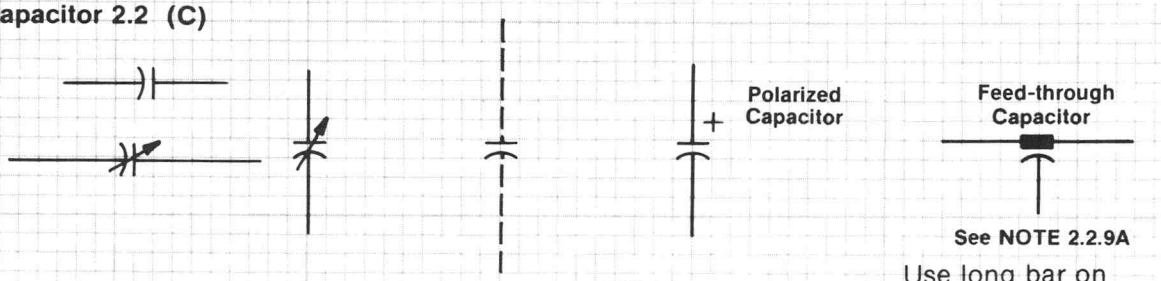
Thermistor 2.1.12.1 (RT)



Symmetrical Photoconductive Transducer (Resistive) 2.1. 13 (R)



Capacitor 2.2 (C)



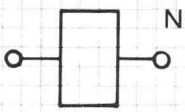
Stray capacitance TEK
Use dashed line on template

Use long bar on
Power Receptacle symbol.

NOTE: The curved element represents:

1. The outside electrode in fixed paper dielectric and ceramic dielectric capacitors.
2. The moving elements in adjustable and variable capacitors.
3. The low potential element in feed-through capacitors.
4. The negative side of a polarized capacitor.

Attenuator 2.4



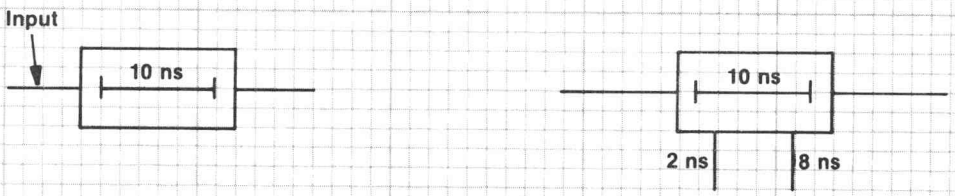
NOTE: The class designation for a potted attenuator is AT.

Battery 2.5 (BT)

One cell Multi cell

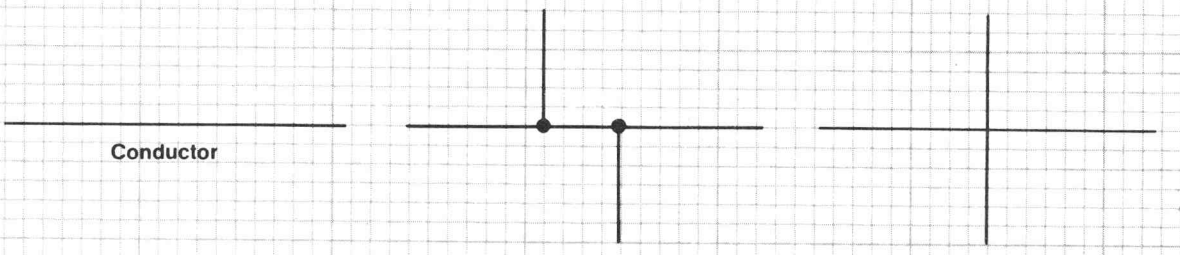
NOTE: List nominal voltage for batteries on diagrams.

Delay Line 2.6 (DL)



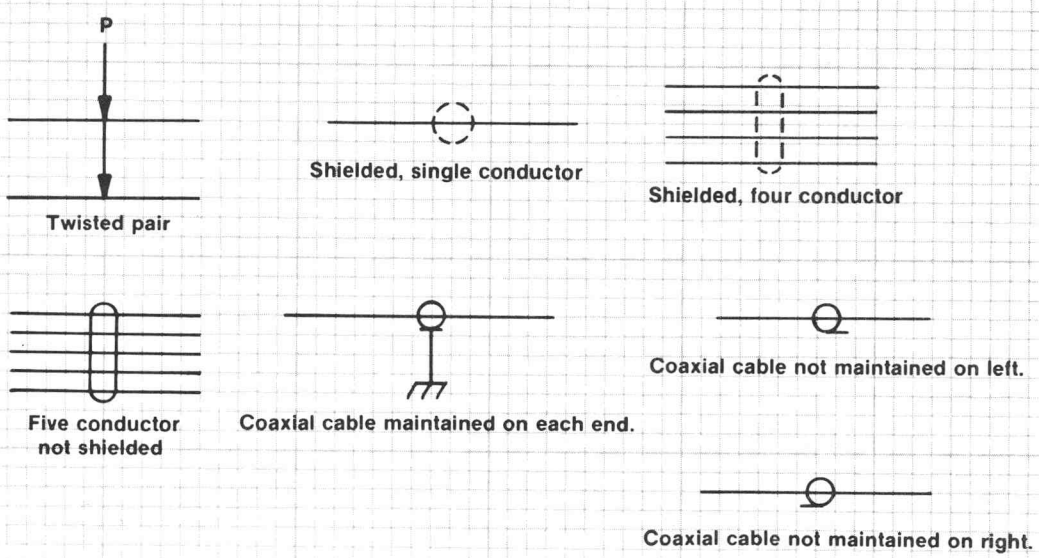
Size: 4/10 x 8/10. Tapped

Transmission Path 3.1



Conductor Conductors connected Conductors not connected

NOTE: All solder dots should be of the same size, approximately 1/16 inch. (Use template).



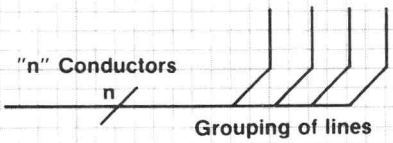
Twisted pair Shielded, single conductor Shielded, four conductor

Five conductor not shielded Coaxial cable maintained on each end. Coaxial cable not maintained on left.

Coaxial cable not maintained on right.

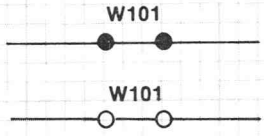
NOTE 3.1.9A: If necessary for clarity, an outer-conductor connection shall be made to the symbol.

NOTE 3.1.9B: If the coaxial structure is not maintained, the tangential line shall be drawn only on the coaxial side.



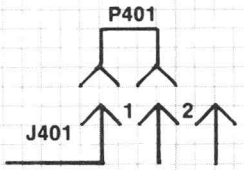
Bend of line indicates direction in which other end of path will be found.

NOTE 3.1.2.3A: The "n" is not part of the symbol. A number representing the actual number of paths shall be substituted for "n".

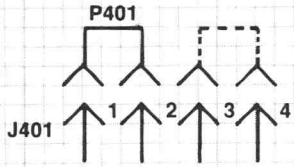


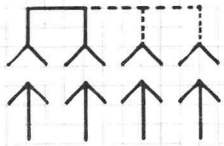
Strap or dummy resistor TEK

NOTE: An open circle indicates a nonsoldered terminal.



Jumper TEK (Harmonica)

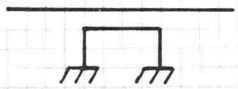




Stripline 3.7

Unbalanced

Balanced



TEK Alternative if standard would not be clear. Ohmic value may be added.

Circuit Return 3.9

Earth ground

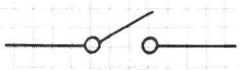
Chassis ground

3.9.3.2 Common-return connections are at the same potential level. Floating or isolated.

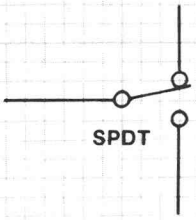
* NOTE: The asterisk is not part of the symbol. Identifying numbers shall replace the asterisk. The number shall be placed within the triangle or, if essential for legibility, adjacent to the triangle.

Switches 4.1

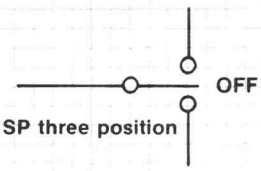
The standard method of showing switches is in a position with no operating force applied. Show self-cancelling switches in the most common position. Use the dashed line on the template for ganged switches.



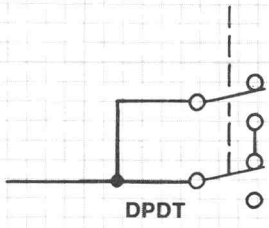
SPST

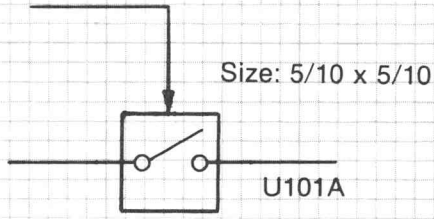


SPDT



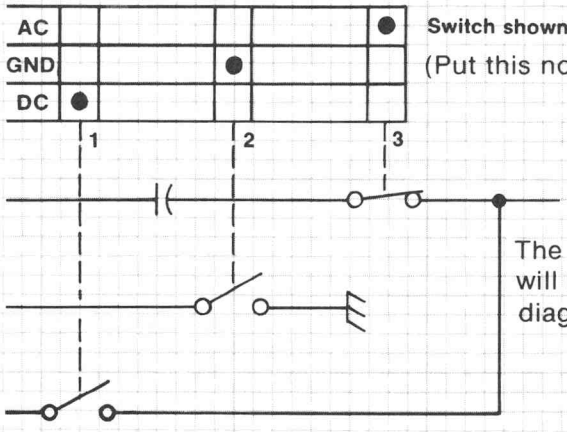
SP three position





Quad-Bilateral Switch
CD4016

Vertical Input Coupling Cam Switch S105

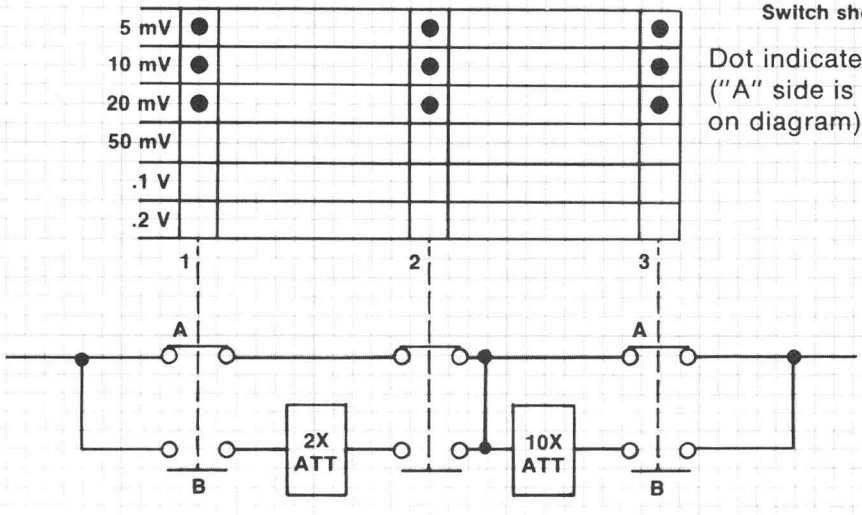


Switch shown in AC position

(Put this note on the diagram)

The dot indicates in what position the switch will be closed. (This note belongs on the diagram boiler-plate page).

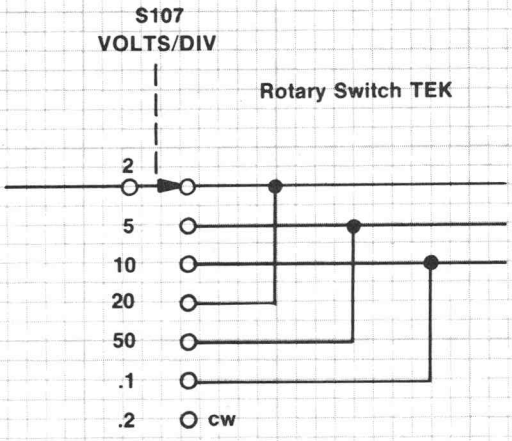
Push-pull Cam Switch VOLTS/DIV S106

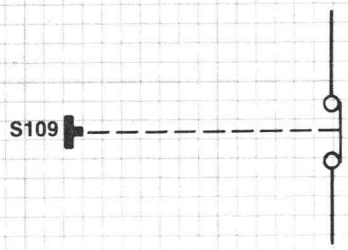


Switch shown in 5 Mv position.

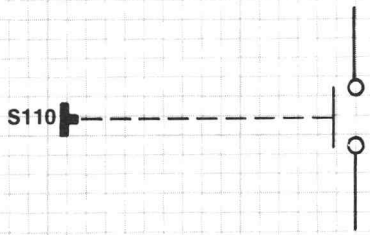
Dot indicates "A" contact closed ("A" side is cam side). (Put this note on diagram).

Note to draftsperson: When A contact opens, B contact closes.

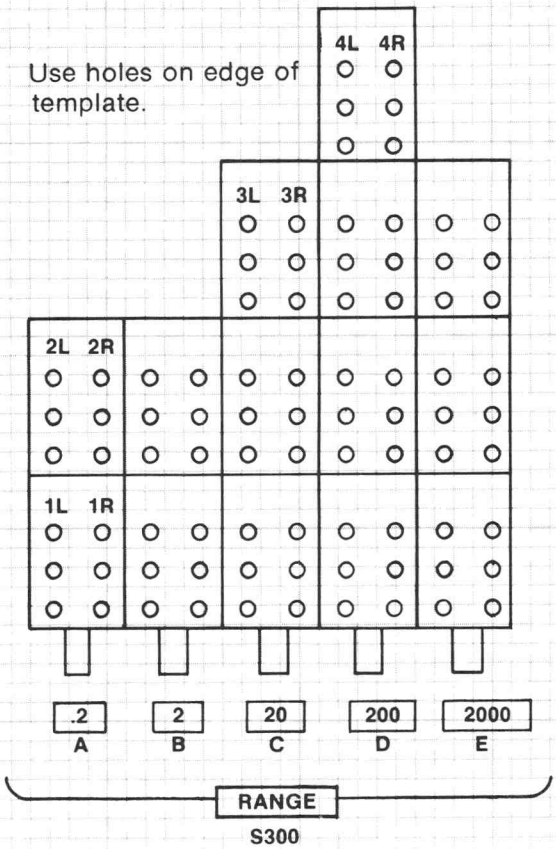




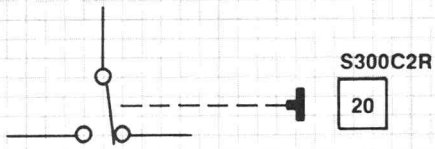
Momentary Contact, spring return switches
4.7

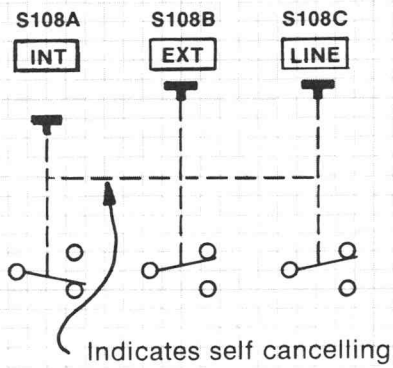


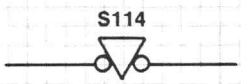
Self-cancelling pushbutton switches.



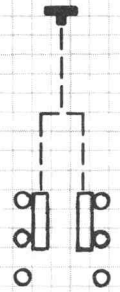
Example of one section.



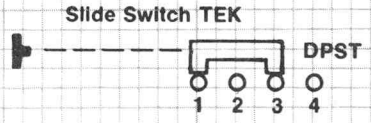


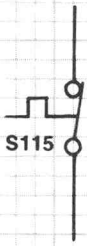


Safety Interlock 4.15



Slide Switch TEK



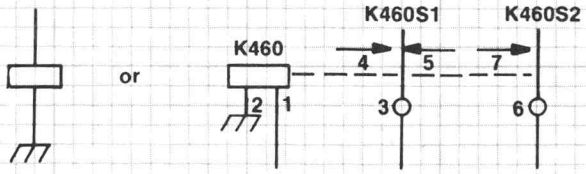


Temperature Actuated switch
(opens on rising temperature)

4.20

(THERMAL CUTOUT)

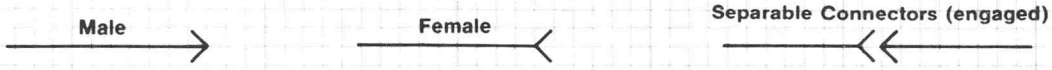
Relays 4.30



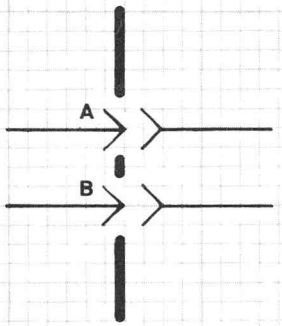
(SHOW IN THE NON-ENERGIZED POSITION)

Connector 5.3

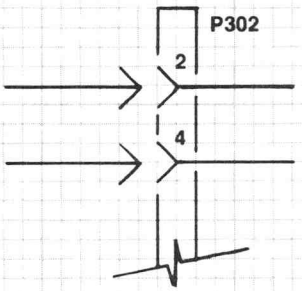
1. The most stationary portion of the connector is designated J.
2. The most movable portion of the connector is designated P. (Some circuit boards at Tektronix may have a P silkscreened on the circuit board, this is to indicate the attachment point for the designated connector (e.g. harmonica.)
3. If two cables are to be connected to each other, each of the mating cable connectors shall be designated P . ANSI Y32.16-1975 4.1.5.3 (4)

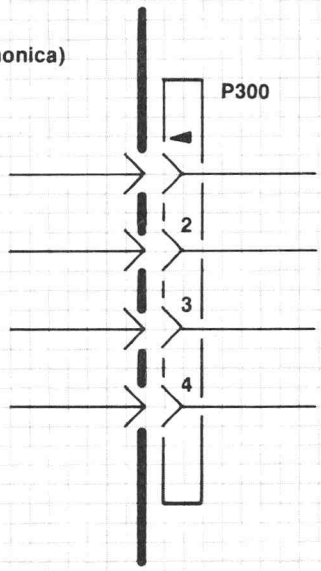


Single Berg pin connectors (square pin)

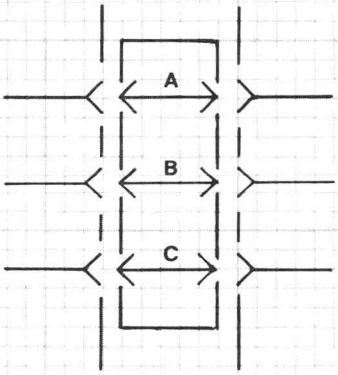


Multiple Berg pin connectors (Harmonica)

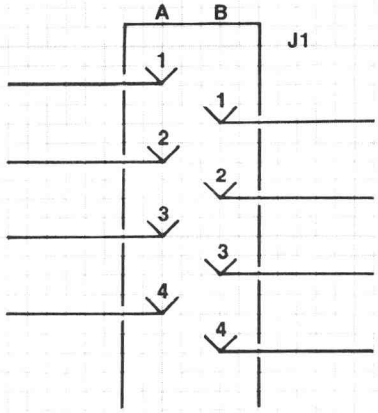




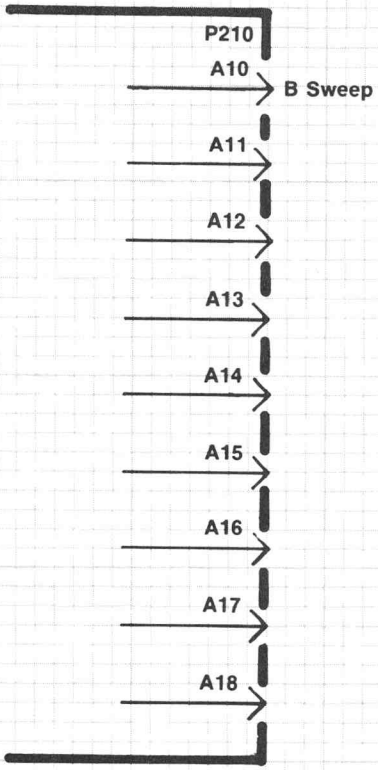
Comb Connector

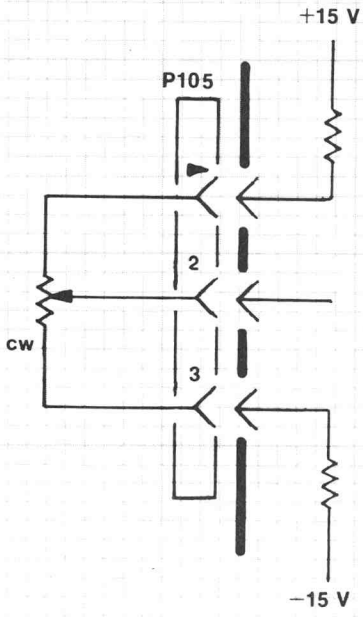


Amphenol Type
Interface Connector

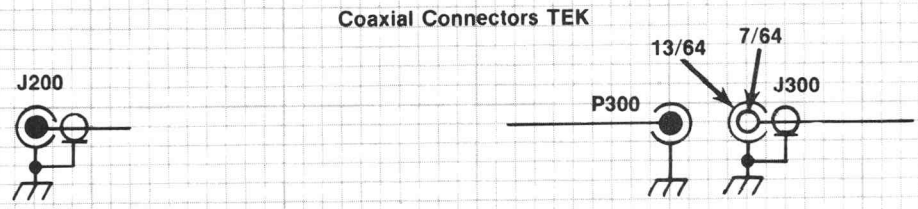


Edgeboard Connectors

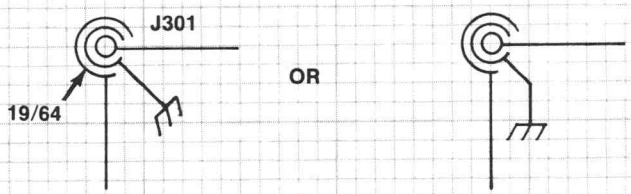




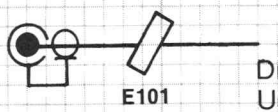
Coaxial Connectors TEK



Probe Coding TEK

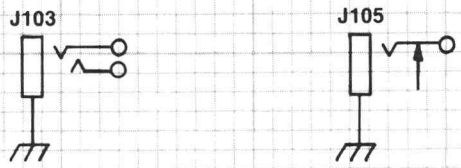


Ferrite Bead on Coaxial Cable 15.18.1

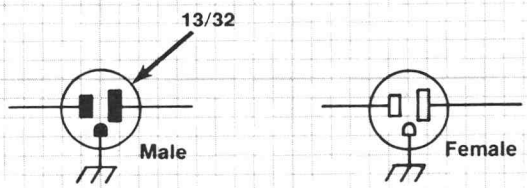


Draw at 30° angle; aspect ratio 1:3.
Use relay symbol on template.

Switchboard Type Connector 5.3.5



ac Line Plug 5.4

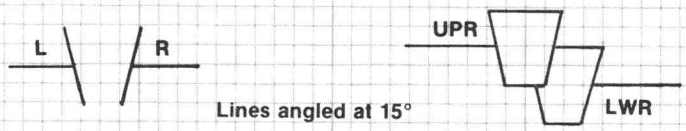


NOTE: Third wire connected to chassis ground.

LEMO Connector: Use manufacturers data sheet; some examples are shown here. Do not number the pins on a LEMO connector, as pin numbering on the same type of connector is not consistent.

(Viewed from Front)

Deflection Plates TEK

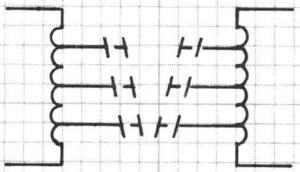


Lines angled at 15°

Horizontal

Vertical

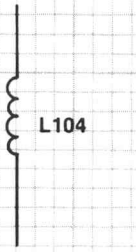
Distributed deflection plates



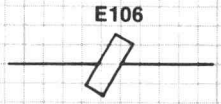
Transformers and Coils 6.2.1

NOTE: 1. Use four loops for coils and inductors.

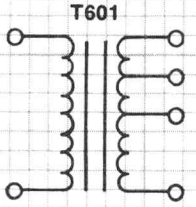
2. Eliminate core on transformers except where needed for clarity; e.g., power transformer. Reference 6.1.1.



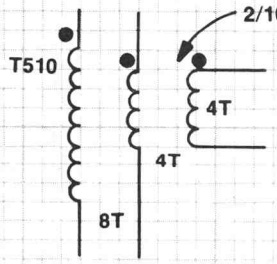
Coil or inductor



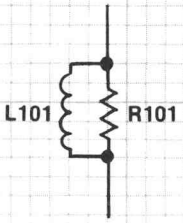
Ferrite Bead



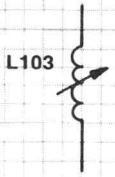
Power transformer



Trifilar transformer



LR circuit



(variable symbol drawn at 30° angle)

Variable inductor

SEMICONDUCTOR DEVICES 8.1

NOTE: 1. All transistors common to an array will be drawn the same size.

2. Concerning Integrated circuits that consist of one kind of component only, such as transistor arrays, resistor arrays, diode arrays, and the like: Multiple arrays of components that are alike shall bear the reference designation of that unit component. For example, a diode array will bear the class designation letters CR; each unit diode in the array bears the integrated circuit designation plus a suffix letter; e.g., CR1, a four-diode array, consists of CR1A, CR1B, CR1C, and CR1D.

   Such units are to be depicted as any other component, except the pin numbers for the integrated circuit should appear on the component leads, as appropriate.

   Bridge rectifiers encapsulated as an assembly bear the class designation letters CR.

   Single light-emitting diodes are to be designated DS.

   The class letter designation U is to be used for seven-segment light-emitting diode arrays, for the following reasons:

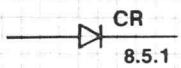
a. These arrays are almost always non-repairable assemblies. (See ANSI Y32.16, paragraphs 3.17 and footnote 7, page 28.)

b. These arrays often contain elements other than diodes. Thus the designation CR cannot apply.

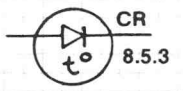
The above decisions are based on ANSI Y32.16-1968, page 24, paragraph 8.1.

3. Envelopes for semiconductor devices are 13/32, use envelope symbol on template.

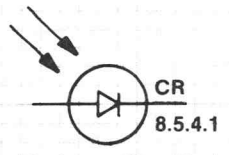
Semiconductor Diodes (two terminal devices) 8.5



Capacitive diode

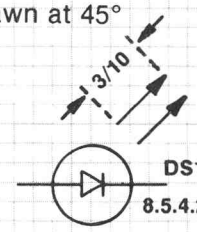


Temperature dependent diode



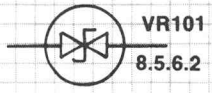
Photosensitive diode

Drawn at 45°

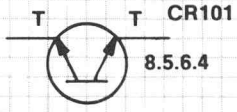


Photoemissive diode

Unidirectional diode
Voltage regulator (Zener)

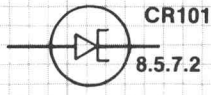


Bidirectional diode (Zener)

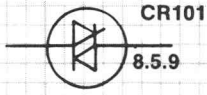


Bidirectional negative resistance breakdown diode; Trigger diac

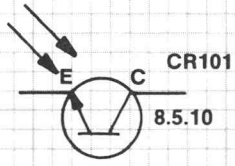
Tunnel diode



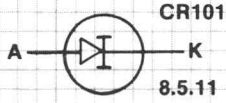
Backward diode



Thyristor, bidirectional diode type; bi-switch



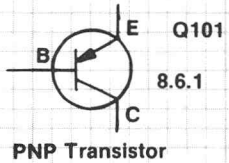
Phototransistor (two terminal)



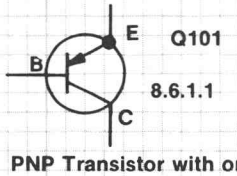
Current regulator (FED)

Semiconductor Devices, three or more terminal devices 8.6

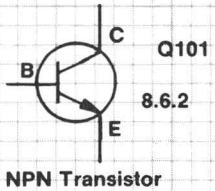
NOTE: It is not necessary to label emitter (E), base (B), and collector (C) on common transistors.



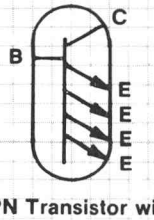
PNP Transistor



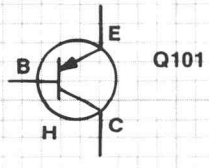
PNP Transistor with one electrode connected to envelope (in this case emitter).



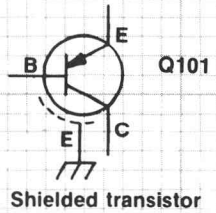
NPN Transistor



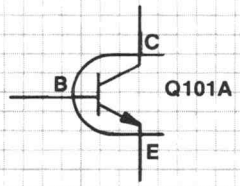
NPN Transistor with multiple emitters (with four emitters shown)



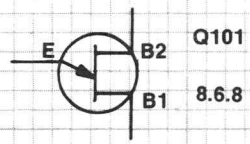
Transistor with heat sink
H-Heat sink TEK



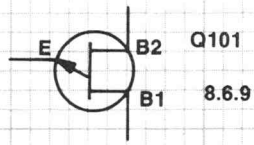
Shielded transistor



Dual transistor



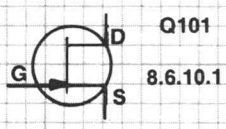
Unijunction transistor, N type base



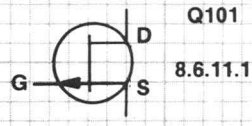
Unijunction transistor, P type base

Field Effect Transistors (FET)

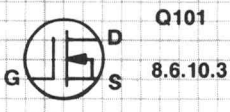
NOTE: Draw the gate opposite the source unless it is known to be otherwise. Label the Gate (G), Drain (D), and the Source (S).



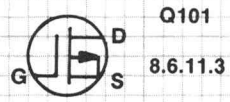
N-Channel junction gate



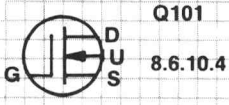
P-Channel junction gate



N-Channel insulated gate, depletion-type, single-gate, active-bulk (substrate) internally terminated to source, three-terminal device.

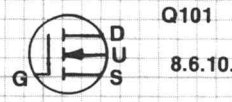


P-Channel insulated-gate, depletion-type, single-gate, active-bulk (substrate) internally terminated to source, three-terminal device.

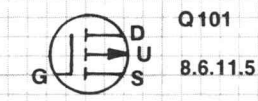


N-Channel insulated gate, depletion-type, single-gate, active-bulk (substrate) externally terminated, four-terminal device.

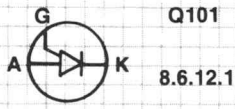
P-Channel insulated-gate, depletion-type, single-gate, active-bulk (substrate) externally terminated, four-terminal device.



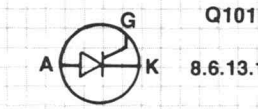
N-Channel insulated-gate, enhancement-type, single-gate, active-bulk (substrate) externally terminated, four-terminal device.



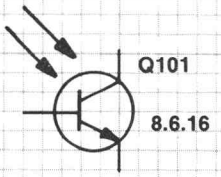
P-Channel insulated-gate, enhancement type, single-gate, active-bulk (substrate) externally terminated, four-terminal device.



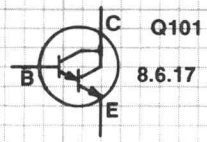
Thyristor, reverse-blocking triode-type, N-type gate; semiconductor controlled rectifier, N-type gate.



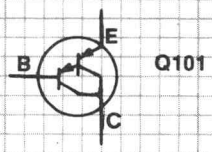
Thyristor, reverse-blocking triode type, P-type gate; semiconductor controlled rectifier, P-type gate.



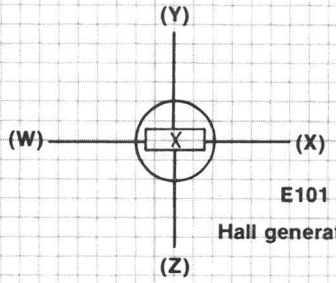
Phototransistor



Darlington transistor NPN-type

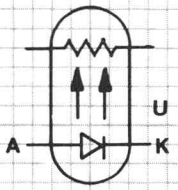


Darlington transistor PNP-type

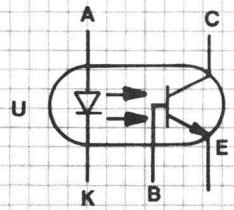


NOTE: W and X are the current terminals; Y and Z are the voltage output terminals. The letters are for explanation and are not part of the symbol.

Photo-Coupled Isolator 8.10

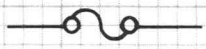


Photoemissive diode and symmetrical photoconductive transducer



Photoemissive diode and phototransistor.

Circuit Protectors 9.1

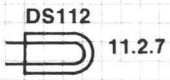


Fuse F101

Spark gap 9.3 E102

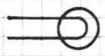
Gas filled E106

Lamps and Visual Signaling Devices 11.1

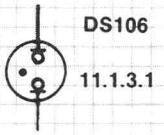


Indicating light.

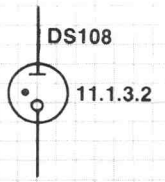
Use this symbol for lamps in general except graticule illumination and non-incandescent lamps such as glow lamps, LEDs, etc.



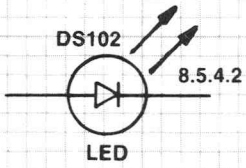
Incandescent lamp.
Use for graticule illumination.



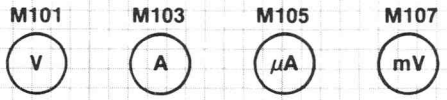
Glow lamp, ac type (Neon)



Glow lamp, dc type (Neon)



Meter, Instrument 12.1



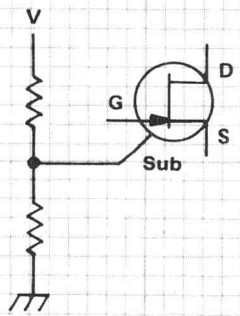
Rotating Machine 13.1

Miscellaneous

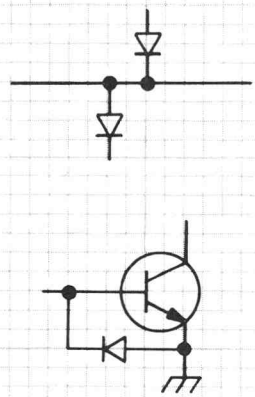
Vcc and Gnd Chart sample

TYPE	V + +5 V	V − −5 V	V_{DD} +5 V	V_{SS} GND	V_{CC} +5 V	GND	UNUSED PINS −5 V
741	7	4					
1458	8	4					
4016			14	7			1,2,13
7400					14	7	

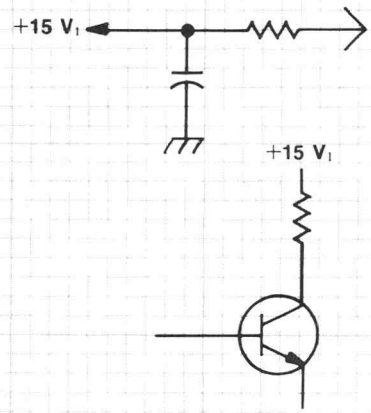
Externally Elevated Substrate

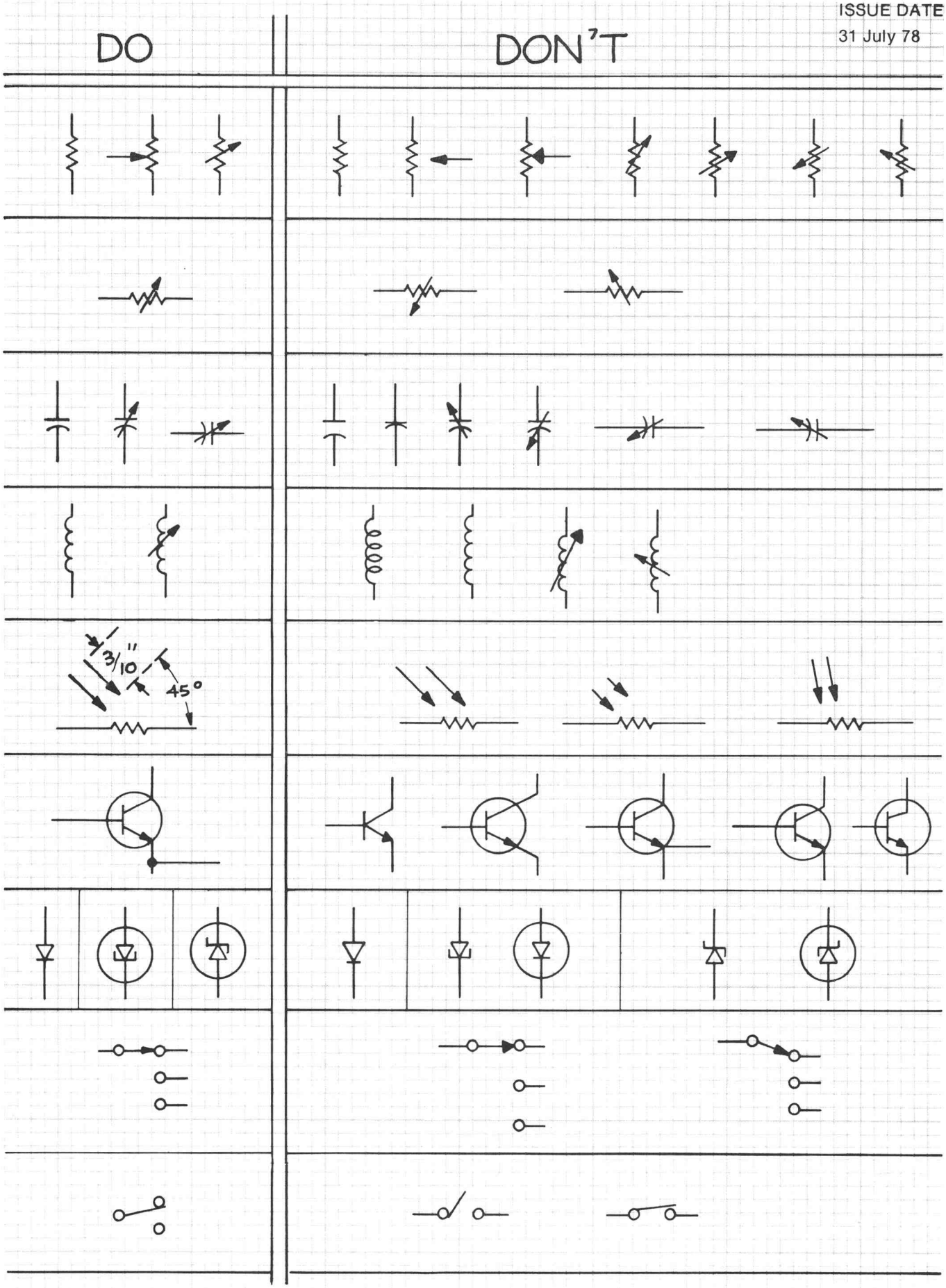


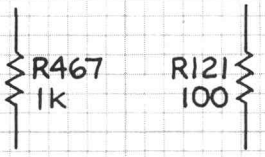
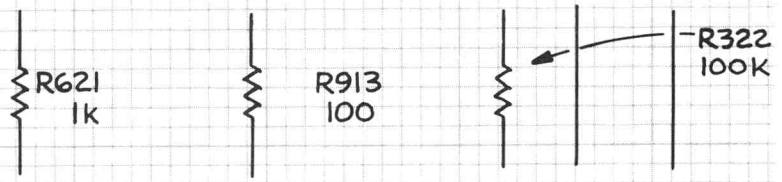
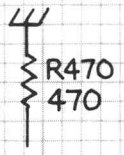
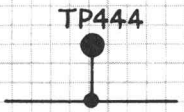
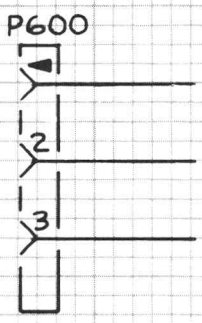
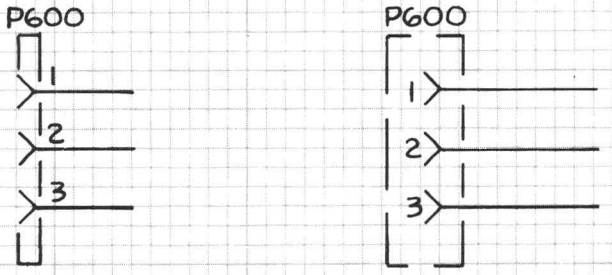
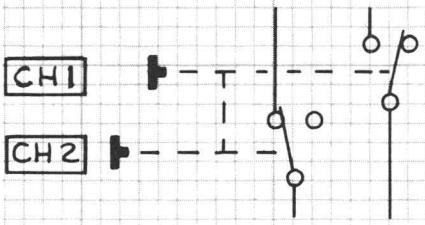
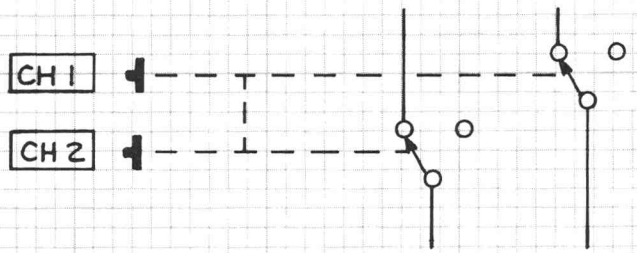
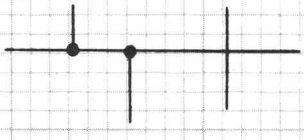
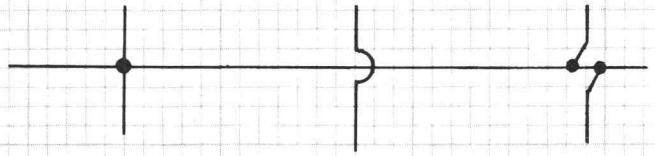
Protective Diode Clamp

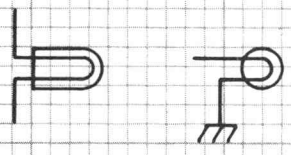
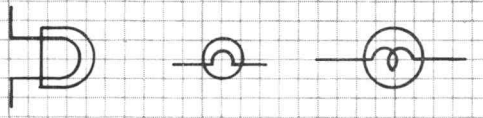
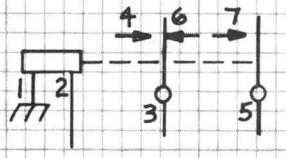
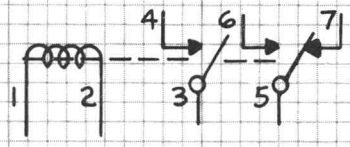
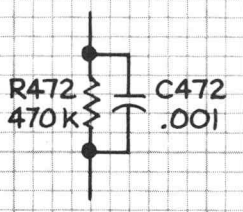
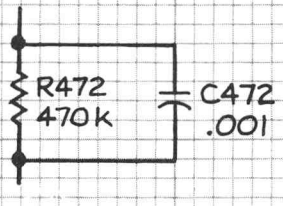
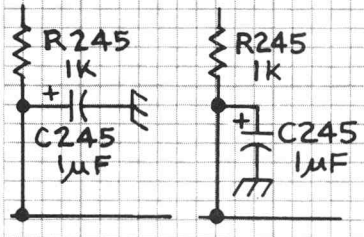
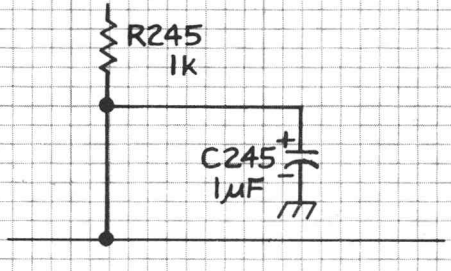
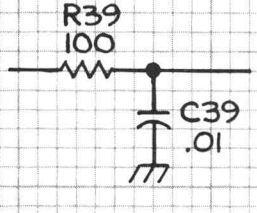
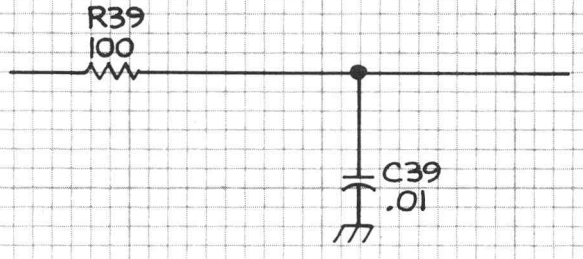
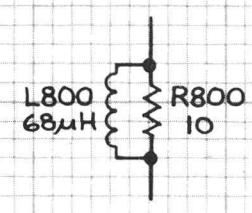
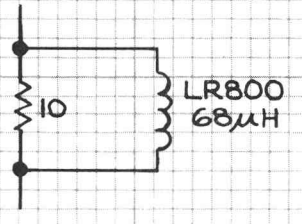


Use subscript to indicate decoupled voltages.

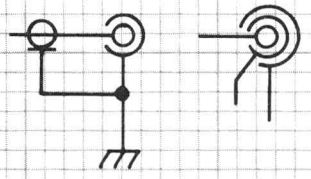



DO
DON'T
3/10"
45°

DO	DON'T
 R467 1k R121 100	 R621 1k R913 100 R322 100K
 R470 470	 R470 470
 TP444	 TP444 TP 444
 P600 1 2 3	 P600 1 2 3 P600 1 2 3
 CH 1 CH 2	 CH 1 CH 2
	

DO	DON'T
	
 4 6 7 1 2 3 5	 4 6 7 1 2 3 5
 R472 470k C472 .001	 R472 470k C472 .001
 R245 1k C245 1μF R245 1k C245 1μF	 R245 1k C245 1μF
 R39 100 C39 .01	 R39 100 C39 .01
 L800 68μH R800 10	 10 LR800 68μH

DO



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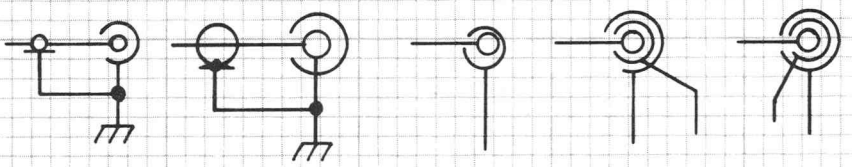

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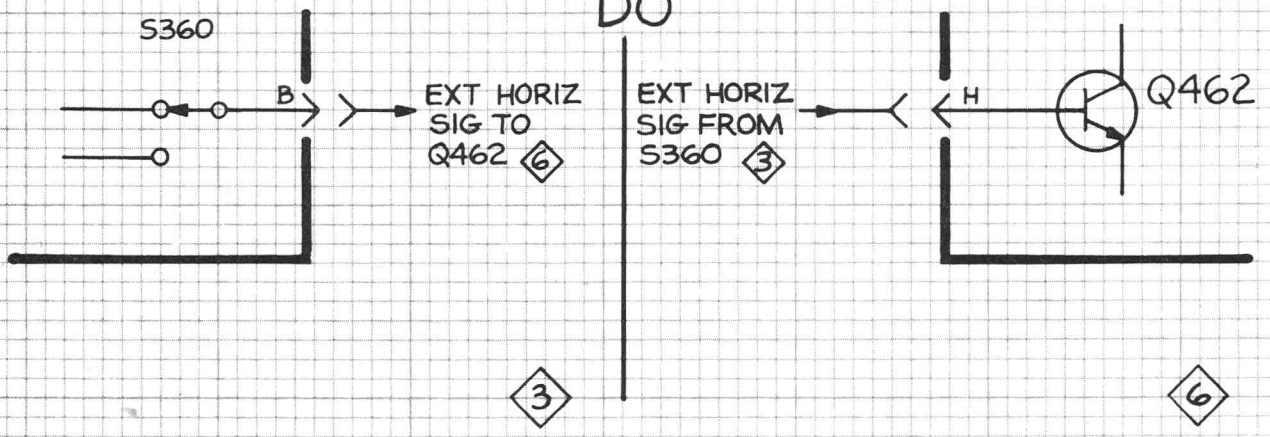

DON'T