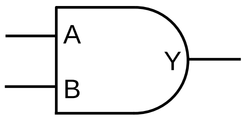
Paul Romsky
5 AUG 2025

KX88 Digital Debug Prep Quiz

Note: If you get any questions wrong, or if you get them correct but really don't understand why, you will not be able to troubleshoot the KX88 Key Bank issues

1. Identify the logic gate:



Circle one:

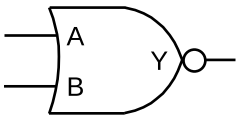
A OR Gate
B AND Gate
C XOR Gate
D NOR Gate
E NAND Gate
F XNOR Gate
G INV Gate

2. Complete the Truth Table for the gate in Question 1:

A	B	Y
L	L	
L	H	
H	L	
H	H	

L = Low, H = High, X = Don't Care

3. Identify the logic gate:



Circle one:

A OR Gate
B AND Gate
C XOR Gate
D NOR Gate
E NAND Gate
F XNOR Gate
G INV Gate

4. Complete the Truth Table for the gate in Question 3:

A	B	Y
L	L	
L	H	
H	L	
H	H	

L = Low, H = High, X = Don't Care

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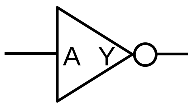
5. Identify the logic gate:



Circle one:

A OR Gate
B AND Gate
C XOR Gate
D NOR Gate
E NAND Gate
F XNOR Gate
G INV Gate

6. Complete the Truth Table for the gate in Question 5:

A	Y
L	
H	

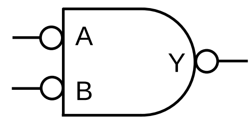
L = Low, H = High, X = Don't Care

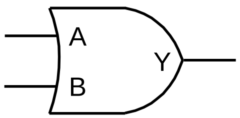
7. What is the proper name of the gate in Question 5?

Circle one:

A Diverter
B Diode
C Director
D Flip-Flop
E Dotted Triangle
F Inverter
G Tri-State Buffer

8. Compete the Truth Tables for both of these gates:





A	B	Y
L	L	
L	H	
H	L	
H	H	

A	B	Y
L	L	
L	H	
H	L	
H	H	

L = Low, H = High, X = Don't Care

9. What is notable about these two gates in Question 8?

Circle one:

A They have opposite logic outputs
B They can both Tristate their outputs
C They have an inverted output logic
D There is nothing noteworthy other than being different gates
E They use different power supplies
F They can both act as inverters
G They have identical logic

10. What is the theorem that is applied to the gates in Question 8?

Circle one:

A Flip-Flip
B Inversion
C Differential
D Pythagorean
E De Morgan
F Fundamental Theorem of Calculus
G None

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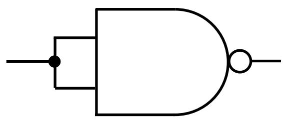
11. How is this gate being used?



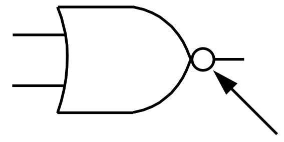
Circle one:

A As a Tri-State Buffer
B As an OR Gate
C As an Inverter
D It is improperly connected (inputs are shorted together)
E As a Dotted AND Gate
F As a Combiner
G As a Diode

12. Draw the simplified symbol (if any), inside the dotted box below, for the gate in Question 11:

☐ Check here if the symbol is already simplified

13. What is the “Bubble” in the symbol below called?



Circle one:

A Bubble, that’s it proper name
B Flip-Flop
C Donut
D It has no name, just part of the symbol
E State Indicator
F Ring
G Active High Output

14. What does the Bubble in Question 13 signify?

Circle one:

A Temporary Output
B Active High State
C Active Low State
D Tri-State Output
E Bubble Logic
F TTL Voltage Level
G Ring Control

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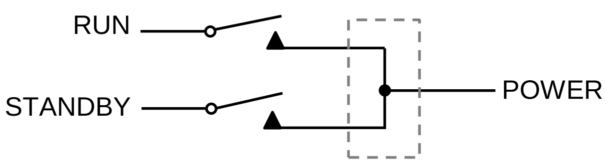
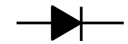
15. Identify the type of circuit used inside the dotted box:



Circle one:

A Splitter
B OR Gate
C AND Gate
D Splice
E Wired-OR
F Wired-AND
G 3 Node Circuit

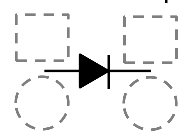
16. Identify this electronic component:



Circle one:

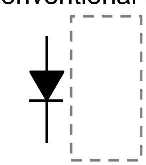
A Inverter
B Amplifier
C Check Valve
D Diode
E Conductor
F Transistor
G Exclusive OR Gate

17. Identify the Cathode with a **K** and the Anode with an **A** next to its respective pin (inside the dotted boxes), and indicate the polarity (**+** or **-**) inside each dotted circle:

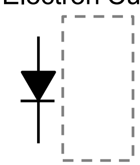


18. Using two “methods” to follow circuitry, draw an arrow (inside the dotted boxes) to indicate which way current flows when the Diodes are forward biased (conducting):

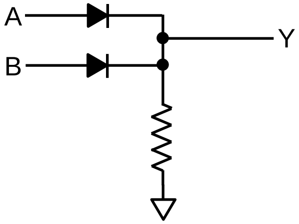
“Conventional Current”



“Electron Current”



19. Fill in the Truth Table and draw the Positive Logic and Negative Logic symbols in the dotted box below, that represents the following circuit:



Hint: Use Conventional Current Flow to fill in the following Truth Table, then determine which gate it is based on the logic results.

A	B	Y
L	L	
L	H	
H	L	
H	H	

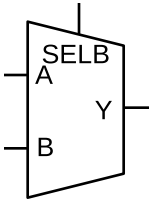
L = Low, H = High, X = Don't Care

Draw the gates inside this box

Positive Logic	Negative Logic

Extra Credit:
Above each Gate, write in its Type (**OR, AND, XOR, NOR, NAND, XNOR,** or **INV**). And also label each Pin Name (**A**, **B**, and **Y**)

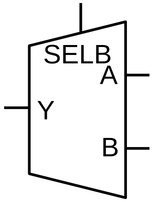
20. Identify this electronic component:



Circle one:

A Combiner
B Splitter
C AND Gate Selector
D Reverse Electronic Controlled SPDT Switch
E De-Multiplexer
F Multiplexer
G OR Gate Selector

21. Identify this electronic component:



Circle one:

A Combiner
B Splitter
C OR Gate Selector
D Forward Electronic Controlled SPDT Switch
E De-Multiplexer
F Multiplexer
G AND Gate Selector

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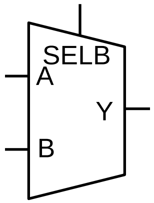
22. Complete the Truth Table for the following component:



Note: The data sheet shows that Input A is selected when SELB is L and Input B is selected when SELB is H

A	B	SELB	Y
L	L	L	
L	H	L	
H	L	L	
H	H	L	
L	L	H	
L	H	H	
H	L	H	
H	H	H	

L = Low, H = High, X = Don’t Care

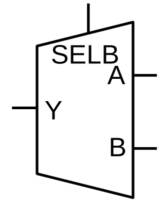
Extra Credit:
Circle the Input States that are actually Don’t Cares: **X**

23. The component in Question 22 is also known as a:

Circle one:

A MUX
B DEMUX
C FF
D AND
E OR
F SPDT
G XOR

24. Complete the Truth Table for the following component:



Note: The data sheet shows that Output A is selected when SELB is L and Output B is selected when SELB is H. The unselected output is forced to a L.

Y	SELB	A	B
L	L		
H	L		
L	H		
H	H		

L = Low, H = High, X = Don’t Care

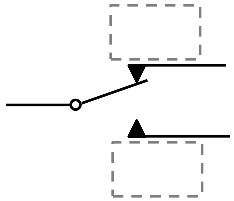
Extra Credit:
Circle the Output States that are actually **forced** to a Low: **L** (unselected)

25. The component in Question 24 is also known as a:

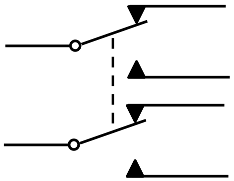
Circle one:

A MUX
B DEMUX
C FF
D XNOR
E AND
F SPDT
G OR

26. The following Switch is found to be "spring loaded" in its data sheet.
It is designed to return to the position shown when not active.
Indicate, in the dotted boxes, which positions are Normally Open (NO), Normally Closed (NC), or Normally Floating (NF):



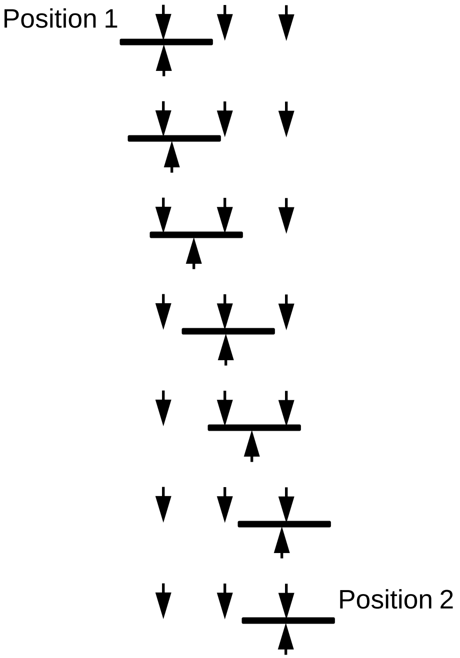
27. Identify this switch configuration:



Circle one:

A 4P2T
B SPST
C SPDT
D DPST
E DPDT
F 2-WAY
G 4-WAY

28. The following symbols explicitly show how a particular Slide Switch operates as it moves from Position 1 to Position 2. Identify this type of Switch:



Circle one:

A Make Only
B Break Only
C Make Before Break
D Break Before Make
E Continuous Make
F Continuous Break
G Return To Make

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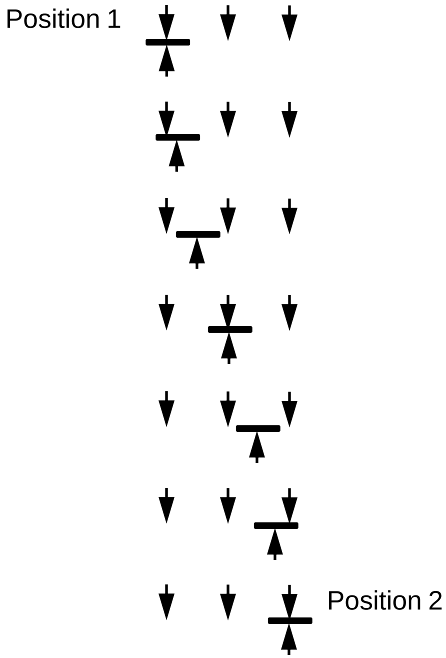
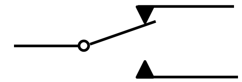
29. The following symbols explicitly show how a particular Slide Switch operates as it moves from Position 1 to Position 2. Identify this type of Switch:



Circle one:

A Make Only
B Break Only
C Make Before Break
D Break Before Make
E Continuous Make
F Continuous Break
G Return To Break

30. As this Switch is drawn (not looking at its data sheet), what can be inferred about its operation?



Circle one:

A Its contacts are Make Before Break (MBB)
B Its contacts are Break Before Make (BBM)
C It is Spring Loaded
D It is a Rotary Switch
E It is a Pushbutton Switch
F It has a Center Off position
G Its contacts are precise Pin Points

Prep for Question 31:

How a 3 bit Binary Value represents a Decimal value

Binary Bits			
MSB		LSB	
2	1	0	Decimal
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

MSB: Most Significant Bit
LSB: Least Significant Bit

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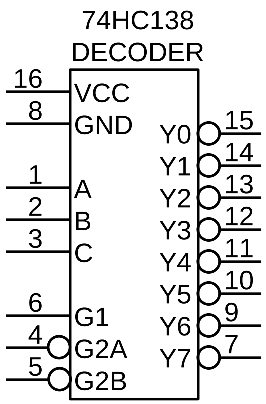
31. Complete the Truth Table for the following component:

Note:
On the KX88 Schematics, Yamaha did not show the “Bubbles”. Some engineers care more about interconnections rather than symbols.



If G1, G2A, or G2B are not satisfied, the device is “Disabled” and thus ALL outputs will be H regardless of the A, B, and C inputs.

When inputs G1, G2A, and G2B are ALL satisfied, the device is “Enabled” and the outputs will be set according to inputs A, B, and C.

A, B, and C have a binary Value of 0 to 7. When Enabled, only the output that corresponds to that Value will go to the active state and the others will stay in the inactive state.

Example:
G1=H, G2A=L, G2B=L
C=L, B=H, A=L:

= LHL (logic levels on pins C B A respectively - binary)
= 010 (binary)
= 2 (decimal)

Thus, since it is Enabled, only the Y2 output will be active (low), the others will stay inactive (high).

Binary Value L=0, H=1

MSB LSB

Decimal Value	C	B	A	G1	$\overline{G2A}$	$\overline{G2B}$	Decode	$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$	$\overline{Y4}$	$\overline{Y5}$	$\overline{Y6}$	$\overline{Y7}$
	X	X	X	L	X	X	Disabled	H	H	H	H	H	H	H	H
	X	X	X	X	H	X	Disabled	H	H	H	H	H	H	H	H
	X	X	X	X	X	H	Disabled	H	H	H	H	H	H	H	H
0	L	L	L	H	L	L	Enabled								
1	L	L	H	H	L	L	Enabled								
2	L	H	L	H	L	L	Enabled	H	H	L	H	H	H	H	H
3	L	H	H	H	L	L	Enabled								
4	H	L	L	H	L	L	Enabled								
5	H	L	H	H	L	L	Enabled								
6	H	H	L	H	L	L	Enabled								
7	H	H	H	H	L	L	Enabled								

L = Low, H = High, X = Don’t Care

MSB: Most Significant Bit
LSB: Least Significant Bit

The “bar” (vinculum) over a Pin Name indicates an Active Low signal, for example:

$\overline{Y2}$ is Active Low

Yellow is from the Example

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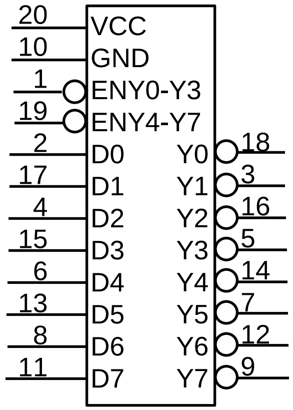
32. Complete the Truth Table for the following component:

74HC240
TRI-STATE BUFFER



If ENY0-Y3 is not satisfied (inactive high),
Outputs Y0 through Y3 will
be Tri-State (disconnected).
If ENY4-Y7 is not satisfied,
Outputs Y4 through Y7 will
be Tri-State.

If ENY0-Y3 is satisfied (active low),
Outputs Y0 through Y3 will
follow their respective inputs but they will be inverted.
If ENY4-Y7 is satisfied ,
Outputs Y4 through Y7 will
follow their respective inputs but they will be inverted.

D0	D1	D2	D3	D4	D5	D6	D7	ENQ0-Q3	ENQ4-Q7	$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$	$\overline{Y4}$	$\overline{Y5}$	$\overline{Y6}$	$\overline{Y7}$
X	X	X	X	X	X	X	X	H	H		T	T		T	T	T	
H or L	H or L	H or L	H or L	X	X	X	X	L	H	$\overline{D0}$		$\overline{D2}$	$\overline{D3}$	T	T		T
X	X	X	X	H or L	H or L	H or L	H or L	H	L	T	T		T	$\overline{D4}$	$\overline{D5}$		$\overline{D7}$
H or L	H or L	H or L	H or L	H or L	H or L	H or L	H or L	L	L	$\overline{D0}$	$\overline{D1}$	$\overline{D2}$		$\overline{D4}$		$\overline{D6}$	

L = Low, H = High, X = Don't Care, T = Tri-State

This means it follows the D0 input but is inverted
D0 = H → Y0 = L
D0 = L → Y0 = H

Tri-State means the output is neither H or L,
it is Hi-Impedance (like the output is disconnected).
Tri-Stating allows other ICs to drive signals that may share
output pins on the same signals.