7490
Dividers

Rue Mohr Oct 2022

This booklet is to all the other electronic geeks of the world, keep geek’n!

Contents

WORDS:

The 7490 is a chip carried thru from the beginning of time. At some point it was adopted into the set of TTL logic chips, where, for multiple reasons it would become the bane of the existence of many people. As a TTL chip that's long obsolete this guide to its division modes and configurations is terribly overdue, but here we are!

This is not intended to be a datasheet for the 7490, its more like a detailed application note or reference. I'll skip most of the details you can directly obtain from the datasheets. Furthermore I will skip even mentioning the 7492, its divide-by-12 sibling, OR the 7493, its divide-by-16, as nobody divides by 12 anymore, and nobody uses a messed up chip configuration like this for a 4 bit binary counter.

IMAGES:

Fig. 1. Photo of 7490 chips, taken in black and white to make it feel older than it is.

INTERNAL DIAGRAM:

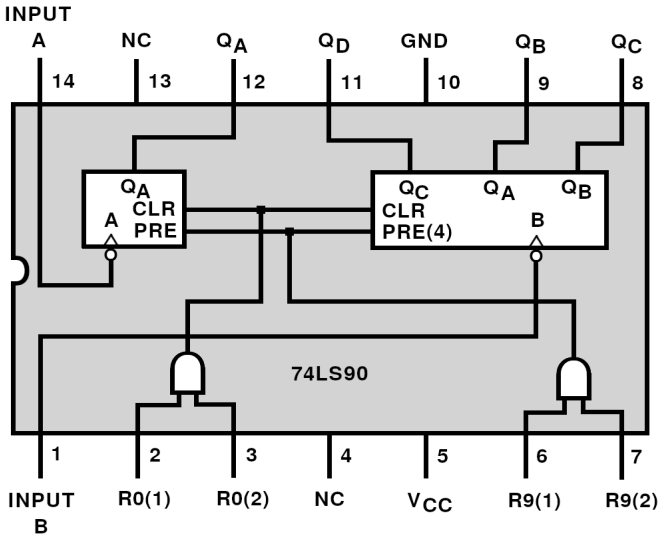


Fig. 2. Mid-level detail of. the 7490 function blocks.

As seen in Fig. 2, the 7490 is actually two counters. Counter A, is a 1 bit counter, and counter B, is a 3 bit binary modulus 6 counter. Each counter has a clear and preset control. The clear input will set both counters to 0. For counter A, preset will set the counter to 1. For counter B, the preset will set the counter to 4.

By using counter A as the LSB and chaining the output to the input clock of counter B, triggering preset results in a 9 on the four outputs. Hence the signal lines being referred to as R0 (reset to zero) and R9 (reset to nine).

RATE TABLE:

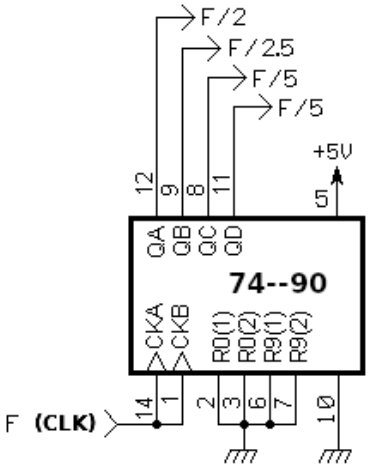
	Divisor												
Circuit	**2**	**2.25**	**2.$\overline{3}$**	**2.5**	**3**	**4**	**4.5**	**5**	**6**	**7**	**8**	**9**	**10**
/2	X			X				X					
/3					X								
/4	X					X							
/5	X			X				X					
/6	X								X				
/7			X							X			
/8	X					X					X		
/9		X					X					X	
/10	X							X					X

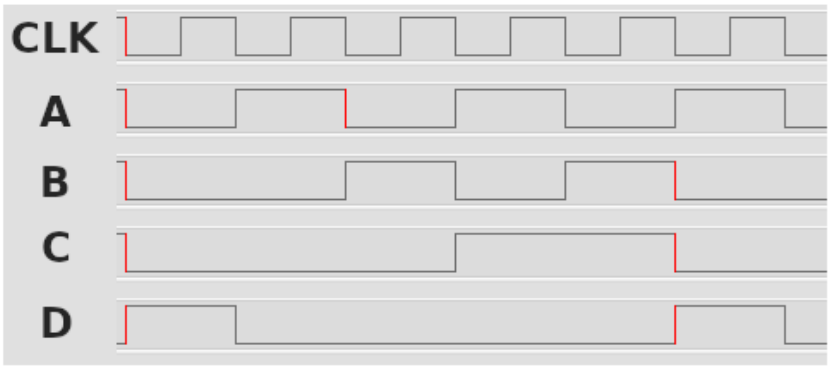
Fig. 3. Input clock rate divisors as provided by the various circuits.

The output rates are measured as a function of cycles out per cycles in, these are not all 50% duty, see the captured waveforms on respective circuit pages. Red edges indicate where the cycles repeat. Each circuit provides multiple rates, so you may even see a duplicate.

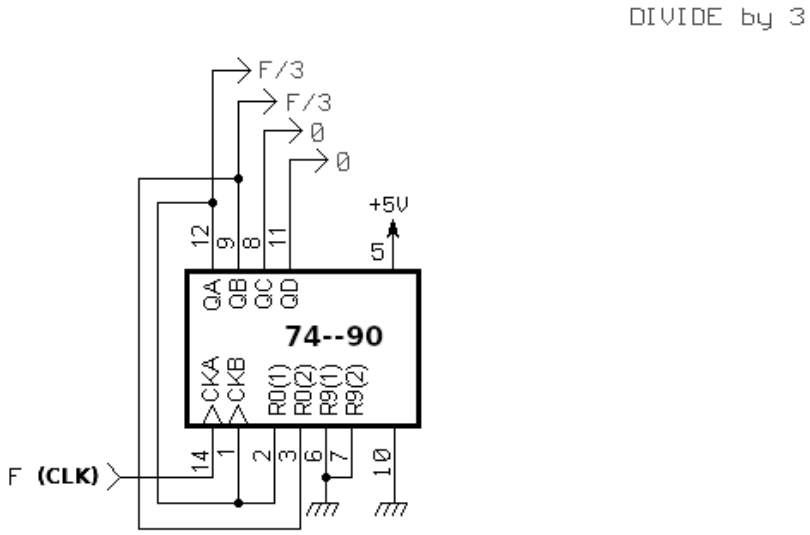
DIVIDE BY TWO:

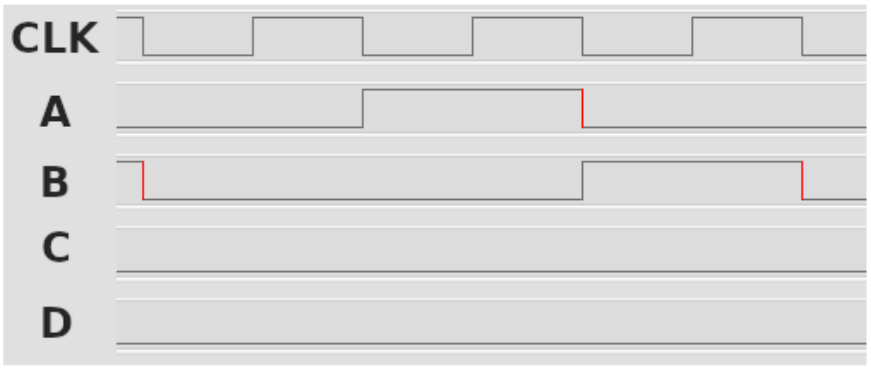
DIVIDE by 2
DIVIDE by 5



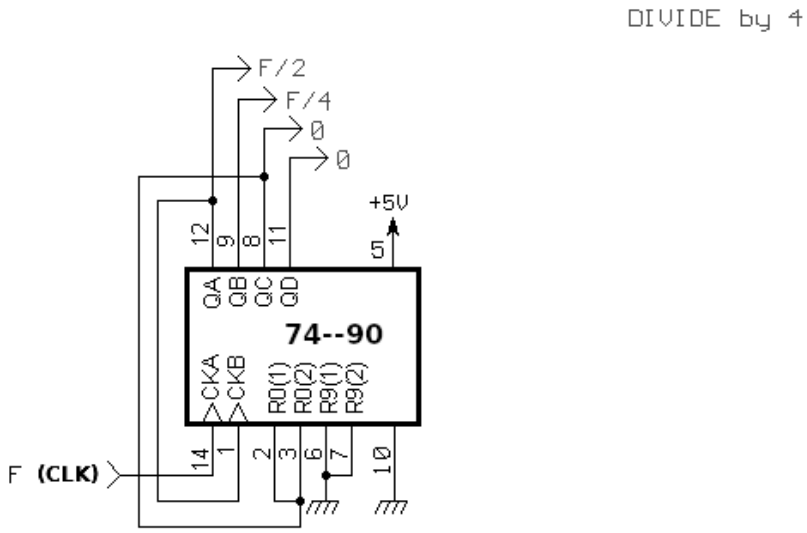


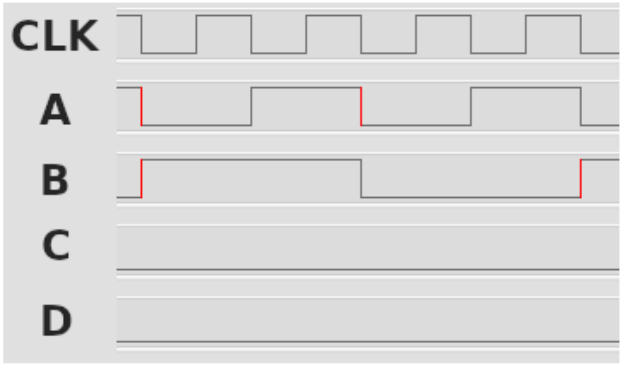
DIVIDE BY THREE:



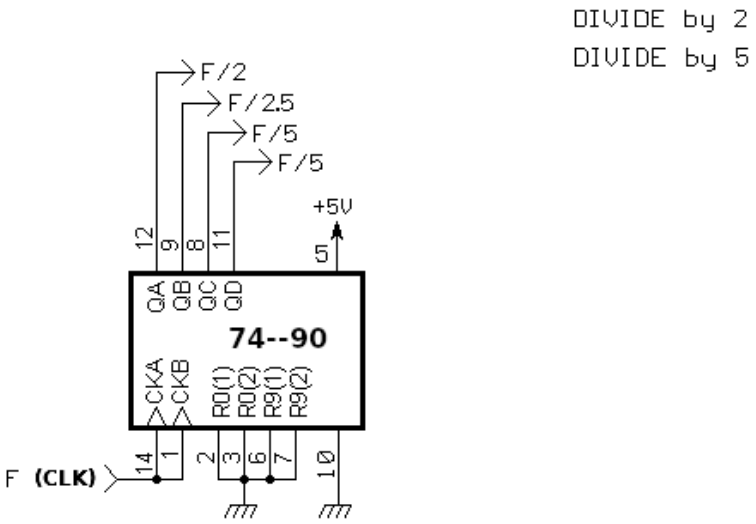


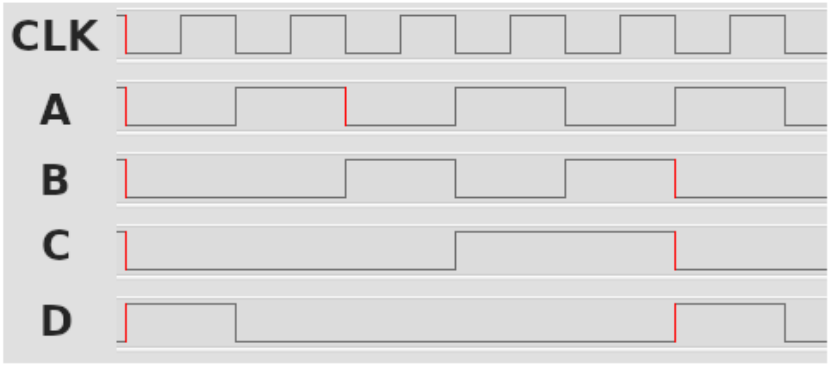
DIVIDE BY FOUR:



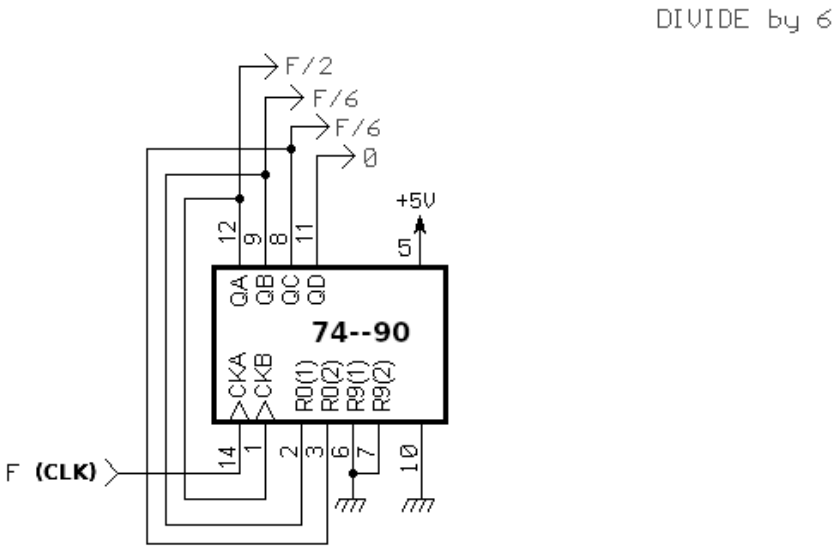


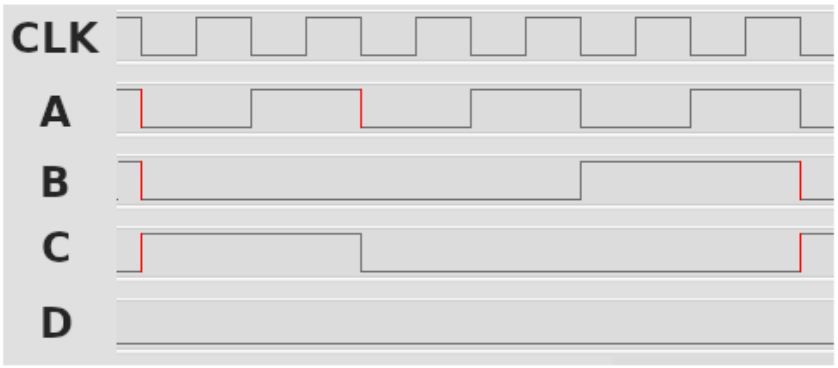
DIVIDE BY FIVE:



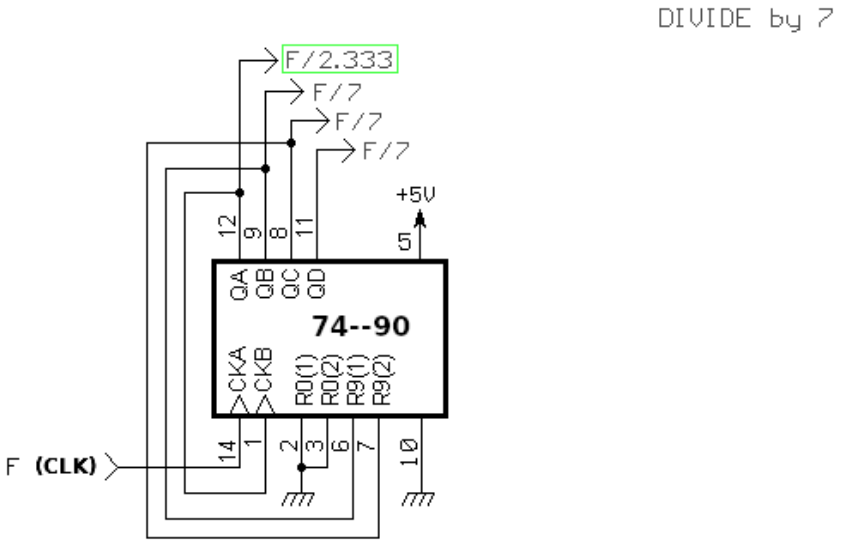


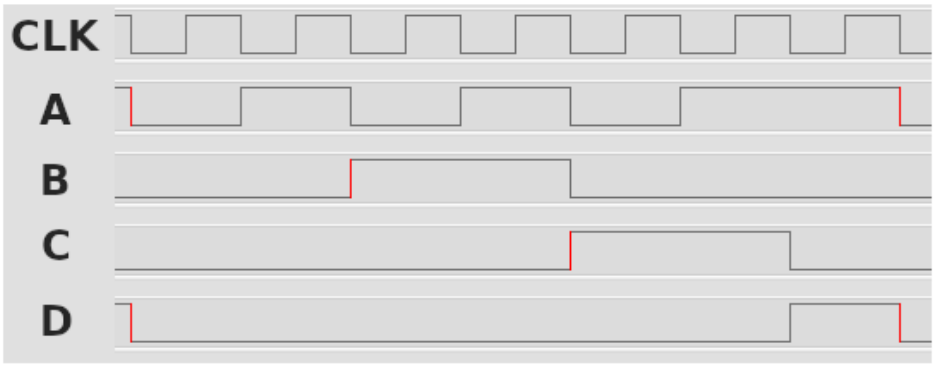
DIVIDE BY SIX:





DIVIDE BY SEVEN:





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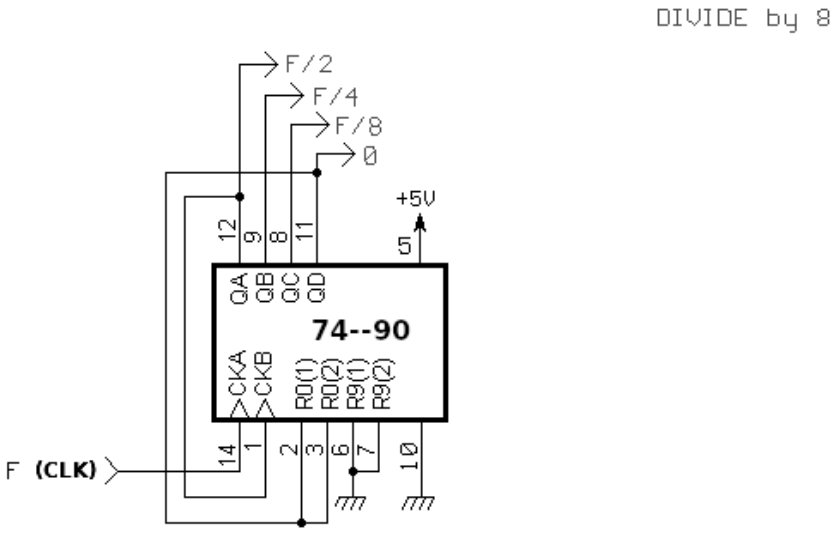
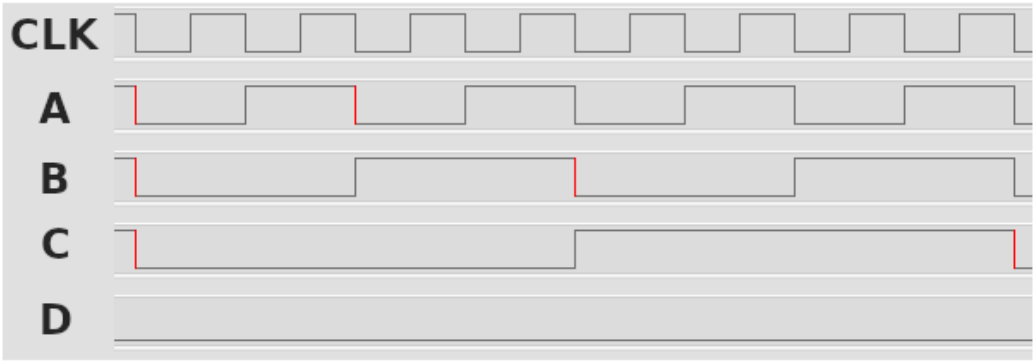
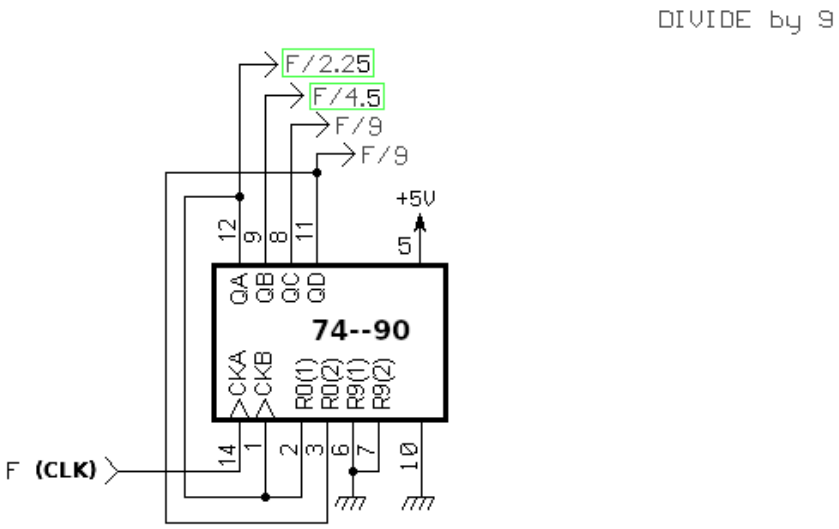
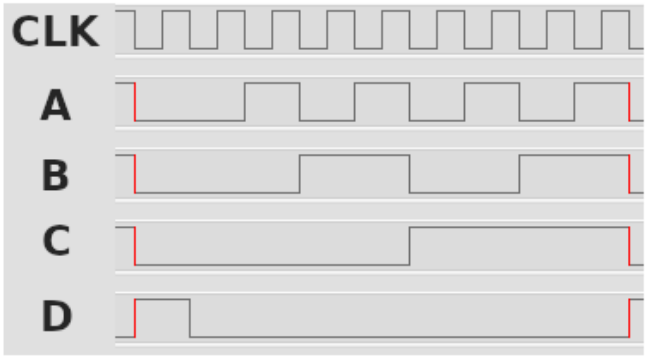


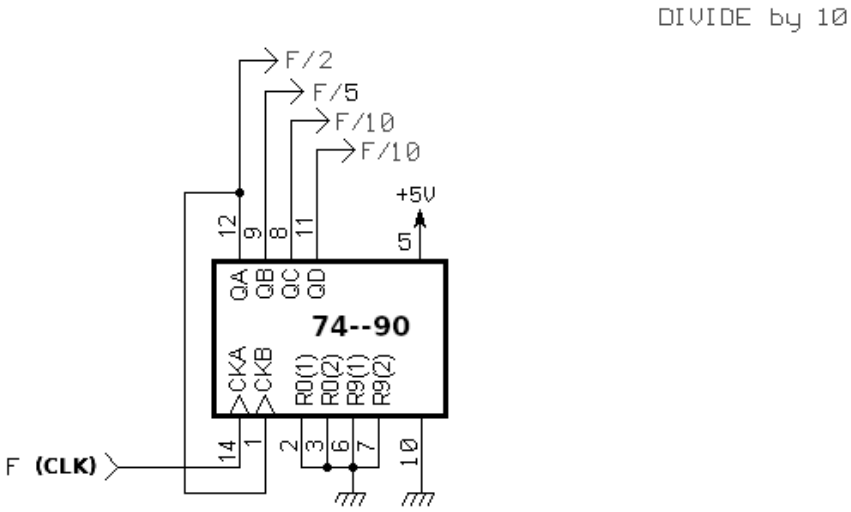


DIVIDE BY NINE:





DIVIDE BY TEN:



SAM 5/02
RUE 4/21

REFRENCES AND CREDITS:

DS006381 Fairchild datasheet for 74LS90, that was used to figure out !@$#$%$^&* internals of the 7490 and trace a block diagram from.

Gimp The graphics software used to photoshop everything.

Linux The OS that ran Gimp.

Digchip The only datasheet site that actually has datasheets and will give them to you.

Salee For the logic capture software that made these accurate diagrams possible.

“Sam” Whos circuit diagrams provided the basis for what was used here. I’m sorry I don’t know who you are.

Freddie The electron thats been slowly working it way thru my CPU for over 5 years now, thanks for the computations little buddy!

Twitter.com Connecting me with electronics people across the world.

“@TubetimeUS” Who posted a photo of a circuit that inspired me to format my notebook into a PDF.

"@kimoanman” Who regularly affirms me that TTL is NOT dead.

Over 3000 twitter followers. I know 2900 of you are bots... but thats ok.

But its not blank, is it?