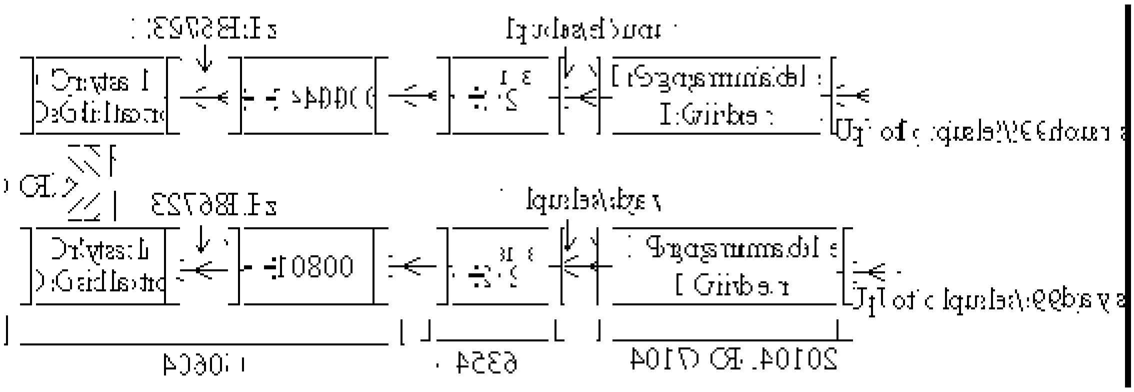
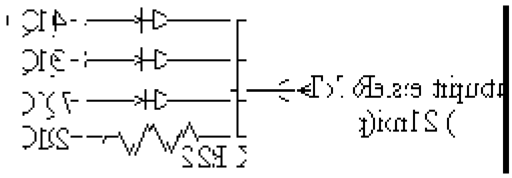
Long Timer



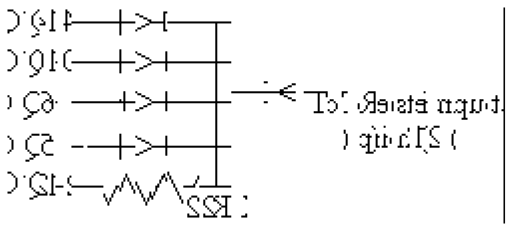
$32768\ Hz / (14400 \times 2^{13}) = (2^{15} \times 60 \times 60\ pulse/hr) / (14400 \times 2^{13}) = 1\ pulse/hr$

$32768\ Hz / (10800 \times 2^{18}) = (2^{15} \times 60 \times 60 \times 24\ pulse/day) / (10800 \times 2^{18}) = 1\ pulse/day$

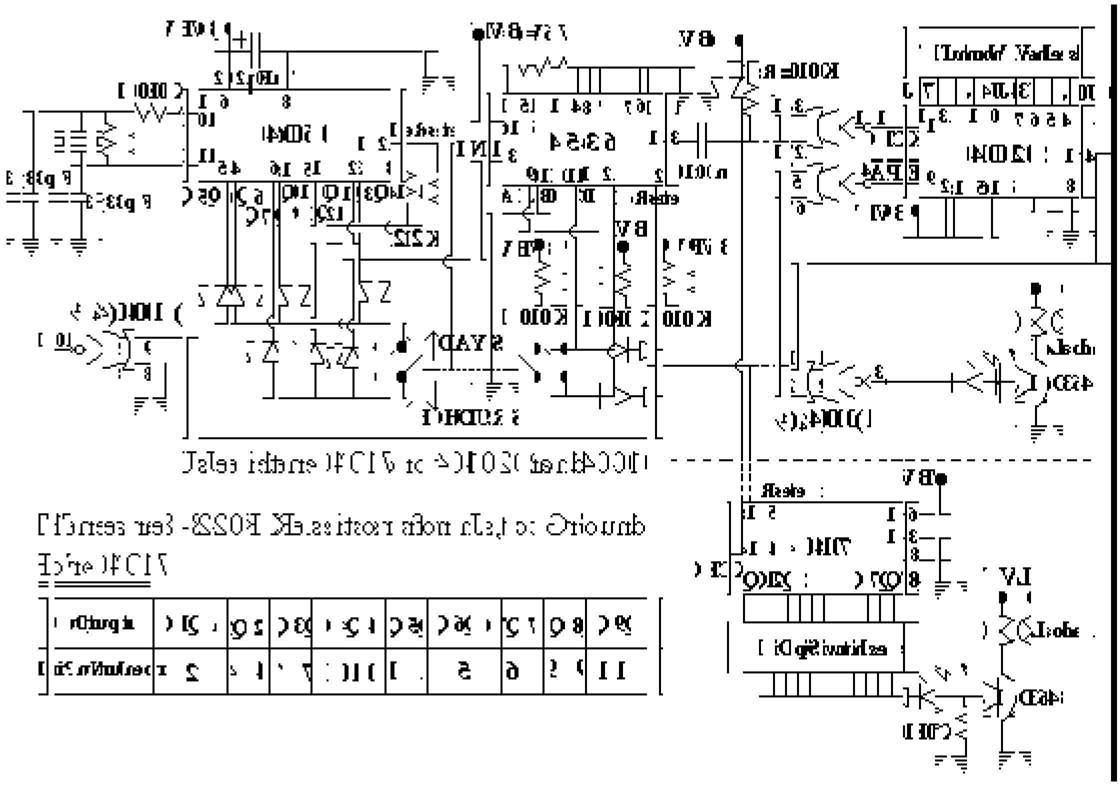
A binary ripple counter can be programmed to divide on any number (within the max counter count) by resetting the counter at this count number.
Suppose our situation here where we need to program 4060 to divide on either 14400 or 10800
Upon going of Reset input (pin 12) to low level; the counter 4060 starts counting the CK pulses (crystally controlled as 32768 CK pulse/sec)
When reaching the binary number 11100001000000 = 14400 corresponding to Q14, Q13,Q12 & Q7 high and all other Q,s are zeros (initially they are all zeros) ; the reset input goes high by feeding back Anded Q14.Q13.Q12.Q7



The Reset input goes high iff Q14, Q13, Q12 and Q7 are high.
Resetting the counter, counting starts again from zero and again reaching count 14400 the counter is reset and so on.
The output at MSB (Q14) will give a number of pulses/sec equal to the CK pulses/sec divided by 14400.
Feeding back Q14, Q12, Q10, Q6, & Q5 will divide on 10800 (the equivalent of 10101000110000).



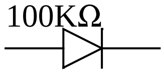
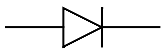
The Reset input goes high iff Q14, Q12, Q10, Q6 and Q5 are high.



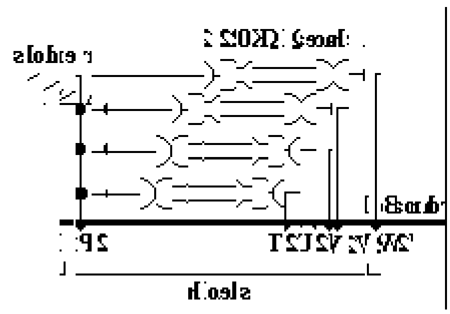
For the programmable counter 4536; the division ratio will be 2^{13} if the inputs A, B, C&D are respectively 0,0,1,0 while it becomes 2^{18} if they are 1,0,0,1 respectively (8-Bypass = 0).
We have used then a DPDT switch to let one pole switches between 14400 and 10800 for 4060 and the other to switch between 2^{13} and 2^{18} for 4536 counter.
Getting either 1 pulse/hr or 1 pulse/day; we can use either 4017 and Dip switches to get 1pulse/N hrs or 1pulse/N days where N is the number of Dip Switches (max N=9)
Other wise we can use 40102 and two Thumb wheels (usually giving BCD outputs) to get up to 1pulse/99 hrs or 1pulse/99 days.
Because both 4017 & 40102 are +vely CK incremented, an RC with short time constant is put between 4536 (- vely CK triggered) and 4017 (or 40102) to get +ve CK transitions at the –ve output transitions of 4536.
Note that when the DPDT switch is in OFF position then 4536 is Reset (also 4017 if used) and 40102 is preset at its programmed value.
On time the output of 40102 goes low while that of 4017 goes high; so an inverter have been used in case of 40102.
DPDT in center Counting OFF.
DPDT in upper position ---- Days
DPDT in lower position ---- Hours
To prevent the Tr. To go ON momentarily when rotating the Thumb wheels (giving zeros to all J,s and making pin 14 of 40102 goes low momentarily) we connect one input of the output NOR gate to the Reset input of 4536.

Circuit Board for Long Timer

1. On a strip board write from left to right the letters A to X and from up to down the numbers 1 to 17.
2. Cut the board over the holes of number 17 to get (24 holes x 16 holes) board.
3. Cut the board over the holes: ABCDEFGH3/AEFG I JQSTUVWX7/ CDLTUVW11/DFGH I JMQTU14/BE12/ACKORSV13/AC15/S10
4. Jumpers and components:

   Jumpers QU13/SV14/H13-K14/JM13/SX8/EG16/FM16/FI1/H6-P7
   Pin1 (4060) Pin 8 AH5
   Pin1 (40102) Pin 8 QX9
   Pin1 (4001) Pin 7 RX15
   Pin1 (4536) Pin 8 FM15
   22KΩ A6-E1 comes over 4060
   100KΩ G1-J2/ I J3/FL8/FM9FK10/GH11/E14-F13
    A8-B1 comes to the left of 4060
    A9-C6/A10-D6/A11-E6/E8-F6/E10-C10/E11-B11/LQ5 E13-D12/E15-D16
   33pF J P1/ I P4
   Jumpers L7-S11/A1-Q4/PX10/FR11/D13-K11/D15-M11/B13-E9 C9-H16/U16-X5/Q15-S5

   220KΩ is soldered to PW2 then another 3-220KΩ resistors are soldered to the holes TUV2 as shown below. Another set of 4-220KΩ resistors is soldered to PTUVW3 and the strip between each couple of holes is cut (except that between P2 and P3).

   The used big size Thumb wheels consist of terminals labeled 1,2,4,8 and C (common), the terminals of the 1st are soldered to W4,V4,U4,T4 and R4,those of the 2nd are soldered to W1,V1,U1,T1 and R1 respectively and from those of the 2nd the first four are jumpered to T10,U10,V10 and W10 respectively.

   Xal I6-J5 lay to the Wright
   100nF I11-L10
   -220µF+ P11-R10 lay to the Wright
   D634 NOP6 lay downward with face down
   DPDT Switch AC12-AC14-AC16 handle goes up and down
   -LED+ N15-T16 just head comes out of the board downward
   - Circuit Battery+ P13-R5
   - Load Battery+ X16-O15
   Load O3-O14
5. Jumpers from strip side: A14-E2/C14-F15/GS15
6. Shorts: AB16/CD12/CD16/KL15/LM15/QR15/VW15/QR6/ST12

The terminals of the Load and Load battery are tied together and fixed to the board and also those of Circuit Battery.