

The Application Note is pertinent to the UnidriveSP, Mentor MP, Commander SK and Affinity Families

Time of Day/Day of Week Applications

Similar to home setback thermostats, there are definite drive applications when it would be ideal to have different settings various times of the day or for the weekend versus weekday periods.

Some examples might include:

- Reducing building HVAC Building Air Re-Circulation flow in the evenings and on weekends for energy conservation (since the building may be vacant or populated with very few people during these periods)
- Running a pool or hot tub filtration unit at higher rates at night to enjoy lower cost of electricity
- Running a pool chlorinization pump for 1 hour every other day during the week and Saturday nite perhaps (Chlorine added to a pool at nite (sunlight accelerates dissipation) lasts longer therefore has a better chance to perform its job of disinfection, plus by morning concentrations are more homogenous throughout the pool making it safer human use)
- Running waste pumps or feed conveyors on a feeding/cleaning schedule for Farming applications



The applications cited all require Time of Day and ideally Day of Week information. Such devices are available, but as a fairly expensive piece of external equipment that must then be interfaced with a motor drive. This application note will discuss how one could achieve this kind of functionality by employing a low cost option module available for our AC Drive Product Families.

Note: In all cases cited, the method used takes advantage of the **SM-I/O Timer** option module which contains a Real-Time of Day Clock with built-in calendar and most importantly – Day of Week register ! In the case of our **Affinity** series, the Real Time Clock is built-in and does not require the SM-I/O Timer module.

Implementation

The screenshots illustrated in this App Note were taken from CTSoft, our free Configuration Software. To obtain your free copy click on the links below.

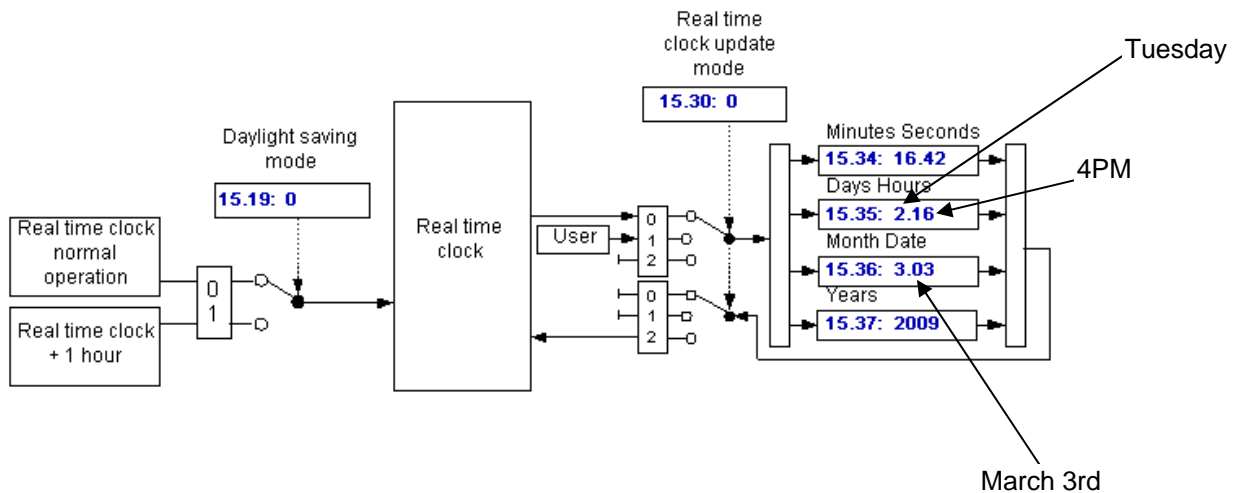
[**CTSoft**](#) [**Computer Cables to utilize CTSoft**](#)

Example Weekend Setback

Suppose one wanted to have a reduced air circulation flow in a building on the weekend. The scenario might be where we would like to reduce a fans speed to about 40% over the weekend – just to keep the air stirring a bit to keep things from getting stale . Most of the people are out of the building by around 7PM- even the cleaning people (especially on Friday). People arrive Monday morning around 5AM so we'd like to get things flushed out up to circulation specs Monday morning starting around 2AM or so.

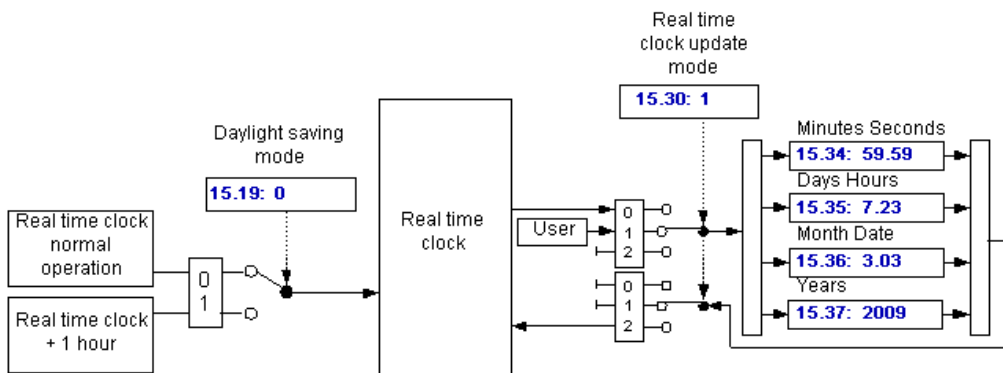
How could we do this ?

The SM-IO Timer has a Time of Day with a built-in clock/calendar function. This clock can provide the Hour/Min/Sec/ Day /Month /Year and the best part is that it includes **Day of Week** information ! We can use this to help us with this requirement as posed above.

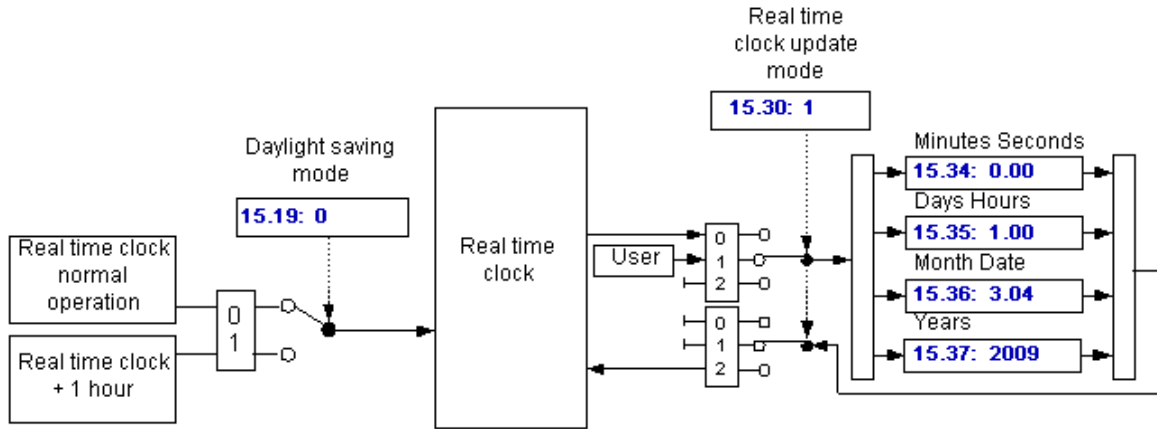


Note that from the registers above specifically #15.35 the Day of Week is 2 and the Hour is 16 which is 4PM in the 24 hour format.

Back to our problem cited in Example 1 , Friday would be Day 5 and 7PM would be 19 hours. Therefore #15.35 would be 5.19. Sunday would be Day 7 and 11PM would be 23 hours. Twenty four (24) hours doesn't show up, as the maximum would be 23:59, then the clock would roll over to the next day which in our case would be Monday just after midnight Sunday evening. At that point, #15.35 would read 1.00. Below is a captured shot of the clock at this moment- Sunday at 11:59:59 PM



After the very next second tick, the clock will advance to the next Day which is March 4,2009 (from my clock at the time of this writing) which will turn over to Monday at 12:00AM which is hour 0.

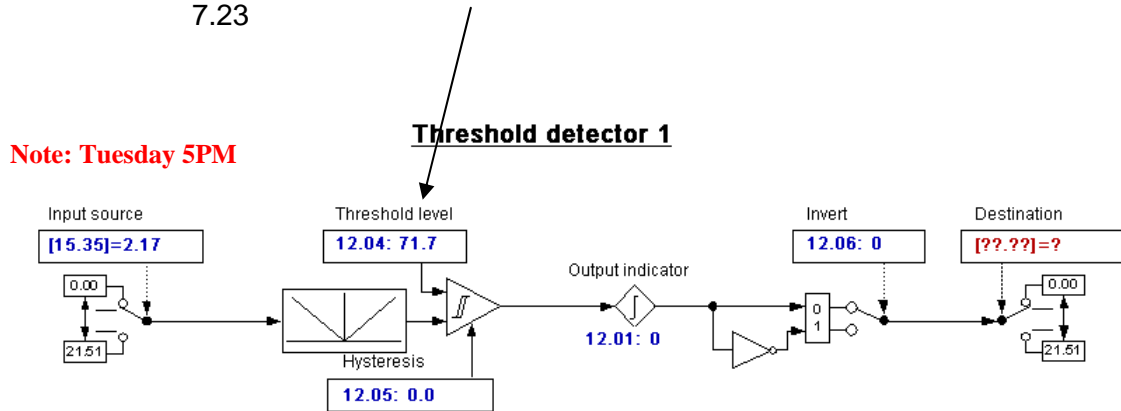


So the maximum number that can appear in #15.35 is 7.23- Sunday 11PM.

At this point one might ask – “Is this going somewhere ?”. Hopefully yes.

It turns out that our drives contain 2 free numerical magnitude comparators in Menu 12. We could use one of these comparators to give us the information that we are in the time range of interest- between 7PM Friday to Sunday midnight. This would be in the range of 5.19 to 7.23 in register #15.35. The only obscure part of the next bit is that the comparators work on a percentage (versus an absolute number) of the register it is monitoring. In our case we will be monitoring #15.35.

Since the point where we are interested in reducing the motor speed is 5.19 (Friday 7PM) this happens to be $\frac{5.19}{7.23} = 0.717$ or 71.7% of 7.23 which is the maximum of #15.35.



So if we put this percentage value into the comparator trip point we should have a method by which we can determine when we are in this time range.

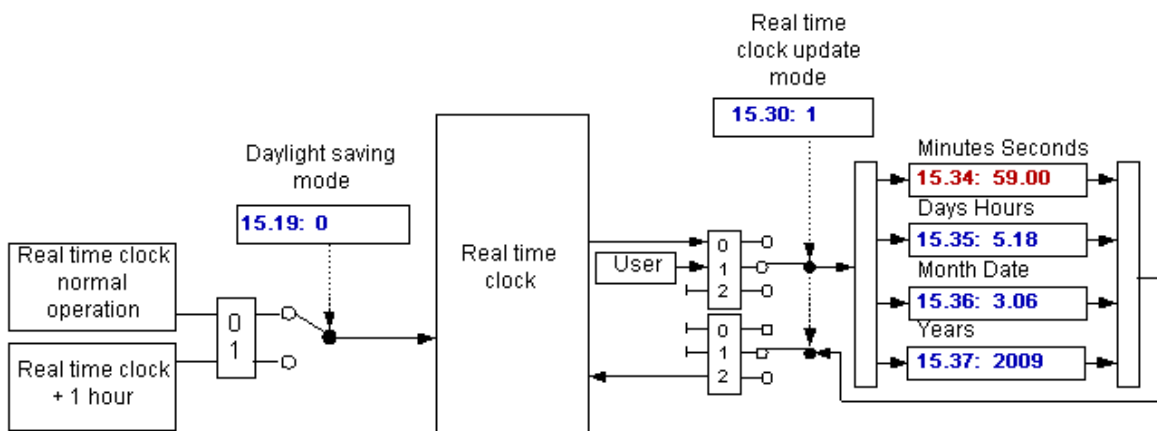
Manipulation of Time

If one would like to test and witness whether this setup actually works we could setup camp in front of the drive with a sleeping bag and an alarm clock to make sure we don't miss the significant event this weekend starting Friday just after work as you can see from the clock this is only Tuesday.

A more practical approach would be to actually manipulate the clock time for ourselves so that we could advance time synthetically.

Caution: Manipulation of time in this manner gives an uncanny feeling of power – however one must remember it is just a simulation and not let it make you feel omnipotent.

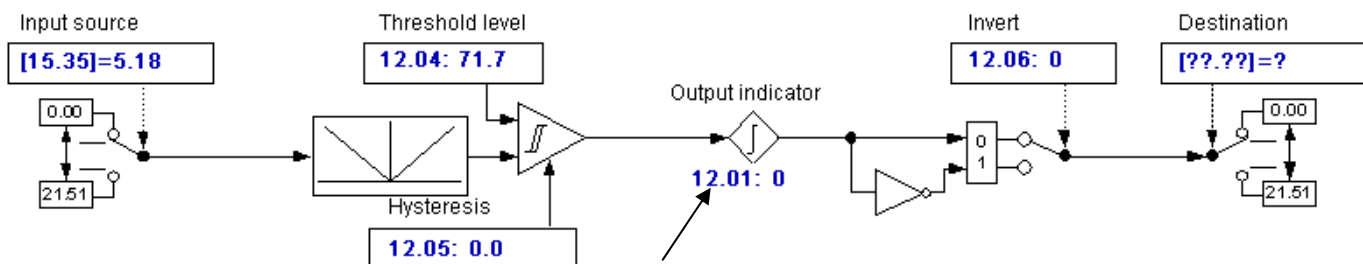
In order to advance time, we could set the Clock setting control word to User and set it for this coming Friday at 6:59PM and watch the comparator output on #12.01 as time progresses to 7PM and beyond.



Hint: To release the Clock click on the little circle in front of the 2.
To temporarily Halt Time (again a wishful thought perhaps) click on the little circle in front of the 1.

Note: Friday 6PM

Threshold detector 1



Now release the clock and watch #12.01

As soon as #15.35 becomes 5.19 which is Friday at 7PM, #12.01 goes to a 1. This bit will allow us to select a different speed – a slower speed for the weekend.

Slowing Down for the Weekend

Now for the easy part. There are many ways to implement this. One could select between 1 of 2 analog inputs, 1 of 2 Preset speeds, if controlling air flow or static pressure via the PID loop this could be selecting 1 or 2 PID setpoints. In the general case, one can view this as merely a selection between 1 of 2 settings. The method to accomplish that is discussed at length in [CTAN282](#) ← click

Going Back to Full Flow

Well when the Day of Week and the hour register becomes 7.23 (full value – Day 7, 23 hours , 59 minutes , 59 seconds) which is Midnight Sunday – a second away from 12.00AM Monday morning finally rolls over into Monday, the Day of Week register will fall to a value of 1.00. This will cause the comparator of menu 12 (specifically #12.01) to change to a 0 which will cause the setpoint selector to select your normal running rate vs the weekend rate.

Summary

This example outlines a method to use the power of the Real Time Clock to achieve a weekend setback scheme. Granted, this occurs a couple of hours earlier than our original specification:

People arrive Monday morning around 5AM so we'd like to get things flushed out up to circulation specs Monday morning starting around 2AM or so.

Even so, a significant energy savings should be realized. If one wished to be more exact with the time that the system resumes normal operation come Monday morning or implement a setback every evening as well, more exotic schemes could be created using the drives SyPT Lite built-in PLC capabilities. This will be a topic of another Application Note.

Questions: Ask the author ??

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