1 Axis Control- (Variables are underlined)

Main Program: The program is based upon Nighttime or Daytime. At Nighttime, you are looking at the light sensor every 5 minutes to determine the night length. When day light is confirmed, the time (Minute) is set to NightTimeMinutes / 2 plus a correction factor to distinguish between first light and sunrise. In Daytime, tracking starts when the Minute > StartTime, and ends when the Minute > EndTime. See hardware description on page bottom.

1. Call Init – sets LCD contrast, sets values in EEPROM Cells 10-19 to 0 (To store the accumulated array Watt Hours). Also Init records the program version, Calls a pull-up subroutine.

2. Enable Interrupt TMR1 for time keeping.

3. While (1) loop.

If statement to distinguish between night and day, depending on the light sensor output. The output is compared to the LightSensorThreshold voltage value. Daytime is further sub divided into Tracking and TwilightMorning and TwilightEvening.

In TwilightMorning, the light sensor output has to be greater than the LightSensorThreshold for 2 intervals of 5 minutes (FirstLightDelay, settable as a constant). This is to avoid a false trip, if lightening was to strike, or a flashlight was to shine on the light sensor.

Twilight subroutine: This subroutine prints some stuff and reads the amp meter every 2 minutes (a constant, Interval_AmpSensorRead).

NightTime subroutine: Print some stuff. If Minute MOD 5 = 0, then increase minutes by 5. If not, then just print something.

Tracking subroutine: Enter a 10 state switch statement, with Minute as the switch case. If minute = StartTime, then the array moves 40 degrees to the east. Then wait until 9 AM to move the array by 10 degrees to the west. Do this every hour until 4, at which time the array is leveled. The move times can be changed in the c code. The code would have to be re-compiled and d/l to the controller.

Move 1 Axis subroutine: The actuator has 3 input lines at 110 vac. Neutral goes to one. 110 v goes to one of the other remaining lines, for CCW and CW operation. Each hour the array moves 15 degrees. One relay on the 2 relay board is actuated to set the rotation direction. The the second relay applies power to the one or the other of the direction lines.

RecordAmps subroutine: Simply reads the amp sensor every 2 minutes and scales the output to compute watt hours. When the panels are generating, the power goes to running the hardware and back to the circuit breaker box, as I am using microinverters. At night time, the amps flow in the opposite direction, hence the watt hours becomes negative. At midnight, the accumulated value is added to the value in EEPROM. Since the EEPROM only stores bytes, numbers stored there have to be de/re constructed, with one integer per EEPROM cell.

Other Subroutines: Clear the screen, position the cursor, print floats, integers, or the time in x:xx format.

Hardware description: An Arduino UNO with a serial display, a 2 relay board, a light sensor, a PV amp sensor. The actuator for motion is a synchronous motor, which is turned on via the 2 relay board. The synchronous motor is by Oriental motor (SMK550A-GN, with a 5GN9KS gearbox). See http://www.watt-tracker.com/CAD/1Axis_Ver2LinAct.pdf

for electrical schematics.

The code has been composed with Flowcode:
http://www.matrixtsl.com/