

RV Monitoring System Requirements

The system will consist of a method of displaying Time Of Day Clock, Battery Voltage, Fresh Water Level, Holding Tank Level, Outside Temperature, and Inside Temperature on two 2 line by 20 character displays. One display is on the outside of the RV, mostly to monitor the water tank while filling, and one on the inside of the RV for easy access to the data while camping. Each display will have one button to cycle through the seven display functions and also to initiate the cycle mode that will display all the data in turn. In addition a 8th mode will be selectable via this button which will turn off the display and backlight. The single button will also be used to set the Time Of Day Clock. Both displays will present data independently. That is to say the outside display could be displaying “fresh Water Level” while at the same time the inside display could be displaying “Inside Temperature”. The system will always be on while +12 VDC is available to the RV either by the battery or shore power or even the Tow Vehicle if equipped and any battery cutoff switch is not in the cutoff position. The System will warn by flashing the backlight on the inside display of a low battery condition when the battery discharges to 11.8 volts. At that time the outside display will be turned off and the only function available is to press the inside button to turn off the flashing backlight until the battery recovers to 12.0 VDC.

Hardware consists of:

A microcontroller PIC16F76 and associated interface logic.

One DS1302 RTC with battery backup.

Two Future Kit FK902, to sense water level in six locations positioned along the vertical surface of the fresh water tank and Holding Tank.

PicoPSU-80 Power Supply and two He721A0500 relays to control power up and down sequence.

Two Aosong AM2303 Temperature and Humidity modules. One positioned to measure the outside air and humidity and one positioned to measure the inside air and humidity. These should be placed out of direct sunlight to avoid erroneous readings.

Two Data Vision P124-4 (DV-2020X) Lcd displays. Two lines by twenty characters. I found these displays at <http://www.goldmine-elec-products.com/prodinfo.asp?number=G19319> for \$1.99 each.

One Alarm Piezo Buzzer Various connectors, switches, wiring, and hardware as required for installation into the target RV.

Software

The software is written in mikroBASIC and developed on the EasyPIC V7 development board. Available from MikroElektronika <http://www.mikroe.com/>

The structure of the software is as follows:

Main Program titled “RV Monitor System”

And Four Modules

1. Subroutines
2. Battery Voltage
3. Water Level
4. Read Temp
5. RTC1302

Software elements functions.

Main Program.

The code will monitor the selection switches and display the required data on the two displays. This element is also responsible for the Cycling of the display data in the “Cycle” mode. The turning of the displays off is also done in this section when selected via the Mode Button(s).

Subroutine Module

In order to conserve Ram and avoid switching banks manually subroutines are used for duplicate functions. These are written and maintained in this module.

Display functions using a Print Buffer in the upper ram bank and controlling the IRP_Bit during Print Buffer Access. The Clock set routine to change/update the clock data in the DS1302.

Battery Voltage Module

The software to read the Battery Voltage using one of the Analog to Digital converters is done in this module. The math required to convert the digital data into scaled volts and the conversion to a n ASCII text string is also done in the routine. Displaying of the data is done in this module on line two of the display.

Water Level Module

This module reads the input port with the six water sensors connected. It will then convert this data to a ASCII Text string suitable for displaying on the LCD displays. Displaying of the data is done in this module on line two of the display. For either Holding Tank (bits 3 -5) or Fresh Water Tank (Bits 0-2)

Read Temp Module

This Module reads the digital data from the AM2303 Digital Temp Sensors located on the inside and outside of the RV and converts the Degrees “C” to Degrees “F”. It then formats the data into an ASCII Text string suitable for displaying on the LCD displays. Displaying of the data is done in the main module on line two of the display.

Which module read is defined in the call by the caller

RTCDS1302 Module

This module reads the data from the DS1302 and stores it in buffers for displaying on demand.

Button Selection sequence.

The associated buttons will step through the following functions in this order.

Time Of Day Clock

Battery Voltage: Displayed in Volts DC

Fresh Water Level: Displayed as a progress bar with three levels of indication.

Gray Tank Water Level: Displayed as a progress bar with three levels of indication.

Outside Temperature: In Deg. “F”

Inside Temperature: In Deg. “F”

Cycle Mode: This mode continually cycles through the previous four Data Displays until the button is pressed again .

OFF: The unit does not turn off but the backlight and the Displayed Data for the given display are turned off.

Low Battery Mode Operation.

A special Mode is provided to warn of a battery LOW condition. When the Battery discharges to 11.3 Volts the outside display is turned off and it’s button no longer functions. The inside display warns of the Low Voltage Condition by Display a message and the actual Voltage. Also the Display backlight will flash. If the display is flashing and people are asleep or just can’t charge the battery until a later time a press of the inside button will turn off the flashing backlight, but will not do anything further until the Battery Voltage goes above 11.7 Volts. This function is a callable routine in the Subroutines Module.

Time Of Day Clock Setting Procedure.

The Set Clock Mode is accessed from the inside display and button by holding down the button longer than five seconds. At that time the set clock display will appear and the time and date can be set one digit at a time. To do this the button is pressed on a given digit for less than two seconds and the digit will increment to the next number. A press of two seconds to 5 seconds will move the cursor to the next position for changing. At any time the button can be pressed for five seconds or longer and the rest of the settings will be skipped. The display will then display a “?” beside the word SET and a press of under two seconds will set the clock to the displayed selections. A press at this time of two seconds or longer will abort the setting procedure without setting the clock and the inside display will continue from where it was interrupted to set the clock.

The power supply will shut down or crowbar with a overvoltage and the relays will disconnect the 5 VDC and Battery feeds to the main circuit board. The system will need to be powered down and powered up after the overvoltage is corrected to continue functioning. A On/Off Switch is provided on the top of the enclosure to accommodate this need.