Abstract on the Display and Power supply board:
The display board test provides a method for checking the correct operation of the 4 -digit display used for the digital clock as well as the on-board unregulated power supply.

The clock display consists of 96 individual LED's. that perform the function of a multiplexed 7-segement display with common cathode digit sink. Groups of 5 LED's are wired in series provide the function of each segment. The LED segments are arranged in digits, and the common cathodes for each of the seven segments on each digit is tied together to provide an isolated "cathode digit sink" and one for each digit.

The anodes for each specific segment are wired together in a common bus arrangement. Industry standard has the designation for each segment of a 7-segment display labeled a,b,c,d,e,f, and g. All of the "a" segments are tied together on the "a-segment" bus. Likewise for the b,c,d,e,r and g segments. For reference purposes in this design we will refer to these bussed segments as "anode segment drive".

By providing a digit with "cathode sink" and for example " anode segment drive" on segments b and c, the number one (1) can be displayed. Similarly with "cathode sink" on a digit and "anode segment drive on segments a,b,c,d,e,f you can display the number zero (0). And so on.

Static Testing the display segments by using the "Octopus Cable" How to make one and why.
Since the clock kit was presented in a classroom exercise I prepared an octopus test cable for the displays that was easy to construct and could be attached to any student's board for quick testing. This cable consisted of 5pieces of wire 8' long all connected to a common point. At the end of each wire I soldered a square .125 " socket that would fit over the wire wrap pins on the display board. This cable was use to energize all the "cathodes" on each of the 4 digits on the display. A second wire about 8" long was equipped with the same kind of .125 square pin socket that would fit onto the wirewrap pins, and this cable had pins on both ends. Finally, I installed heat shrink tubing on all the pins .

Installing the "Octopus Cable" and performing the test.
Connect one end of the octopus cable to the – (minus) on the power supply section of the display board. After making this connection, 4 wires are free each of which can be connected to each of the "cathode digit sink" connections on the display board. These are labeled D1, D2, D3, D4, D5, and D6. (This was 6 digit clock chip but only 4 of the digits are implemented in this version.)

WARNING: the following segment verification test is done with the power on:
Use the single piece of wire to make one connection to the + (plus) on the power supply section this wire will provide segment excitation voltage, and we will be connecting it to the various anode segment drive pins.
WARNING: The following testing process will require that it be performed with the power applied. Start by energizing the clock power supply, insert the wall mount transformer into an outlet and connect the DC power plug to the jack in the rear of the Display/Power supply printed circuit board.

At this point we assume you have some skills in DC voltage trouble shooting, including finding shorts, opens, and mis-polarized connections and components. If you don't, here is where you learn.
Start by connecting a wire to the "a" segment digit drive. All the "a" segments should be illuminated on the display board. If you get no display at this point use a volt meter to measure the + and – pins on the power supply to make certain that power is working and that you have approximately 18 VDC unregulated power. Diagnose the power supply lack of power if you get no voltage by making certain all components are installed, soldered correctly, and polarized correctly.

If when powering the "a" segment drive you get some segments lit others not, then look for breaks in the printed circuit board traces or poor solder joints on the LED's wiring. Move to "b" segment drive and repeat the diagnostic process.

The 10's hours digit is only 2 segments of a 7-segment display. It consists of segments b and c, and in 12 hour mode will light only for 10:00 11:00 and 12:00 time readings. The notion of implementing a digit like this is a cost savings measure and saved us from soldering another 25 LED's onto the display board.

Testing the Colons.
The colons have their own digit sink and segment drive and this was not provided for on the octopus digit sink cable. You will have to remove digit sink wire (-) and connect it to the (-) colon cathode sink. Then using the digit anode drive cable, energize the colons by attaching to the (+) colon anode drive pin.

If you can make all the segments light in the testing procedure your display and power supply are fully tested and you can move forward on the assembly of the clock logic board.