GEKCO

MODEL CLK100

DIGITAL CLOCK

ASSEMBLY & OPERATION MANUAL

P/N 595-445 REV 1.1

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LIST OF FIGURES

1.   Introduction

The Digital Clock Model CLK100 was designed to fill the need for an accurate digital clock with the capabilities of two time zone displays in a compact format.

This clock has 6 digits for hours, minutes and seconds and the hours display can alternate between two time zones, i.e. Coordinated Universal Time (UTC) and local time.

The CLK100 is offered in kit form or fully assembled and tested. The kit is easy to assemble with no surface mount parts.

This step by step manual will guide you through the process to complete the assembly and testing of the model CLK100 Digital Clock. The manual was designed so a total beginner in electronics can be successful, but the more experienced builder can skip any unnecessary information. Also, this design is fully open source for both the hardware and firmware. There are full schematics and pictorial diagrams of the hardware, also there are links and flowcharts of the firmware microcontroller code.

2.   Operational Summary

The Model CLK100 has 6 digits of seven segment displays to display HOURS, MINUTES and SECONDS. The HOURS display can alternate between two time zones, which can be UTC and local time. This function can be turned off by a menu selection if desired.

- The six digit display provides Hours, Minutes and Seconds
- Dual time zone display, alternates between two time zones every 2 seconds, i.e. UTC and local
- The display LEDs are high contrast red, 0.56 inch character height
- Adjustable display brightness
- Local hours can be set for 12 or 24 hour mode
- Very accurate Real Time Clock (RTC) with battery backup
- Powered by a U.L. listed 5 VDC wall adapter
- Size: 4.16 x 2.35 x 3.5 inches (Width x Height x Depth)
- Weight: 0.75 pounds

3. Parts and Unpacking

The kit is packaged in the order that the assembly is recommended. Each assembly block has an associated parts bag. Only open a parts bag when called for during assembly to avoid misplacing parts.

3.1. Top Level Parts List

Remove the parts from the main bag and separate each individual parts bags.

ITEM	QTY	PART NO.	DESCRIPTION
1	1	DBR100-KIT	Clock Display Board PCA parts bag
2	1	CLK100M-KIT	Clock Main Board PCA parts bag
3	1	2217625	Real Time Clock (RTC) Module DS3231
4	1	CLK100HDW-KIT	Final Assembly Hardware
5	1	CLK100ENC-KIT	Enclosure with Front and Back Panels
6	1	54-660	AC to DC Power Supply Wall Adapter Single Output 5 Volt 1 Amp 5 Watt 2.1mm Conn

3.2. Display Board Parts List

Clock 100 Display Board Printed Circuit Assembly (PCA) parts kit, P/N DBR100-KIT

ITEM	QTY	REFDES	PART NO.	DESCRIPTION
1	3	DS1,DS2,DS3	412-499	LED Display Module 7-Segment 2-Digit 0.56"
2	1	X1	434-3110	Socket IC Dip24-300
3	1	U1	442-3090	IC LED Display Driver MAX7219CNG
4	1	J1	131-1X10	Connector Header Single Row Male 10 pins
5	2	LED1,LED2	412-125	LED Red PCB Mount T1 3/4
6	1	C2	26-102	Cap elect alum radial lead 10uF/16v
7	1	C1	20-104	Cap mono Cer 50v radial lead
8	1	R1	6-1002-12	Res metal film 1/4w 1% 10k
9	1		81-180911D	PCB Display Board
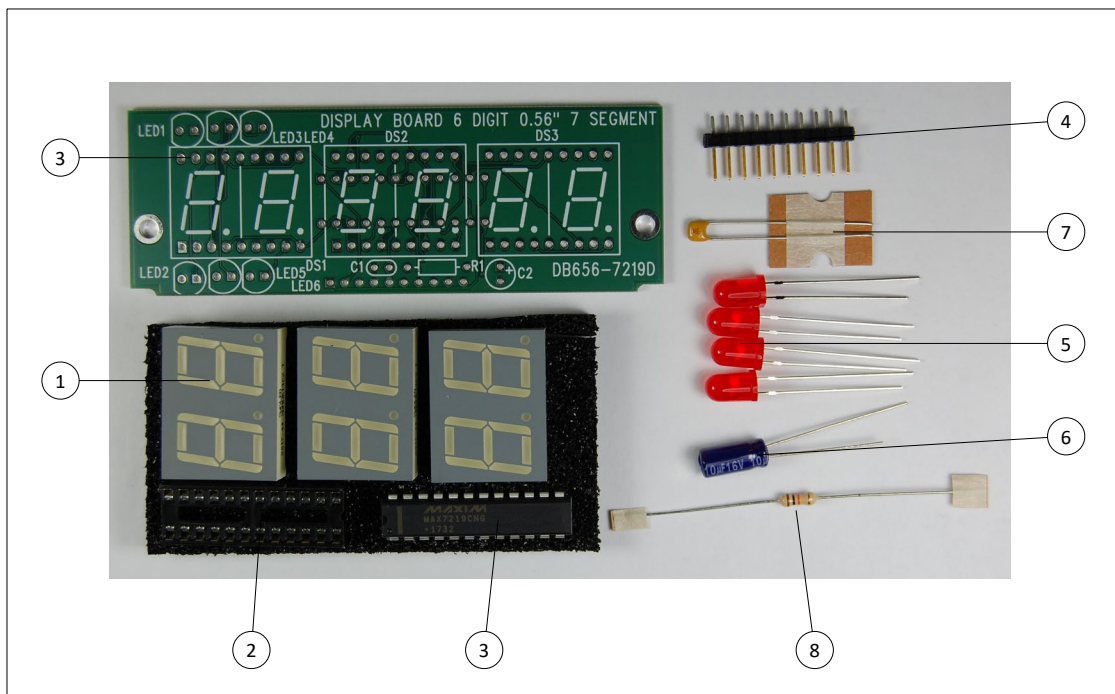
3.3. Main Board Parts List

Clock 100 Main Board PCA parts kit, CLK100M-KIT

ITEM	QTY	REFDES	PART NO.	DESCRIPTION	VALUE
1	3	C3,C4,C5	20-104	Cap mono Cer 50v radial lead	0.1UF
2	2	C1,C2	21-220	Cap mono Cer COG radial lead	22pF 100v
3	1	C6	26-102	Cap elect alum radial lead	10uF/16v
4	1	Y1	404-160	Crystal HC49	16.00 MHz
5	1	D1	55-62	Diode schottky rectifier	1N5817-T
6	3	SW1,SW2,SW3	64-1839	Switch Momentary SPST	
7	1	SW4	64-1827	Switch Momentary 5mm H	
8	1	J4	131-1X10S	Conn Header Female Single Row 10 pins	
9	1	J2	131-1X06RA	Conn Header Right Angle	Male 1 row of 6 pins
10	1	J3	131-1X05	Connector Header	Male 1 row of 5 pins
11	1	J1	134-002	Connector Power 2.1mm PCB Mount	
12	1	RN1	95-103	Res network 6 sip	10K 5 Res SIP Package
13	1	X1	434-311	Socket IC	Dip28-300
14	1	U1	444-106-01	IC Microcontroller	Programmed Part CLK100 V1.01
15	1	LS1	220-1420	Audio Piezo Transducer 30V	
16	1		81-181004A	Printed Circuit Board	Main Board
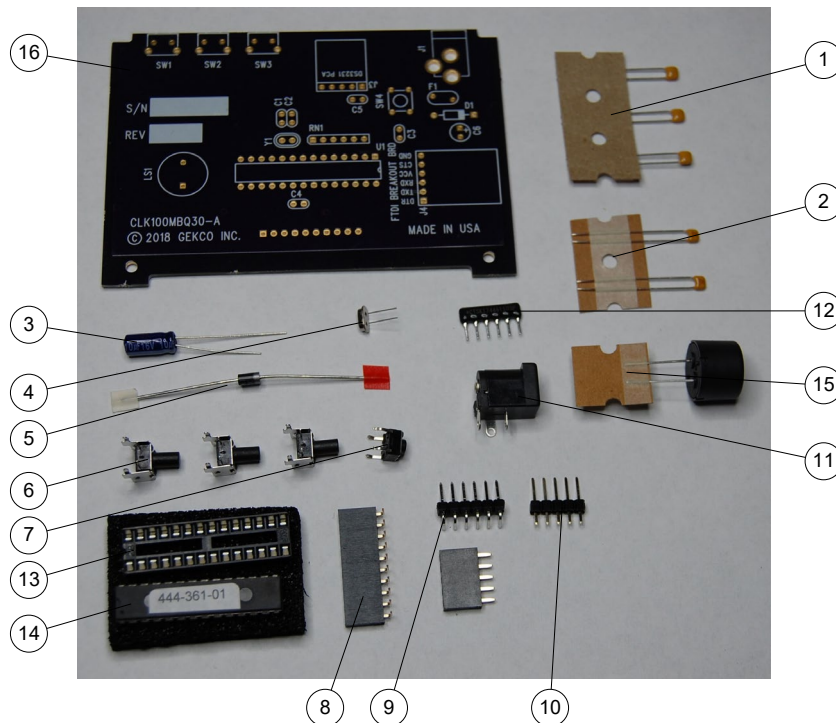
3.4.   Final Assembly Parts List

Clock 100 Final Assembly Hardware parts kit, P/N CLK100HDW-KIT

ITEM	QTY	PART NO.	DESCRIPTION
1	2	258-616	Hardware Angle Bracket 4-40
2	2	250-1418	Hardware Screw Panhead 4-40 x 1/4"
3	2	250-1533	Hardware Screw Panhead 4-40 x 1/8"
4	2	252-440	Hardware Nut 4-40

3.5.   Enclosure Parts List

Clock 100 Enclosure kit, P/N CLK100ENC-KIT

ITEM	QTY	PART NO.	DESCRIPTION
1	1	86-20113001	Enclosure Base
2	1	86-20113002	Enclosure Cover
3	2	86-20113003	Enclosure Bezel
4	1	86-181114F-A	Enclosure Front Panel
5	1	86-181114F-A	Enclosure Rear Panel
6	1	250-1410	Hardware Screw Flat-head 4-40 x 3/8"
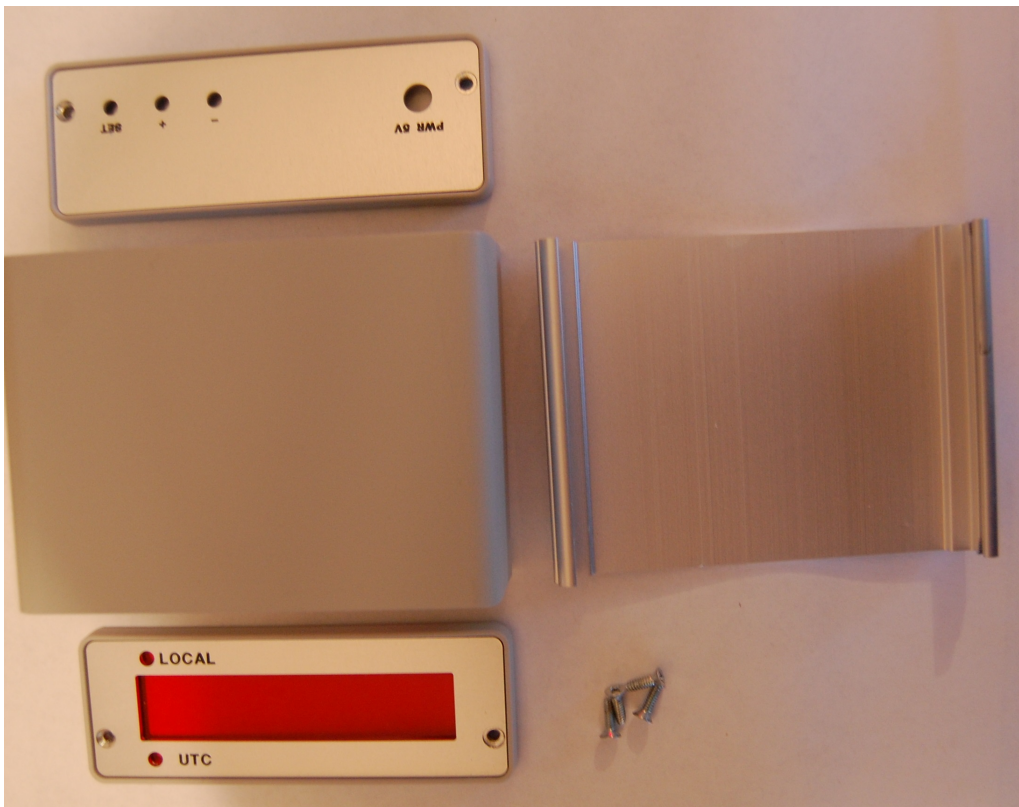
4. Assembly Notes

4.1. TOOLS

You will need these tools to assemble your kit.

- Diagonal Cutters
- Needle Nose Pliers
- Flat Head Screwdriver
- Philips Screwdriver (for the enclosure only)
- Pencil Soldering Iron (22 to 25 WATTS)

4.2. ASSEMBLY

1. Follow the instructions carefully. Read the entire step before you perform each operation.

2. Refer to the Pictorial and Detail Illustrations for help in performing the assembly steps. The illustrations are arranged in the proper sequence, as called for in the assembly steps.

3. Pictorials show the overall operation for a group of assembly steps: Details generally illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue using that Pictorial until you are referred to another Pictorial for another group of steps.

4. Position all parts as shown in the Pictorials.

5. Solder instructions are generally given only at the end of a series of similar steps. You may solder more often if you desire.

6. Each circuit part in an electronic kit has its own reference designator (R3, C8, etc.). Use these designators when you want to identify the same part in the various sections of the manual.

7. **SAFETY WARNING: Avoid eye injury when you cut off excessive lead lengths. Wear safety glasses or goggles and hold the leads so they cannot fly toward your eyes.**

4.3. SOLDERING

Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between two parts such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating properly.

It is easy to make a good solder connection if you follow a few simple rules:

Use the right type of soldering iron. A 22 to 25-watt pencil soldering iron with a 1/8" or 3/16" chisel or pyramid tip works best.

Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth: then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and re-tinned.

NOTE: What solder to use, leaded or lead free? The printed circuit boards in this kit are plated with lead free solder so if you choose to use lead free solder the complete assembly will be RoHS compliant. Regarding kits though, it is more difficult to solder with lead free material due to the higher melting temperature, so we recommend using a rosin core, radio-type solder (60/40) or (63/37) tin-lead content) for all of the soldering in this kit. If you decide to use leaded solder, be careful to wash your hands after soldering and never eat, drink or smoke, until you wash thoroughly and you are done soldering. Contain all materials that touched leaded solder in a special container dedicated for that purpose. This waste can be disposed of at electronic-recycling events or contact your waste management company

5.   Step-By-Step Assembly

5.1.   Display Circuit Board

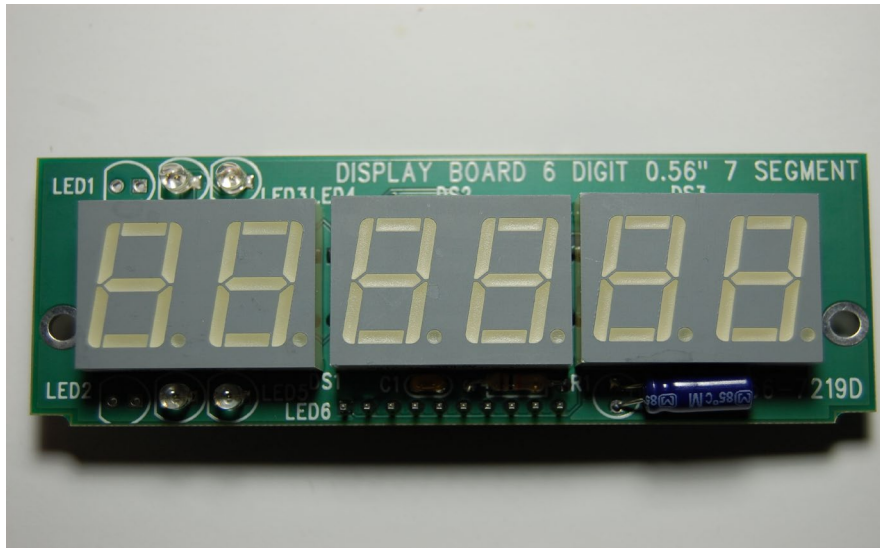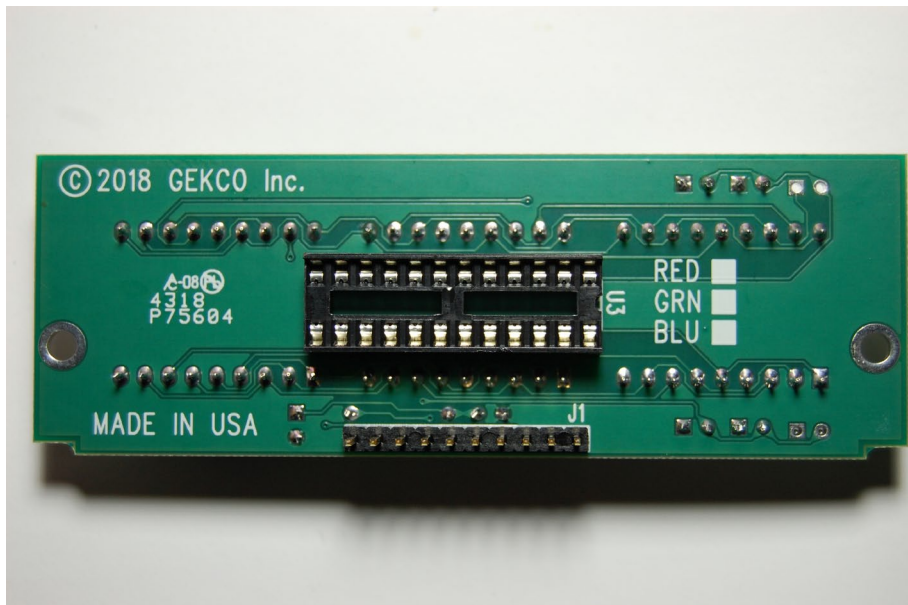Figure 1: Display Board Top Side Completed Assembly

Figure 2: Display Board Bottom Side Completed Assembly

(   )   Open the Display Board Printed Circuit Assembly (PCA) parts kit, P/N DBR656-KIT

Refer to Figure 3 for the following steps.

Position the Display Circuit Board with the bottom side facing up as shown
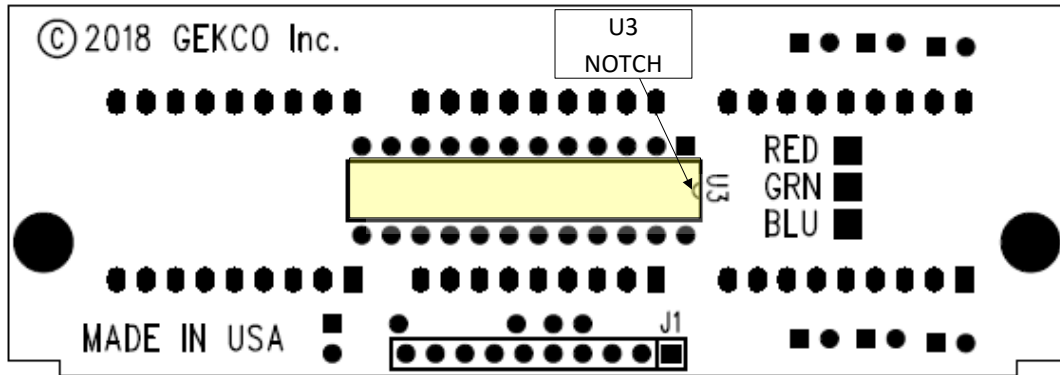

Figure 3 Display Board Bottom Side

Locate the 24 pin IC socket for U3

Place the socket on the board with the notch on the socket aligned with the notch noted on the printed circuit board (PCB) silkscreen. Turn the board over and solder the corner pins and check to be sure the socket is firmly against the board and then solder the rest of the pins.

(   )   X3: 24 pin DIP socket

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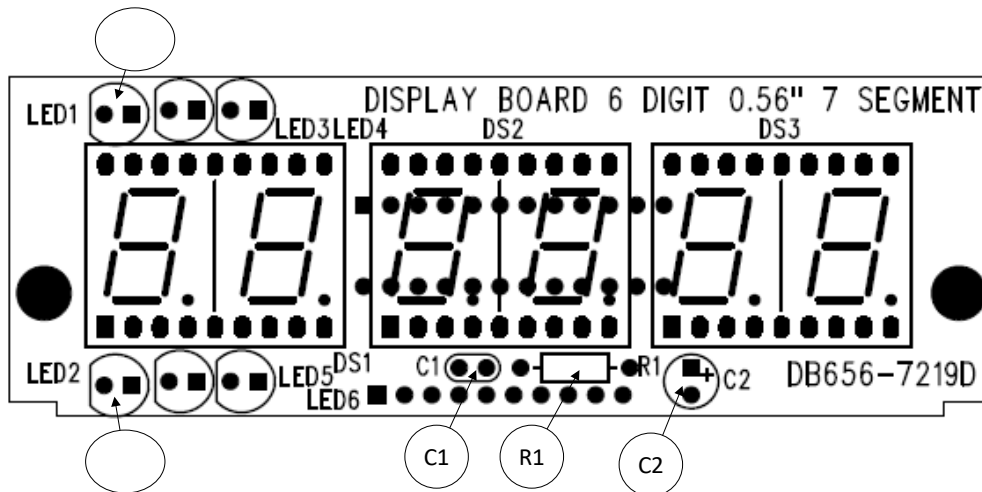Position the Display Circuit Board with the component side facing up as shown below


Figure 4: Display Board Top Side Assembly Pictorial

Install the decoupling capacitor.

( )   C1: 0.1 uF (104) radial-lead ceramic capacitor

( )   R1: 10 kΩ (brn-blk-org-silver) resistor

NOTE: Before you install an electrolytic capacitor, look at it and identify the leads. One lead will have either a negative (−) mark or a positive (+) mark near it on the side of the capacitor. The aluminum electrolytic capacitor has the marking for a negative lead which may look like an oblong bar, sometimes with a circle around it, inside an arrow. Be sure to install the positive lead in the positive-marked hole.

( )   C2: 10 uF radial-lead electrolytic aluminum capacitor (lay down the capacitor against the board so it does not interfere with the enclosure)
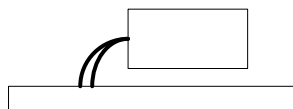
C2 SIDE VIEW

( )   Solder the leads to the foil and cut off the excess lead lengths.

In the next step, make sure the LED display modules are oriented correctly. Match the decimal point on the display with the orientation shown on the PCB silkscreen. Solder the corner pins first and make

sure the display is mounted flush with the board and oriented correctly and then solder the rest of the pins.

( )   DS1: 7 segment LED display module

( )   DS2: 7 segment LED display module

 ( )   DS3: 7 segment LED display module

Make sure the LEDs are oriented correctly, there is a flat side on the LED housing or make sure the long lead (anode) is inserted in the square hole and the short lead (cathode) in the round hole.

( )   LED1: LED Red PCB Mount

( )   LED2: LED Red PCB Mount

Note: LED3, LED4, LED5 and LED6 are not installed in this version of the display board.

 ( )   Solder the leads to the foil and cut off the excess lead lengths.

This completes the assembly of the Display Board. Connector J1 will be installed after the main board assembly is almost complete. Set aside for the final assembly later.
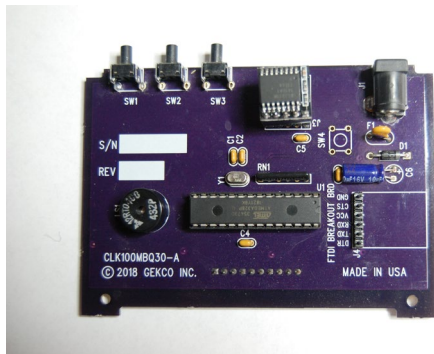
5.2. Main Circuit Board
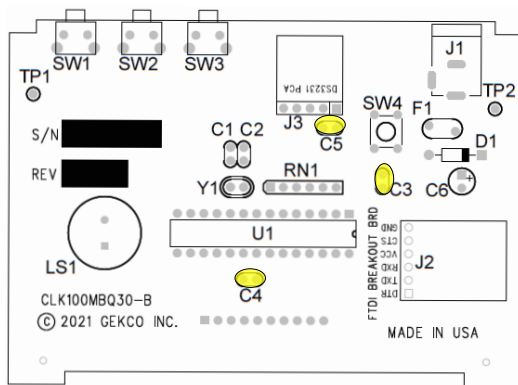

Figure 5: Main Board Completed Assembly

Figure 6 Main Board Top View 1

( ) C3: 0.1 uF (104) radial-lead ceramic capacitor

( ) C4: 0.1 uF (104) radial-lead ceramic capacitor

( ) C5: 0.1 uF (104) radial-lead ceramic capacitor
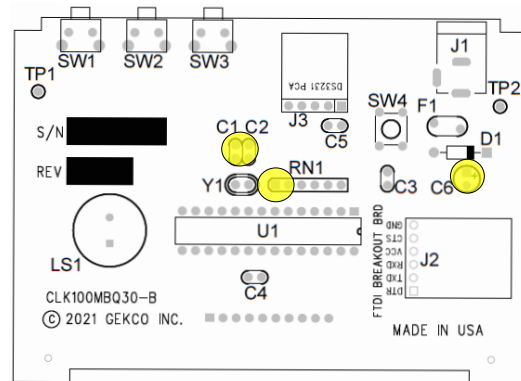
Figure 7: Main Board Top View 2

( ) C1: 22 pF (22) radial-lead ceramic capacitor

( ) C2: 22 pF (22) radial-lead ceramic capacitor

( ) C6: 10 uF radial-lead electrolytic aluminum capacitor
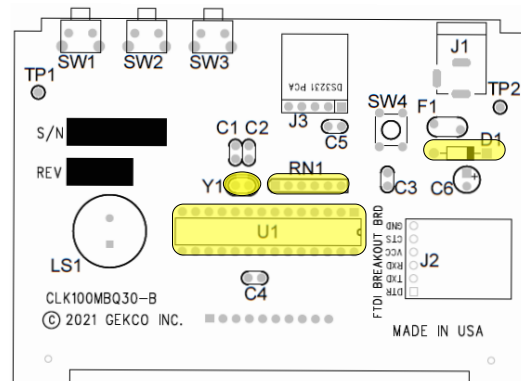
Figure 8: Main Board Top View 3

( ) Y1: Crystal HC49 16 MHz

For the next step, be careful to position the end with the dot or line towards the "square pad" and tapered outline on the circuit board. After you solder the first pin make sure the pins are fully seated in their holes, solder the rest of the pins to the foil.

( ) RN1: 10 kΩ 103 resistor pack.

NOTE: When you install the diode, be sure to orient the diode correctly. Always match the band on the diode with the band mark on the

circuit board. The circuit will not work properly if a diode is installed backwards.

( )　　D1: 1N5817 schottky diode

When installing the IC socket next, be sure to align the notch on the socket with the notch on the PCB silkscreen.

( )　　X1: 28 pin DIP socket

Figure 9: Main Board Top View 4

( )　　SW1: momentary right angle switch

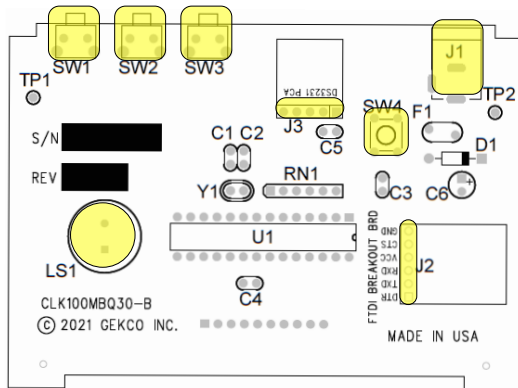( )　　SW2: momentary right angle switch

( )　　SW3: momentary right angle switch

( )　　SW4: momentary switch

( )　　J2: Connector Header Male 6 pin right angle mount

( )　　J3: Connector Header Male 5 pin right angle mount

In the next step, solder one pin and re-align the connector if necessary and then solder the rest of the pins. The connector needs to be aligned with the silkscreen outline.

( )　　J1: Connector Power 2.1 mm

( )　　LS1: Audio Piezo Speaker

( )　　Solder the leads to the foil and cut off the excess lead lengths.

The next step is to install the mating connector between the display board (J1) and the main board (J4). Turn the board over and install connector J4 on the bottom side of the PCB.
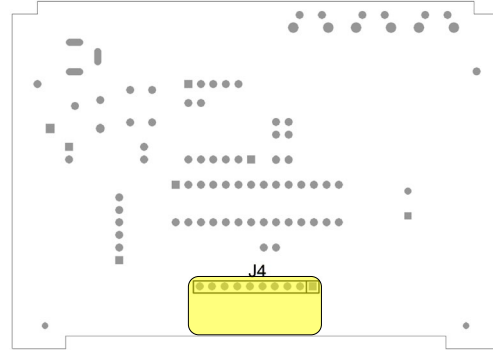
Figure 10: Main Board Bottom View

This completes the assembly of the Main board.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit boards for the following problems.

( )　　Unsoldered connections

( )　　Poor solder connections

( )　　Solder bridges between foil patterns

( )　　Protruding leads which could touch together

Refer to the illustration where the parts were installed as you make the following visual checks.

( )　　Diodes for the proper type and positioning of the banded end

( )　　Electrolytic capacitors for the correct position of the positive (+) or a negative (−) marked ends

( )   Locate the RTC module and install on the clock main board as shown.

Figure 11 RTC Module Assembly

6.   Initial Tests

Before installing the IC's perform the following tests.

Display Board

Using a multi-meter to measure resistance perform the following checks.
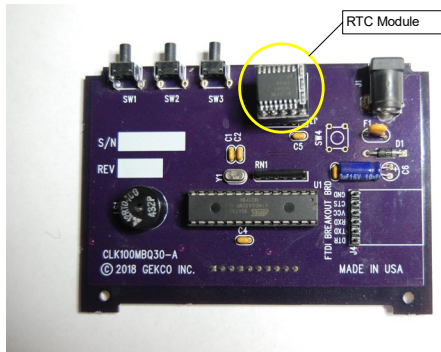
( )   Verify that the resistance with the positive lead on C1 positive pin and negative lead on C1 negative pin, is greater than 2k ohms.

Main Board

( )   Verify that the resistance with the positive lead on D1 cathode (the component end with the band) and negative lead on the ground pad TP1, is greater than 2k ohms.

IC INSTALLATION.

NOTE: You will install the following IC's on the main circuit board.

CAUTION: Integrated circuits (IC's) are complex electrical devices that perform many complicated operations in a circuit. These devices can be damaged during installation. Read all of the following information before you install the IC's.

Some of the IC's you will install in the following steps are MOS {metal oxide semiconductor) devices. Be sure they do not get damaged by static electricity. Once you remove the IC from the foam pad, **do not let go of it** or lay it down until it is in its socket. Install it as follows. Read all of the following steps before you pick up an IC.

1. Pick up the IC and touch the foam pad with both hands.

2. Hold the foam pad with one hand and remove the IC with the other hand.

3. Continue to hold the IC with the one hand and straighten any bent pins with the other hand.

4. The pins on the IC's may be bent out at an angle as shown in A, and if this is the case, they will not line up with the holes in the IC socket or circuit board pads. Lay the IC down on its side as shown in B and very carefully roll it toward the pins to bend the lower pins into line. Then turn the IC over and bend the pins on the other side in the same manner. Do not try to install and IC without first bending the pins as described. To do so may damage the IC pins or the socket, causing an intermittent contact.

Install the IC on the display circuit board. Be sure to line up the dimple with the circuit board silkscreen

( ) U1: MAX7219 IC

Install the IC on the main circuit board:

( ) U1: ATMEGA328P IC

This completes the assembly of the circuit boards.

(   ) Locate the miscellaneous hardware bag and attach the angle bracket to the display board using the 4-40 screws and nuts as shown.
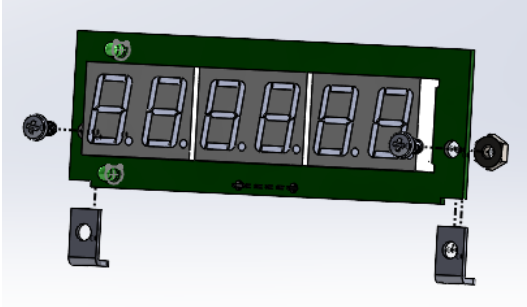

Figure 12: Display Board Hardware Assembly

(   ) Attach the display board assembly to the main board using the two 4-40 x 1/8" screws.
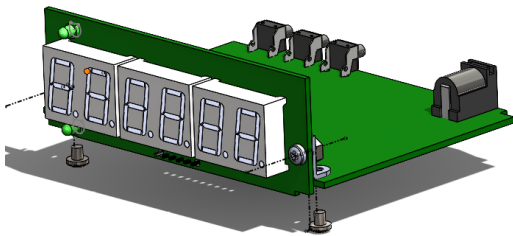

Figure 13: Display Board to Main Board Assembly

This completes the final assembly of the main and display boards

7. Final Tests

Using a multi-meter to measure resistance perform the following checks.

( ) Verify that the resistance with the positive lead on U5 pin 20 and negative lead on pin 10, is greater than 2k ohms.

( ) Connect the plug in transformer T1 to power connector PS1 and plug into a wall outlet and verify that the voltage with the positive lead on U5 pin 20 and negative lead on pin 10, is 5V.

8. In Case Of Difficulty

The "Visual Checks" that are provided below will help you locate any difficulties that might occur during the assembly and testing of your Digital Clock. Additional " In Case of Difficulty" information is also provided in your Operation Manual.

In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information at the back of the Manual.

VISUAL CHECKS

1. The majority of kits that fail are due to poor solder connections. Therefore, you can eliminate many difficulties by carefully inspecting each connection to make sure it is soldered as described in the solder instructions section. Reheat any doubtful connections.

2. Check the circuit board to be sure there are no solder bridges between adjacent connections.

3. Check capacitor values carefully. Be sure the proper value part is installed at each capacitor location and that the negative (−) mark or a positive (+) mark is oriented correctly.

4. Check each resistor value carefully.

5. Be sure the correct diode is installed at each location, and that the banded end is positioned correctly.

6. Check the orientation and the correct part number of the Integrated Circuits. Use the pictorial diagrams as a reference.

9. Final Assembly

Skip these steps if the enclosure is not used.

( )   Unpack the enclosure parts kit, which includes the front and back panels with bezels, four 4-40 flat head screws and the base and cover pieces.

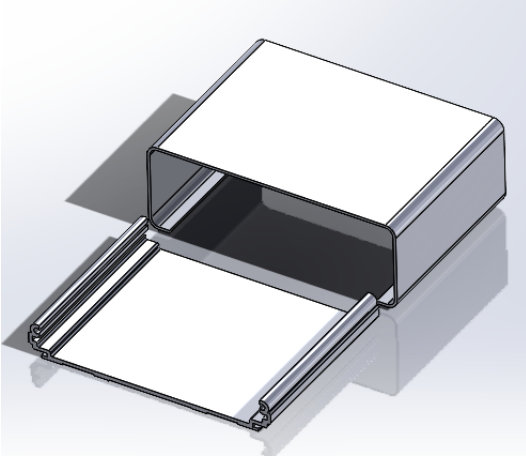( )   Slide the cover into the base as shown in figure 14.

Figure 14: Enclosure Cover to Base Assembly

( )   Insert the front panel into one of the bezels and attach to the enclosure front end as shown in figure 15.
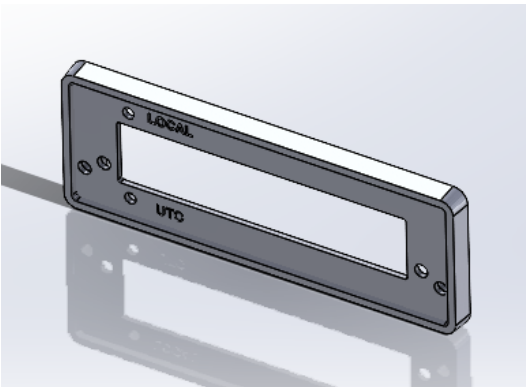

Figure 15: Front Panel

( )   Attach the front panel with the bezel to the enclosure base with two 4-40 pan head screws.

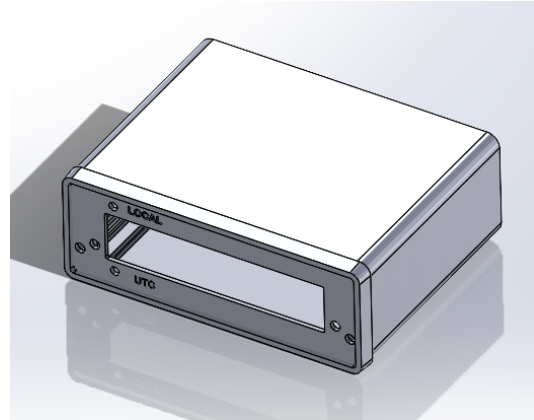Figure 16: Front Panel to Base Assembly

( )   Slide the main and display board assembly into the enclosure base from the back end as shown.
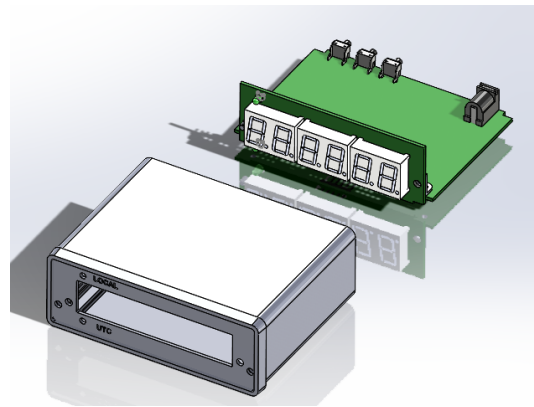
Figure 17: Display and Main Board to Enclosure Assembly

( )   Insert the rear panel to the other bezel and attach to the enclosure assembly with two 4-40 pan head screws. Be careful to make sure the panel is aligned correctly so the switch buttons can move freely.
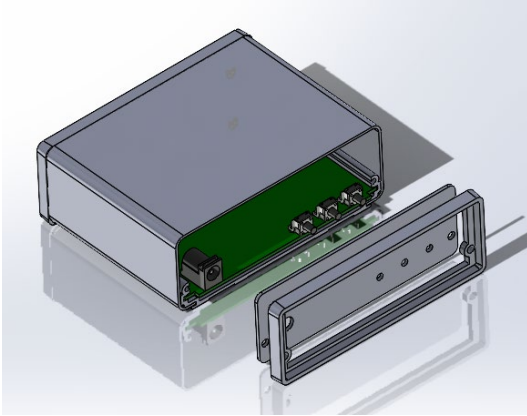
Figure 18 Enclosure Back

This completes the assembly.

Congratulations you have successfully completed the assembly of the unit and now you can enjoy using a clock that you have assembled yourself.

10.   Operational Instructions

Pressing the SET button will start the menu selection process. Each button press of the SET button selects the next menu option. If the + or – button is pressed during the time setting mode, the menu loop ends after the seconds setting. If no time settings are changed the menu loop goes through the entire set of options, changing to the next option for each SET button press. The menu options are listed below. See figure 19 for the detailed flow chart.

- Set Time

- Set UTC Mode On or Off

- Set UTC Hour Offset

- Set Alarm Time

- Set Alarm On or Off

- Set Local Time to 12 or 24 Hour

- Set Display Brightness

10.1.   Setting the Time

The time is set by first pressing the SET button. This then presents the first menu option which is the hours setting, then press the + (increment) button to increment the hours and the – (decrement) button to decrement the hours. Once you have set the correct hours then press the SET button again to change to the minutes setting. Press the + (increment) button to increment the minutes and the – (decrement) button to decrement the minutes. Once you have set the correct minutes then press the SET button again to change to the seconds setting. Press the + (increment) button to increment the seconds and the – (decrement) button to decrement the seconds. The seconds setting is adjusted by 10 seconds each time the + or – button is pressed. Once you are satisfied with the new time settings, wait to press the SET button until the display time is synchronized with the correct time and then the new clock setting is saved to the Real Time Clock module.

10.2.   Setting the UTC Mode On or Off

The UTC (Universal Coordinated Time) display mode can be set on or off. The is done by pressing the SET button until the "utc on" display option is shown. Then press the + (increment) button to toggle the UTC Mode either On or Off. Press the SET button to exit to the next menu option.

10.3.   Setting the UTC Hour Offset

The UTC (Universal Coordinated Time) hour offset from your local time can be set. The is done by first pressing the SET button. Press the SET button again to enter the UTC offset setting. Then press the + (increment) button to increment the offset and the – (decrement) button to decrement the offset. Press the SET button again to exit this setting.

10.4. Setting the Alarm Time

The alarm time can be set. The is done by pressing the SET button until the "Set AL" display is shown. Then press the + (increment) button to set the alarm hours. Press the + or – button to increment or decrement the alarm hours. Press the SET button to select the alarm minutes setting. Press the + or – button to increment or decrement the alarm minutes. Press the SET button to exit this setting.

10.5. Setting the Alarm On or Off

The alarm function can be set on or off. The is done by pressing the SET button until the "AL OFF" display option is shown. Then press the + (increment) button to toggle the alarm either On or Off. Press the SET button to exit to the next menu option.

10.6. Setting the Local Time to 12 or 24 hour

The local time display can be set 12 or 24 hour mode. The is done by pressing the SET button until the "12H on" display option is shown. Then press the + (increment) button to toggle the 12 hour mode either On or Off. Press the SET button to exit to the next menu option.

10.7. Setting the Display Brightness

The display brightness can be set from a minimum to maximum brightness level of 0 to 15. The is done by pressing the SET button until the "diSP 8" display option is shown. Then press the + or – button to increase or decrease the display brightness. Press the SET button to exit and return to the normal clock display.
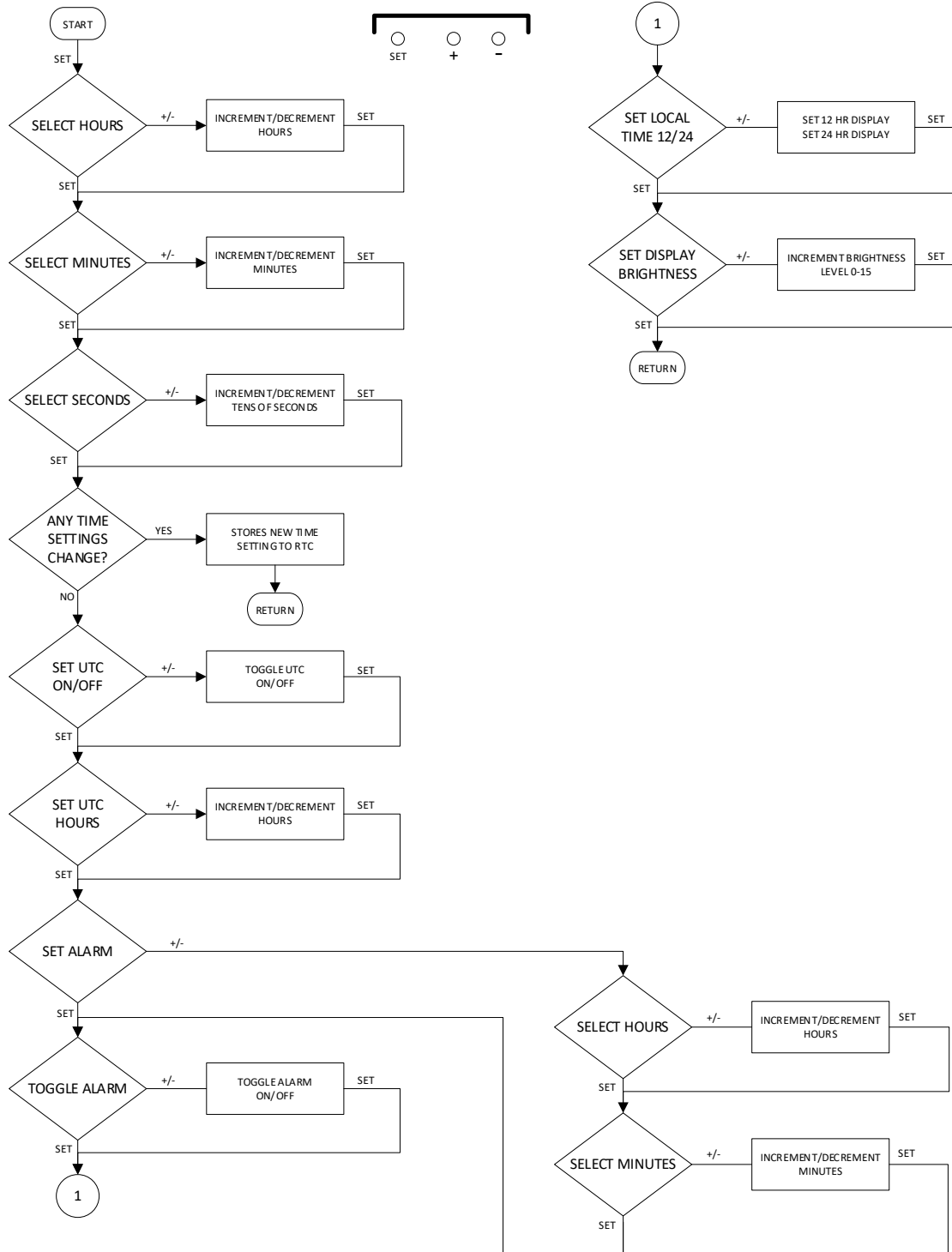
MENU ROUTINE

Figure 19: Menu Flow Chart

11.   Theory of Operation
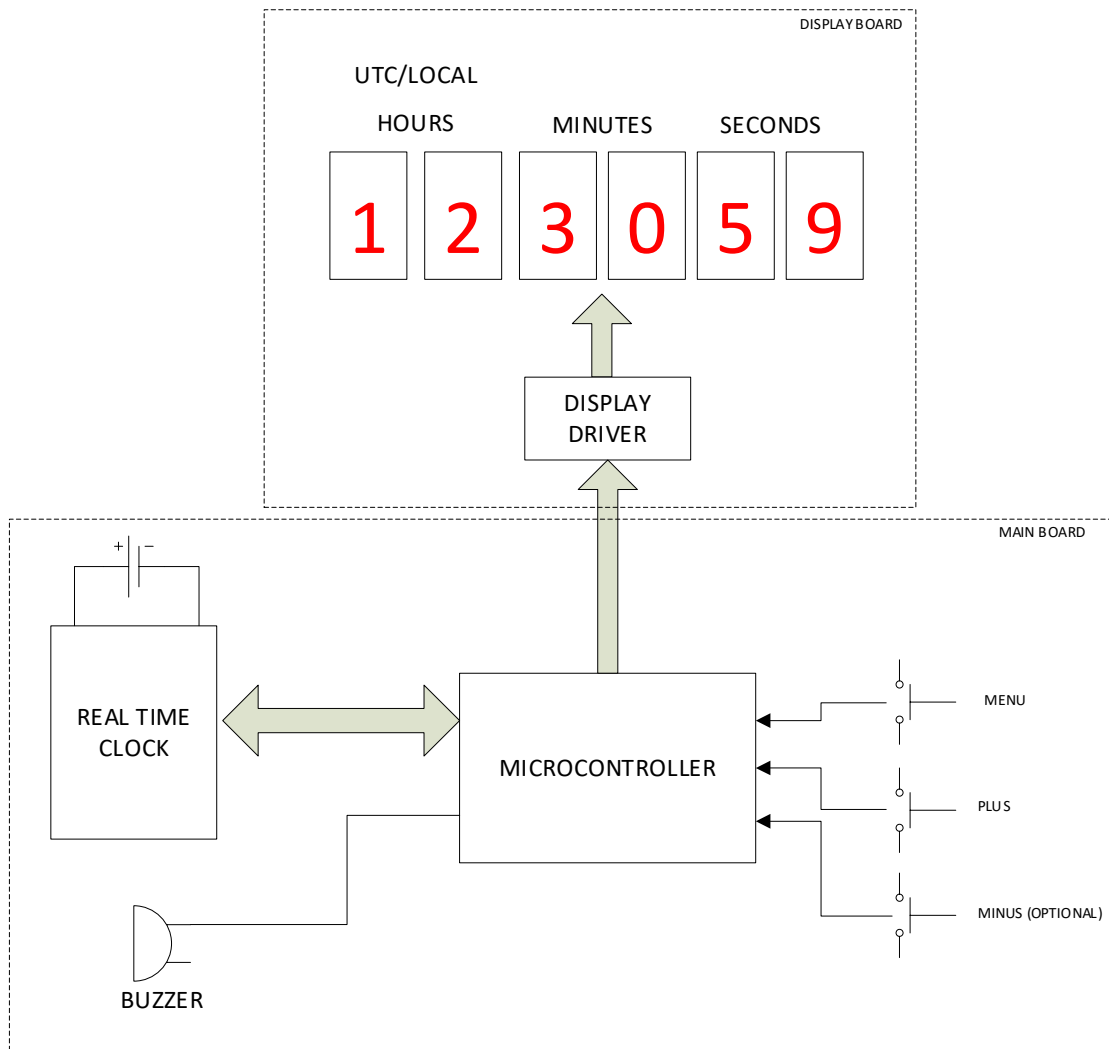
11.1. Block Diagram

Figure 20: Block Diagram

The clock consists of two modules, the main board and the display board. The clock was designed this way to allow the same main board to use different display boards which could vary in size.

If may be helpful to review the block diagram and schematics while reading the circuit descriptions.

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11.2. Main Board Circuit Description

The main circuit board has the microcontroller, real time clock (RTC), switch inputs and connectors for the display board, programming interface and the input power.

The microcontroller U3 is the heart of the clock. This design uses the popular Atmel ATMEGA328P. This is a powerful microcontroller with 32Kbytes of flash memory, and 2Kbytes of SRAM as well as numerous other peripherals. See the ATMEGA328P data sheet for details.

The crystal Y1 provides the clock for the microcontroller and C1 and C2 are required pad capacitors for the crystal to operate. The display board interface connectors are J4 and J5. J4 is the only one used in the model CLK100. This connector provides the standard serial peripheral interface (SPI) interface to the display board. The signal SS is asserted low when serial data is present on the MISO signal. The MISO signal is the serial data stream from the microcontroller to the MAX7219 on the display board. The signal SCK provides the clock timing for the interface. More details of the SPI interface can be found on the web.

Connector J3 provides the interface to the real time clock (RTC) module. The clock time accuracy and the time keeping function are provided by the RTC module, which has a Maxim DS3231 real time clock. This device uses a 3 wire, I2C interface to communicate with the microcontroller.

Connector J2 is the programming interface connector. This allows the firmware to be modified and the ability to reprogram the microcontroller. The CLK100 board looks just like a Arduino Uno and can use the popular Arduino IDE.

The path for the input power for the clock is provided by connector J1. The input voltage should be 5V +/- 5%. Diode D1 is a schottky diode which provides protection of the internal circuits if the polarity of the applied voltage is incorrect.

Resistor network RN1 provides the 10kohm pull up resistors for the switch inputs SW1 through SW4. SW1, SW2 and SW3 provide the clock setup capabilities and SW4 allows the user to reset the device.

The piezo electric buzzer LS1 provides an audible alert for the alarm function.

11.3. Display Board Circuit Description

The display board used in the model CLK100 utilizes the MAX7219 as the display driver and controller. This part provides a 4 wire interface to the main board to interface to the 6 digit display. The LED displays are multiplexed by the logic in the MAX7219. The microcontroller on the main board only needs to communicate with the display board when a change in the display is desired.

The seven segment common cathode LED display modules are from Sun LED part number XDUR14C2. There are two digits per display module and each digit has separate interface pins. In our design, we have the segment sections wired in parallel and each digits common cathode is wired separately to the display controller. Resistor R1 sets the current drive for the LED displays.
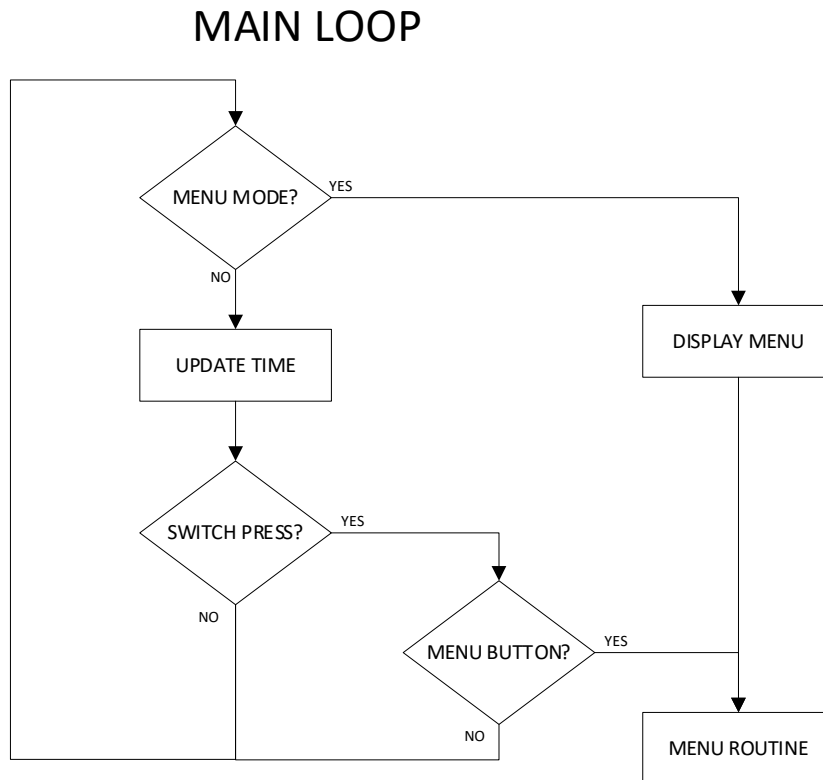
12.   Firmware

12.1.   Flow Chart

MAIN LOOP

Figure 21: Software Flowchart

12.2.   Firmware Design Description

There are two basic modes of operation.

- Clock Mode

- Menu Mode

12.2.1. Clock Mode

This mode reads the real time clock module and updates the display

Menu Mode

This mode handles all of the functions to allow the clock settings to be set. These features are:

Time setting in hours minutes and seconds
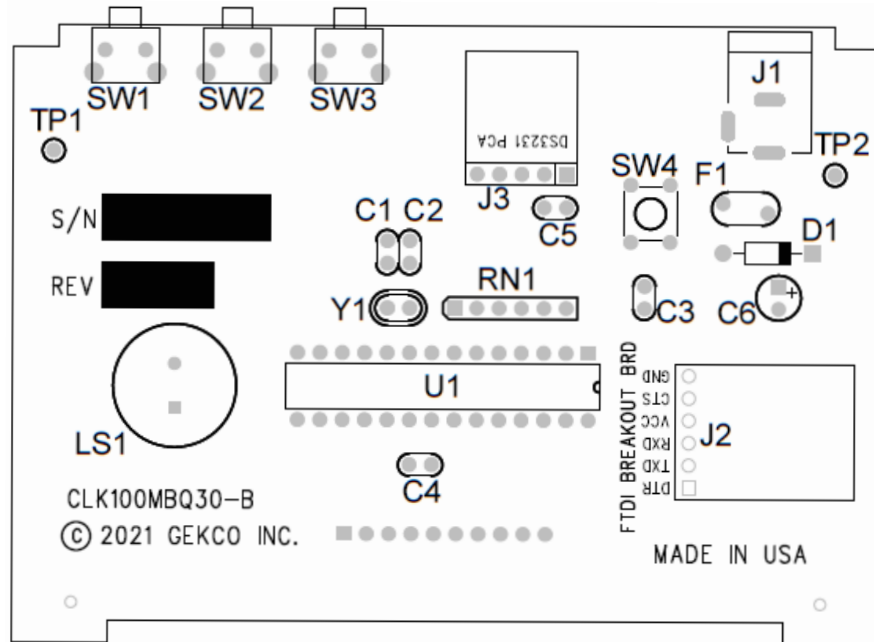
13.   PCA Pictorial Diagrams
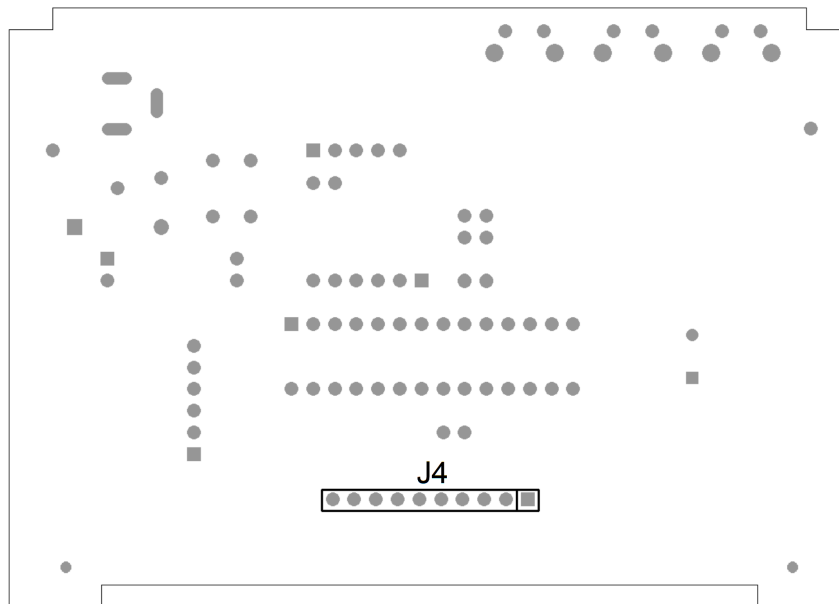
13.1.   Main Board

Figure 22: Main Board Top

Figure 23: Main Board Bottom

13.2. Display Board

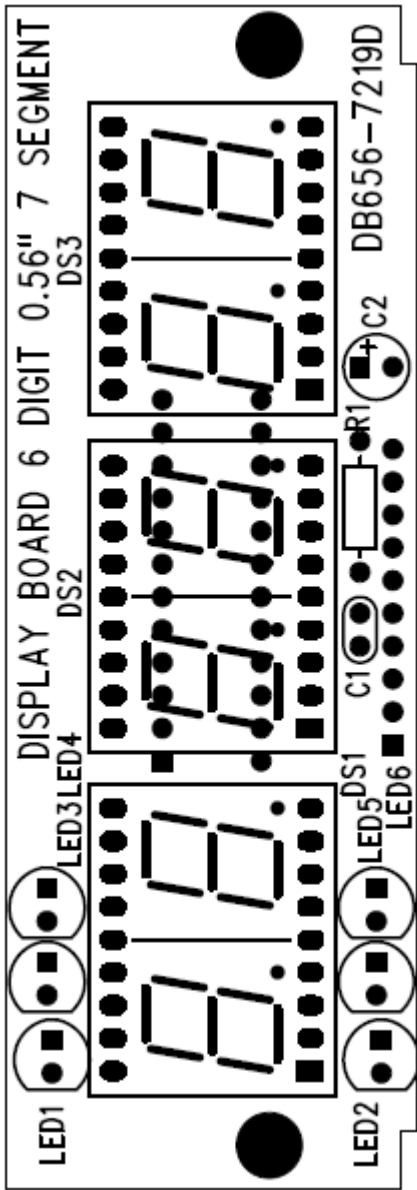
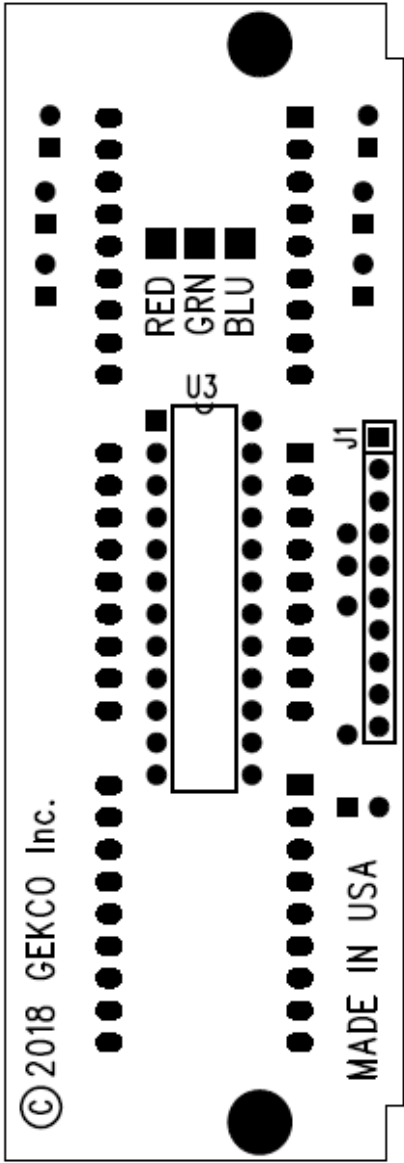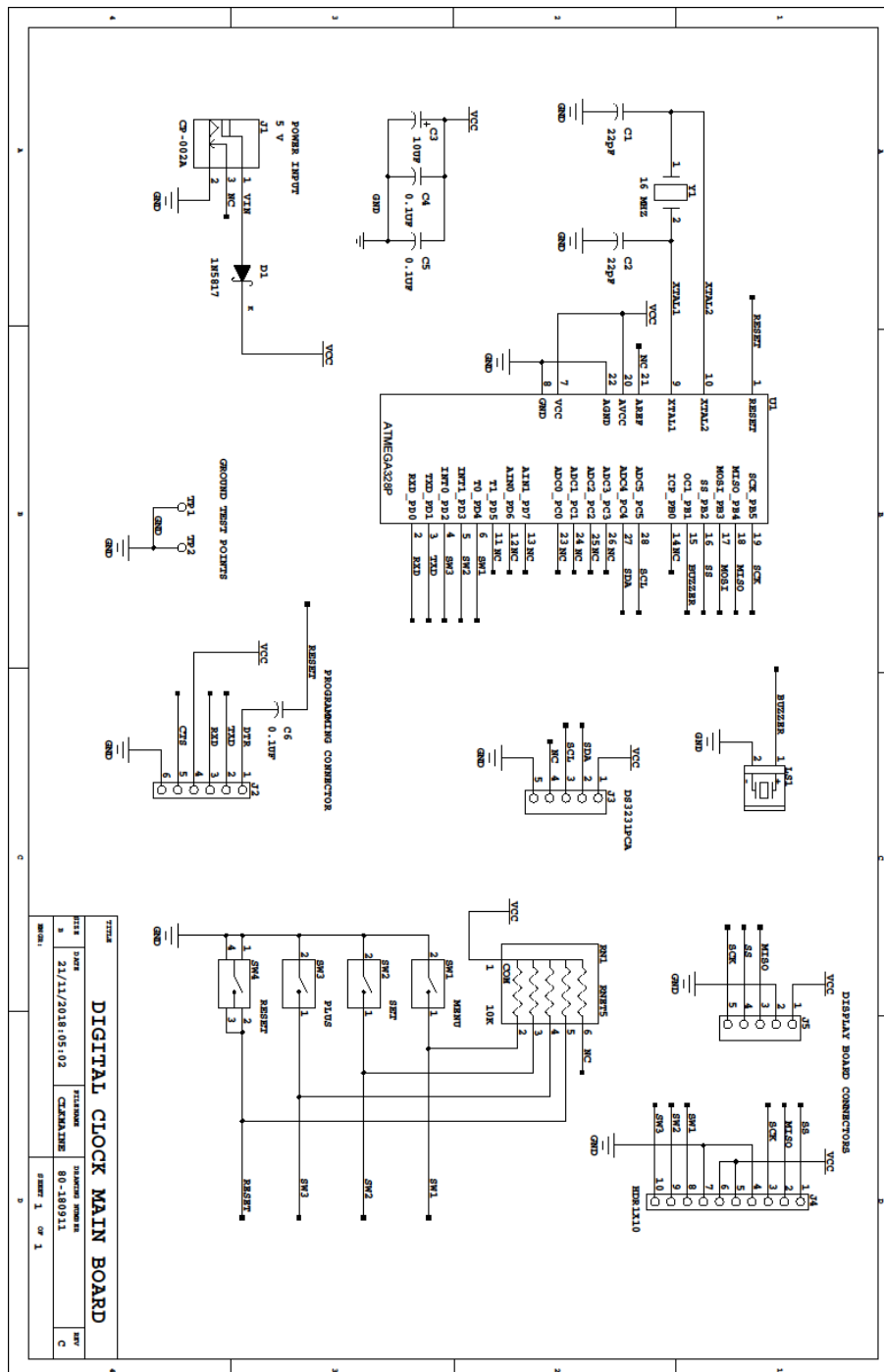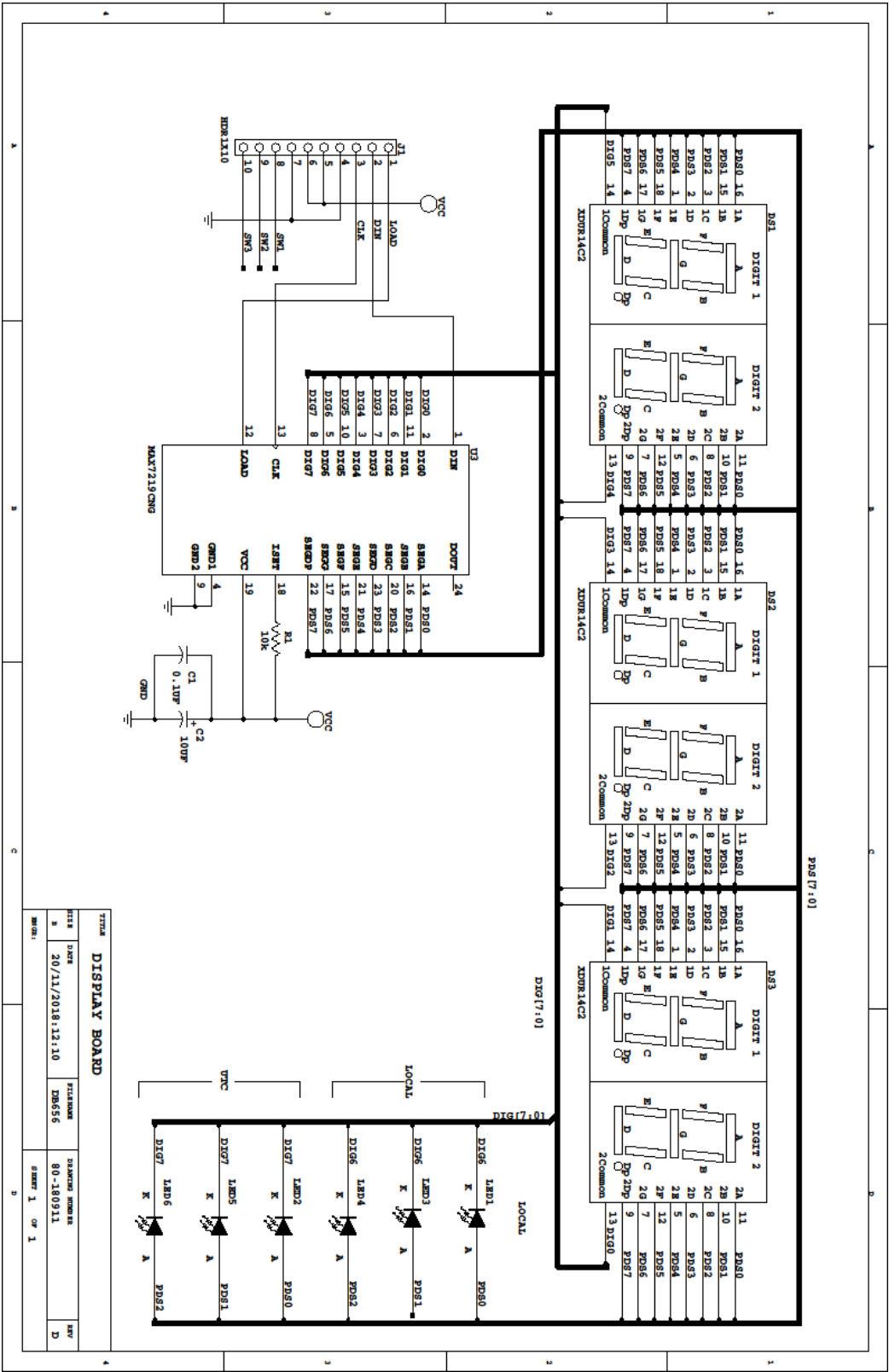Figure 24 Display Board Top Side

Figure 25 Display Board Bottom Side

14. Schematic Main Board

15. Schematic Display Board

16.   CUSTOMER SERVICE

Please provide complete information when you request replacement parts from the factory. Be certain to include the GEKCO part number exactly as it appears in the parts list.

Ordering from the factory

Print all of the information requested on the parts order form furnished with this product and mail to GEKCO. If you are unable to locate a order form, write us a letter or card including:

- GEKCO part number

- Model Number

- Date of purchase

- Location purchased or invoice number

- Nature of defect

- Your payment or authorization for COD shipment of parts not covered by warranty.

TECHNICAL CONSULTATION

Need help with your kit?   Self-Service? Construction?   Operation?   Call or write for assistance. You'll us eager to help with just about any technical problem.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the label.

- The date of purchase

- An exact description of the difficulty.

- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

REPAIR SERVICE

Service facilities are available, if needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

When returning your kit to the factory, attach a letter containing the following information directly to the unit.

- Your name and address.

- Date of purchase and invoice number

- Copies of all correspondence relevant to the service of the kit.

- A brief description of the difficulty.

- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay).

Check the equipment to see that all screws and parts are secured. Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, shipping popcorn, etc.) on all sides. Use additional packing material where there are protrusions (long connectors, large knobs, etc,).

Seal the carton with good quality shipping tape, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damages if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

GEKCO Inc.
1565 SW Cypress Ln.
McMinnville, OR 97128

17. Document Revision History

1.0	18-Nov-18	Initial Release
1.1	21-Jan-5	Updated with Main Board Rev B