

# Troubleshooting

Applicable model: 06203P, 06203KP, 06204KP

## General Notes:

- 1) Whenever a kit assembled does not work its power supply should be first checked. The +5V power supply should be within +5V +/- 2% range and there are no apparent overheat components (the heat sink of 7805 could warm up to 40 – 50 and that is normal).
- 2) If any overheat or smoke is seen power off the unit immediately and carefully check soldering, component placement, polarity, and their values.
- 3) It is assumed that users have a digital multi-meter available when carrying out troubleshooting.
- 4) Unless otherwise stated voltages are measured with volt meter's negative probe connected to GND (7805's heat sink) and positive probe connected the point to be checked.
- 5) Always power off oscilloscope before carrying out connection check.

Fig. 1 shows typical voltages measured at various check points for a normal 062 oscilloscope.

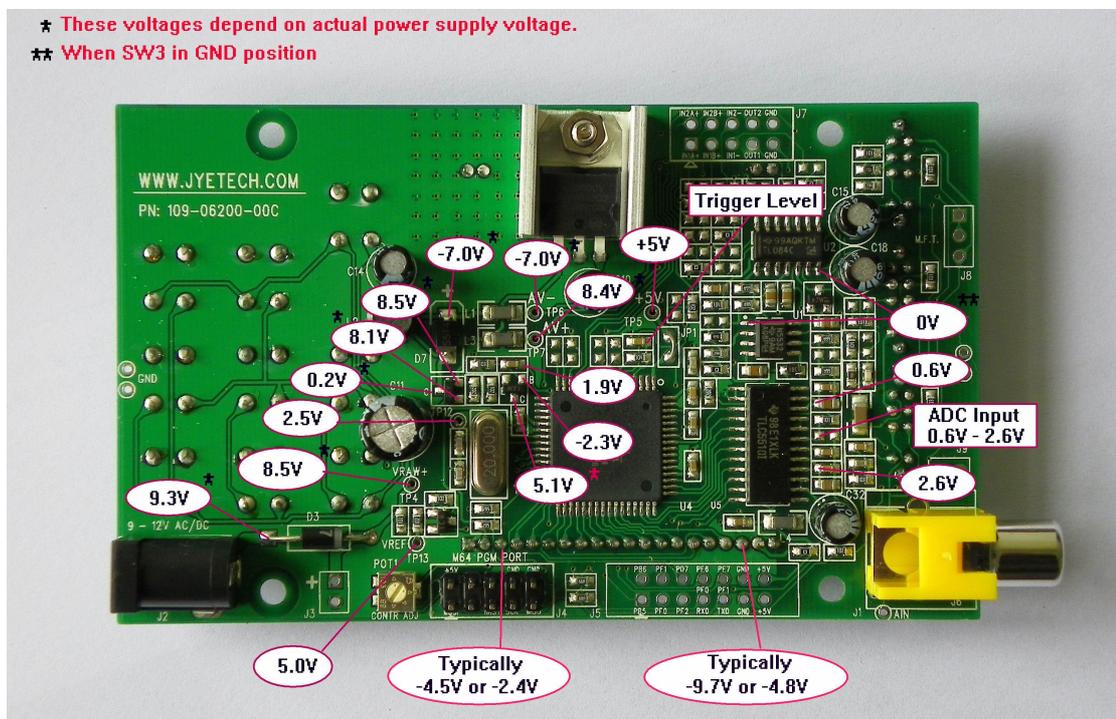


Fig. 1

## 1. LCD backlight does not light up

The LCD backlight is simply powered by +5V through a 0 ohm resistor R23. Pin 19 & 20 of LCD module are the power pins for LCD backlight. If it doesn't work following items should be checked.

- 1) Check voltage at TP5 to see if +5V power supply is normal.
- 2) Is JP1 closed? JP1 should be closed permanently after +5V at TP5 checked good.
- 3) Check soldering of pin 19 & 20 of LCD module.
- 4) Check R23 soldering and value.
- 5) If normal +5V is measured between pin 19 & 20 of LCD module and the LCD backlight doesn't light up then it is possibly an LCD module internal problem.

## 2. LCD lights up but nothing seen on screen

For this problem there are four possible causes.

### A. LCD contrast is incorrect

LCD contrast is determined by voltage at pin 3 (VO). This voltage depends on VEE at pin 18 and

the central tap position of POT 1. Changing POT 1 you should see contrast changes. Set it to a position so that proper contrast is obtained.

If contrast does not change first check VEE at pin 18 of LCD. VEE is generated by a built-in negative voltage generator inside LCD module. Typically this voltage is about -9.7V or -4.8V depending on LCD modules used. If this voltage is found wrong possible causes include:

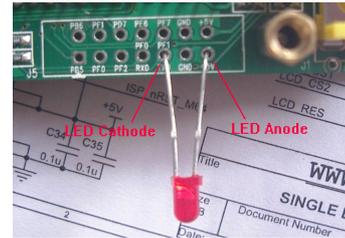
- 1) Pin 18 of LCD module is shorted to something else.
- 2) Pin 18 is opened.
- 3) Bad negative voltage generator inside LCD.

If VEE is ok then check POT 1 itself and related connections.

#### **B. MCU (Atmega64) does not work properly**

To verify MCU state you can use following different methods. (Method 2 is recommended)

- 1) Check voltage at its pin 5 (measuring at C17 is easier). This is the voltage for driving negative voltage generator to produce AV-. It should be about 1.9V if MCU boots normally.
- 2) With firmware version of 113-06208-031 or later the MCU generates two LOW level pulses at PE1 pin (TXD) when it boots. By placing an LED between PE1 and +5V (you can use J5 for this check with LED anode to +5V [J5 pin 13] and cathode to TXD [J5 pin 11]. See photo left) and powering up the unit you will see the LED blink twice. If you don't see the blinks then it likely the MCU is not booted.
- 3) MCU emits certain ASCII strings at its UART0 output pin (PE1, pin 3 of U4 or pin 11 of J5). The baud rate is 38400bps. Data format is 8-N-1. By connecting this output to PC serial port via a serial level converter you can capture these outputs so as to verify MCU state.



If you find MCU is not running correctly then possible causes are

- 1) MCU is not programmed.
- 2) Bad soldering at some critical pins like those for power supply and oscillator.
- 3) Oscillator not running. Oscillator can be roughly checked with a digital voltmeter. Measure voltage at pin 23 (probing at C24). If 2.5V is read then oscillator is working. (For a kit with programmed MCU bad oscillator is unlikely because it is verified at programming. Successful completion of programming requires a good oscillator.)
- 4) Bad chip.

#### **C. Bad connections between MCU and LCD**

There are 14 signals (see signal labels with prefix "LCD\_" in schematic) connecting LCD to MCU. Their connections can be checked with an ohm meter. It is recommended that sharp meter probes be used and check from pin to pin instead of pad to pad. Try to identify possible opens (false soldering) and shorts (like bridged MCU pins, etc).

#### **D. Bad LCD module**

### **3. Display and buttons work but no trace seen**

If display and buttons are working that means the digital part is OK. The problem is in analog part that includes analog power supply (AV+, AV-), analog channel (the opamps), and ADC (TLC5510).

#### **A. Check AV+**

AV+ should be the same as or slightly lower than VRAW+. If it is significantly lower then it is possible that somewhere are shorted. If it is 0V L3 may be open.

#### **B. Check AV-**

AV- should be -6V or lower if you use a power supply of +9V or higher. If AV- is close to 0V then you would not be able to see any traces. For AV- problems please check:

- 1) Is D7 placed correct? - D7 should be placed with its striped end pointing to the crystal (see Fig. 1). If D7 is placed wrong Q1 is likely burnt. Q1, if burnt, can be replaced with any general purpose PNP transistor. A through-hole PNP transistor is also good if SMD not available. Please pay attention to polarity in installing through-hole transistors. Polarity is marked on PCB.
- 2) Is L2 open? - Please check it with multi-meter. It should read about 3 ohms.
- 3) Any possible short/open of components around Q1 and Q2?

#### **C. Check analog channel**

If AV+ and AV- are normal then analog channel should be checked. Put SW3 in GND position (this will ensure input to the analog channel is 0V) and follow steps below.

- 1) Measure voltage at pin 7 of U2. It should be 0V. If it is not check if R5 is opened or DN1 shorted.
- 2) Measure voltage at pin 1 of U1. It should also be 0V. If it is not check R6, R11, and SW2.
- 3) Measure voltages at pin 7 of U1 and pin 1 of U2. They should be approximately the same when voltage at U1 pin 1 is 0V. If this is not the case check R2, R3, R8, R12, and D1. Voltage at U2 pin 1 determines V.POS. It is generated by MCU and can be varied from panel (please see Operating Instructions).

#### D. Check ADC

Keep SW3 in GND position and change V.POS from panel (this adjusts voltage at pin 1 of U2) so that voltage at pin 7 of U1 falls in the range of 0.6V – 2.6V. When the voltage in this range trace should be seen on screen (remember to put scope trigger in AUTO mode when doing this checking). If not then problem lies in ADC chip, TLC5510.

- 1) First measure voltage at pin 19 of U5. It should be equal to that of U1 pin 7. If not R24 may be opened.
- 2) Check voltages at pin 16 (17) and pin 22 (23) of U5. They should be about 2.6V and 0.6V, respectively. If they are far from these values the chip is possibly bad.
- 3) Power the unit off and check connections between U5 and MCU with an ohmmeter. These connections include the 8 data lines (pin 3 - 10 of U5) and clock line (pin 12 of U5). Again sharp meter probes should be used and checks be made from pin to pin. This is try to uncover any bad soldering (possible opens/shorts).

### 4. Scope does not trig

Trigs are produced by comparing trig source signal to trigger level. Trigger level is generated at C16 by MCU via the RC filter formed by R21/C16 and is fed to U4 pin 4, the non-invert input of built-in comparator of ATmega64. Trig source signal is brought to the invert input of the comparator connected inside ATmega64. For internal trig this signal is from analog output at U1 pin 7 going through R30 to U4 pin 57. For external trig it is from the M.F.T. terminal via R31 to U4 pin 58 (PF3).

When trigger does not work the following items can be checked.

#### A. Trigger level

Measure the voltage at C16 while varying LEVEL setting from panel. This voltage should change accordingly. For internal trig the range of this voltage is from 0.6V – 2.6V and for external trig it is 0V – 5V. If this voltage is ok check connection between C16 and pin 4 of U4 for possible opens.

#### B. Trig sources

For internal trig check connection from U1 pin 7 to U4 pin 57 and soldering of R30. For external trig check connection from M.F.T. to pin 58 of U4.

### Revision History

| Version | Date       | Summary       |
|---------|------------|---------------|
| v01     | 2010.08.01 | First created |
|         |            |               |
|         |            |               |
|         |            |               |