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EL-31

Replacement display kit
for the
YAESU FT-301D

Construction, operational and functional description

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Table of Contents:

1 Introduction 3
2 Assembly of the display module 3
2.1 Parts lists 5
2.2 Step by Step assembly and testing of printed circuit boards 6
2.2.1 Assembling the pcb 6
2.2.2 Initial testing of the board 7
2.3 Start-up and adjustments 7
2.3.1 Adjustment of the voltage measurement circuit 8
2.3.2 Adjustment of the frequency measurement circuit 8
2.4 Conversion of the FT-301D 10
2.4.1 Removal of the old display board from the FT-301D 10
2.4.2 Installation of the new display board in the FT-301D 11
3 Operation and functions 13
3.1 Display 13
3.2 Communication with the display module 13
3.3 Menu structure 14
3.4 Modes 15
3.4.1 Frequency Display 15
3.4.2 Voltage Display 17
3.4.3 Morse readout of frequency 17
3.4.4 Morse readout of voltage 17
4 Software Update 18
4.1.1 Installing the USB-updater software on the PC 18
4.1.2 Installing the USB driver software 18
4.1.3 Transferring the software updates in the EL-31 20
5 Appendix 21
5.1 Specifications 21
5.2 Rulers 21
5.3 PCB assembly 22
5.4 Schematics 23

Important! Advices or tips for the correct function of the EL-31

Caution! The instructions must be observed carefully.

1 Introduction

The old YASEU FT-301D shortwave transceiver (first built in the 70s), is still popular, due to the very good receiver. It was probably one of the first devices that came with a digital frequency display. Unfortunately the display module with LEDs causes big problems. At that time the 7-segment LED displays were not as efficient as today, and they have a huge power consumption. The resulting heat had the effect that individual segments in the LED displays failed.

The replacement of the 7-segment displays was still possible some years ago. Today these components are practically impossible to buy and if so, at exorbitant prices. The replacements fail as well after some use due to overheating.

Today, modern microcontroller-controlled transceivers can be purchased. However many radio amateurs are enthusiastic about their old device. However it's no fun to use it with a damaged display.

Therefore a replacement display module has been developed that is 1:1 compatible with the old one and includes additional useful functions.

The assembling of the kit is simple, since wired components are used almost exclusively.

2 Assembly of the display module

For the assembly you need the following tools and additional material:

- 50 to 80W pencil-style soldering iron
- solder Ø 0.5mm flux-core
- small needle nose pliers
- several screwdrivers (Phillips)
- tweezers
- fine side cutter
- multi meter (ohmmeter, voltmeter)

It is advisable to study carefully and print out this documentation as a reference when you assemble the device. It allows you to control each implemented step.

Make sure the workspace is safe and free of static electricity, so that the installed elements are not damaged. It might be helpful to wear an antistatic bracelet. The illustrations (Table 3) on page 6 should help to identify the shapes and colors of the individual components.

The components, pcb and all mechanical elements corresponding to the component list (Table 2) are packed in a bag. Open the bag carefully, so that no components are lost or damaged.

Soldering is one of the most important aspects of setting up this device. A bad solder joint - even with a carefully assembled kit - can make it impossible to operate the unit and lead to frustration.

It's easy to create a good solder joint, if the following rules are observed:

1. Use a temperature controlled pencil-style soldering iron with about 50 to 80 watts. A 1 to 2 mm wide chisel or pyramid tip works best.
2. Set the temperature for lead-free solder to a maximum of 320°C (608°F) and for leaded tin to a maximum of 360°C (680°F).
3. The tip must always be clean and well tinned. Wipe the tip often on stainless steel wool (to be found in the cleaning-products department at a supermarket), never on a wet sponge. Otherwise the soldering iron tip cools off unnecessarily, and there is not enough heat at the solder joint.
4. Do not use solder pastes, but good quality solder wire with a flux-core.
5. Keep the soldering iron tip only once, but long enough (approximately 2 to 3 seconds), to the soldering joint, so that the solder can flow well. During this time enter very little solder between solder joint and tip.
6. Never touch the soldering pads on the board; otherwise a good soldering will not be possible. Should this happen anyway, clean the pcb with a lint-free cloth and benzine.
7. For multi-pole components such as IC sockets, plugs, etc. solder only 2 pins on diagonally opposite corners. This has the advantage that the elements can still be adjusted and afterwards soldered definitively. Subsequently, all other connections can be soldered.

Always make sure that you do not burn the already soldered components with the soldering iron.

The resistors in the parts list show the respective color coding (see also Table 1). If you are not familiar in dealing with the color coding, it is better to measure the resistance value with an ohmmeter prior to soldering.

Color coding of resistors with 4 rings				
Color	**Resistance in Ω**			**Tolerance**
	1st ring (1st digit)	**2nd ring (2nd digit)**	**3rd ring (multiplier)**	**4th ring**
none	-	-	-	±20%
silver	-	-	10^{-2} = 0.01	±10%
gold	-	-	10^{-1} = 0.1	±5%
black	-	0	10^{0} = 1	-
brown	1	1	10^{1} = 10	±1%
red	2	2	10^{2} = 100	±2%
orange	3	3	10^{3} = 1’000	-
yellow	4	4	10^{4} = 10’000	-
green	5	5	10^{5} = 100’000	±0.5%
blue	6	6	10^{6} = 1’000’000	±0.25%
violet	7	7	10^{7} = 10'000’000	±0.1%
gray	8	8	10^{8} = 100'000’000	-
white	9	9	10^{9} = 1'000'000’000	-

Table 1

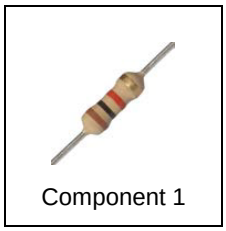
Note: all polarized components (diodes, transistors, capacitors, ICs, relays, etc.) must have the correct mounting orientation.

2.1 Parts lists

EL-31 board

piece	components No.	Description
1	R2 (not installed)	22Ω 1/8 W (red-red-black) [Component 1]
2	R8, R13	100Ω 1/8 W (brown- black - brown) [Component 1]
3	R6, R9, R10	10kΩ 1/8 W (brown -black-orange) [Component 1]
1	R12	33kΩ 1/8 W (orange-orange-orange) [Component 1]
2	R5, R7	47kΩ 1/8 W (yellow-violet-orange) [Component 1]
2	R1, R11	100kΩ 1/8 W (brown-black-yellow) [Component 1]
1	C7	6.5-30pF Trimmer (green) [Component 2]
1	C6	22pF ceramic, designated 150 [Component 16]
7	C1, C2, C3, C4, C5, C8, C11	0.1uF ceramic designated 104 [Component 3]
1	C10	1uF/50V electrolyte [Component 14]
2	C9, C12	47uF/16V electrolyte [Component 14]
1	X1	8MHz Crystal HC-49U [Component 4]
6	U1, U2, U3, U4, U5, U6	LSHD-A103, 7 Segment LED [Component 11]
1	U7	MAX7221CNG or AS1106PL [Component 8]
1	U8	PIC18F2550 I/SP programmed [Component 7]
1	U9	SN7400N Quad NAND [Component 6]
1	U10	TSOP4838 IR-Rx [Component 12]
1	B1	AT-1220-TT-5-R Buzzer [Component 13]
2	P1, P3	1x7 pin header [*Component 9*]
1	P4 (already installed)	USB-B mini jack (SMD) [Component 5]
1	J6 (not installed)	RJ-11 Jack
1	J1	Jumper on the board (leave open)
1	J2	Wire length 5cm red [Component 10]
1	J3	Wire length 30cm white [Component 10]
1	PCB EL-31	PCB Version 1.0a [Component 15]

Table 2

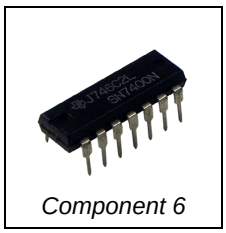

Component 1

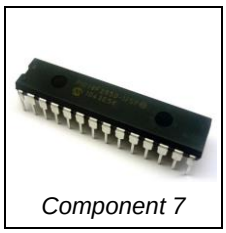
Component 2

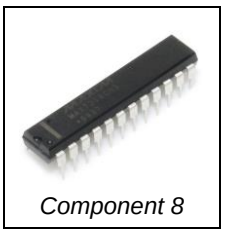
Component 3

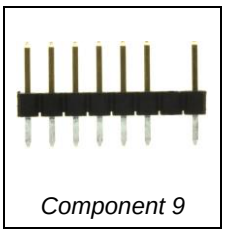
Component 4

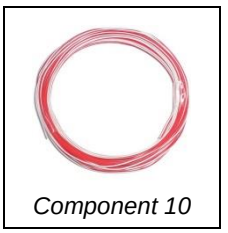
Component 5


Component 6


Component 7


Component 8


Component 9


Component 10

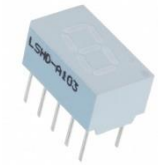
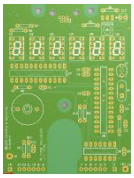
 Component 11	Component 12	Component 13	Component 14	 Component 15
Component 16				

Table 3

2.2 Step by Step assembly and testing of printed circuit boards

2.2.1 Assembling the pcb

For the placement drawings of the top and bottom of the pcb refer to Chapter 5.3 (Figure 18 and Figure 19). The SMD components are already assembled.

Populate the following components, using the parts list (Table 2).

- ☐ R1 to R13, resistors
- ☐ X1, Crystal 8MHz → The crystal is soldered with a small distance to the circuit board:

⚠ Cut a paper or a plastic strip 4mm x 30mm (thickness approx. 0.2mm) and place it on the component side between the two quartz ports. After soldering, remove the strip.

- ☐ C1 to 12, capacitors → mind the polarity in electrolytic capacitors!
- ☐ U1 to U6, 7-segment LED display 10 pin→ note installation direction!
- ☐ U7, IC MAX7221 or AS1106 LED Display-Driver 24 pin → note installation direction!

The LEDs must be very accurately aligned in a straight line! Solder only 2 pins (diagonal) first, so that the alignment can still be corrected.

- ☐ U8, IC PIC18F2550 microcontroller → note the installation direction!
- ☐ U9, IC SN7400N Quad 2-Port NAND → note the installation direction!
- ☐ U10, IC TSOP4838 IR Receiver → leads have to be turned by 90°.
- ☐ B1, AT-1220-TT-5-R Buzzer
- ☐ P1 and P3, pin connectors 2x7

⚠ The pin connectors are fitted on the backside and soldered on the front side. The pin strips must lie flat and stay perpendicular to the pcb.

- ☐ J2, Solder the 30 cm long white wire → This wire will be connected to the 13.8V supply voltage of the transceiver after installation of the display board into the FT-301D.

☐ J3, Solder the 5 cm long red wire → this wire will be connected to the resistor R15 (3.3kΩ) after installation of the pcb into the FT301D (see 2.4.1 Removal of the old display board from the FT-301D).

☐ Check all solder joints very accurately!

A magnifying glass may be helpful, because even the smallest, unwanted solder bridges can prove disastrous impact to the function.

2.2.2 Initial testing of the board

If all elements are fitted, a first electrical test can be followed.

Note: Keep your workspace clean so that the pcb is not laying on cut pieces of wires which can lead to short circuits.

☐ Plug in a 5V-power supply to the connector P3 (pin 1 is the +pole, pin 2 the -pole).

If you have a power supply with current limit set it to a maximum current of about 40mA.

☐ Turn on the power supply.
The following text will appear on the 7-segment display :

followed by the Morse code "R" (di-dah-dit)

☐ Subsequently the display is in the frequency measurement mode. If on P3 Pin 5 no RF-signal is present, the display will show

.

If the first test is successful, you can do the adjustment procedures for voltage and frequency.

2.3 Start-up and adjustments

For the calibration procedure, you need the following measurement instruments:

- Digital voltmeter for the range DC 0 to 20V (resolution 10mV)
- An additional (auxiliary) power supply, adjustable between DC 5 to 20V, minimal current 2mA
- PHILIPS or universal IR-remote control, set to the RC5 TV mode.
- A frequency counter with a range up to 15MHz and a resolution of 1Hz.
- A RF-signal generator in the frequency range 10 to 20MHz, in which the output signal can be set to about 0dBm (1mW, 223mV).

With the built in calibration routines, the display board can be easily calibrated for all operating modes.

For example if you set and save incorrect values in the voltage calibration procedure, the meter will indicate wrong values. But you can repeat the calibration procedures as many times as you want, until you get the correct result.

2.3.1 Adjustment of the voltage measurement circuit

☐ Plug in a 5V-power supply to the connector P3 (pin 1 is +pole, pin 2 is -pole).

If you own a power supply with current limit, set it to a maximum current of about 40mA.

☐ Connect the auxiliary power supply to the GND (-) and the white wire (+), connected to J2 on the display board.

☐ Set the voltage of the auxiliary power supply exactly on 13V. Measure the voltage with the voltmeter.

☐ Turn on the 5V power supply to power the display board.

☐ If the display shows `0.000.00` select, the `SEtUP` „Setup“-Mode, by pressing the **VOL+** or **VOL-** button on the remote control.

☐ Press the numeric key no 4 on the remote control. `CAL-U` „Calibrate V“ will be displayed.

☐ Using the **VOL+** or **VOL-** key to calibrate the display to exactly `13.00` Volt.

☐ Press again the numeric key no 4 on the remote control. You are now back to the `SEtUP` mode, and the calibration value is stored in the memory of the microcontroller.

☐ Select the display `U= 13.0` volts by using the **VOL+** or **VOL-** key.

☐ Increase the voltage on the auxiliary power supply to e.g. 15.7V (see Voltmeter) and the display should now show `U= 15.7` volts.

☐ The adjustment is completed. Turn off the auxiliary and the 5V power supply.

2.3.2 Adjustment of the frequency measurement circuit

For the following adjustments you should use an RF signal generator with a precise frequency from 10 to 15MHz at a level of about 0dBm (220mV). The frequency of the calibration is not as essential as is the precision with which the alignment can be implemented. This requires an accurate frequency counter (<1Hz accurate).

☐ If your RF signal generator has a TTL-level output, the auxiliary interface circuit is not needed.
You can connect the signal generator directly to the EL-31 P3 / Pin 3.

☐ For the injection of a sinusoidal test frequency an auxiliary circuit is required. This auxiliary circuit is available in the transceiver FT-301D, but it is needed to carry out the frequency alignment on the not built-in display board.

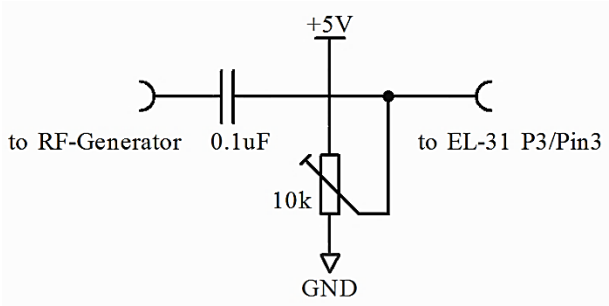


Figure 1

☐ Plug in a 5V-power supply to the connector P3 (pin 1 is +pole, pin 2 is -pole).

⚠ If you own a power supply with current limit, set it to a maximum current of about 40mA.

☐ Connect the frequency counter to the RF signal generator so that you can always measure the exact frequency.

☐ Connect the input of the auxiliary circuit to the signal generator. Connect the output of the auxiliary circuit with P3 / Pin 3 of the display board.

☐ Turn on the 5V power supply to power the display board.

☐ If the display shows `0.000.00` select the `SEtUP` „Setup“-Mode by pressing the **VOL+** or **VOL-** button on the remote control.

☐ Press the numeric key no **3** on the remote control. `AUto` „Automatic Frequency Display Mode“is displayed.

☐ Using the **VOL+** or **VOL-** buttons the `10 H2` „10Hz-Frequency Display Mode“, the frequency is always displayed in the 10Hz-resolution without the MHz digits.

☐ Press the numeric key no **3** on the remote control again. You are now back in the `SEtUP` mode.

☐ Press the **VOL+** or **VOL-** key until `-.000.00` is displayed.

☐ Turn on the signal generator and set a frequency, for example 13.000.000 MHz at a level of about 0dBm.

☐ Change the trim potentiometer at the auxiliary circuit to a stable frequency reading on the display unit, for example `-.999.75` (last digit = 10Hz).

☐ Set the frequency with a non-conductive screwdriver on the trimming capacitor C7 exactly to the frequency that you are reading on the frequency counter.
e.g. `-.000.00` if accurate 13.000.000 MHz is measured.

☐ Use the remote control by pressing the **VOL+** or **VOL-** key to select the `SEtUP` „Setup“ mode.

☐ Press the numeric key no **3** on the remote control. You see `10 H2`.

☐ Change with the **VOL+** or **VOL-** key to the `AUto` mode.

☐ Press the numeric key no **3** on the remote control again. You see `SEtUP`.

☐ Press the **VOL+** or **VOL-** key until the display shows `13.000.0` (last digit = 100Hz).

☐ The adjustment is completed. The auxiliary circuit can be disconnected from the display board and the power can be switched off.

2.4 Conversion of the FT-301D

2.4.1 Removal of the old display board from the FT-301D

⚠ To prevent problems the mechanical assembly has to be done strictly according to the following order:

☐ Remove the cover of the device, which is secured by four plastic tabs.

☐ Disconnect the cable from the speaker terminal.

☐ Place the unit upside down and remove the 12 screws and the bottom cover.

☐ Carefully pull off the two header connectors from the display board.

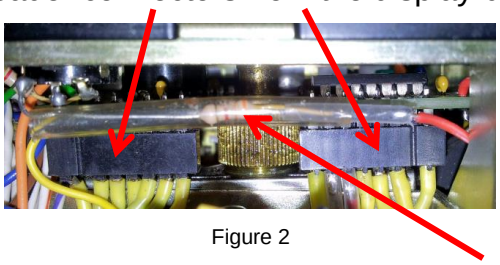


Figure 2

☐ With a side cutter cut the wire of the 3.3kΩ resistor to the terminal connector on the side it is soldered to the display board. The resistor will be reconnected after installation of the new display board into the FT-301D.

☐ Turn the device over again, so that the top is facing up.

☐ Remove the large frequency setting knob on the front panel by loosening the two grub screws.

☐ Remove the mounting screw behind the frequency setting knob (see Figure 3).

Figure 3

☐ Loosen the two screws securing the display device holder on top (do not remove entirely).

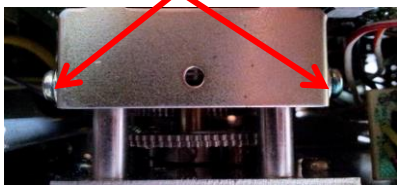


Figure 4

☐ Pull the display board upwards very carefully. You may need to tilt the board slightly.

2.4.2 Installation of the new display board in the FT-301D

☐ Remove the bracket from the old display board and mount them to the back of the new board. Use the same screws.

☐ Slide the new display board very carefully behind the front panel of your device until the mounting bracket rests on the two screws.

Note: The two wires (red and white) must be routed down.

☐ Install the mounting screw behind the frequency setting knob (see Figure 3).

☐ Tighten the two fixing screws on the display device holder again.

☐ Mount the large frequency setting knob on the front panel again.

☐ Turn the device over, so the bottom is facing up.

☐ Take 2cm (3/4”) of shrink tubing and put it over the red wire, which is soldered to the new display board.

☐ Solder the 3.3kΩ resistor to the red wire, and slip the shrink tube over the soldered point to prevent a short circuit.

☐ Carefully plug the two pin headers connections back to the new display board (see Figure 2).

☐ Route the white wire, which is soldered to the new display board, to the rear wall and solder it on the connection of the cable entry (see Figure 5).

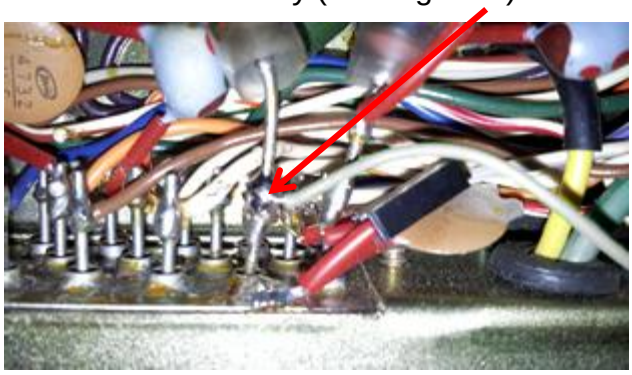


Figure 5

Before mounting the base and cover, a functional test is carried out.

☐ Connect the device to a power supply with a voltage of about 13.8V / 2A.

☐ Set the BAND switch to **20** and CHANNEL switch to **VFO**.

☐ Turn on the FT-301D. The following text will appear on the display: followed by the Morse code "R" (di-dah-dit).

☐ Now the frequency will be displayed, for example

Should the display show only ------ the display module is missing an input signal. The trimming potentiometer for the DC offset in the MIXER COUNTER UNIT PB-1541D must be re-adjusted.

Proceed as follows:

- ☐ Open the small metal cover (it is only pressed) of the COUNTER MIXER UNIT PB-1541D. This unit can be found on the bottom side behind the display unit.
- ☐ Using a small screwdriver, rotate the trim potentiometer until the display shows a stable frequency in the 20m band.

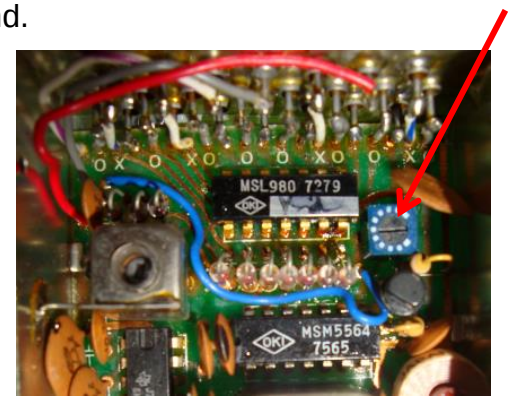


Figure 6

- ☐ Close (only press on) the MIXER COUNTER UNIT PB-1541D with the metal cover.

- ☐ Install the bottom cover with the 12 screws.
- ☐ Turn the device over, so that the top is facing up.
- ☐ Take off the cover and insert the speaker wire again.
- ☐ Put the cover onto the device and secure it with the four plastic plugs.

3 Operation and functions

The LED display EL-31 is primarily intended as a 1:1 replacement for the failure-prone original display module. With the modern microcontroller technology, it is relatively easy to implement additional features and make the replacement even more worthwhile.

The various operating modes will be explained below.

3.1 Display

The display is a six-digit, 7 segments LED on one line.

7 segment LEDs were originally developed for the display of numeric characters and often used in watches or first digital calculators. For alphanumeric characters the 7-segment display is only partly suitable. With some performance loss it is possible to display simple information.

In the EL-31, the characters are as defined in Figure 7:

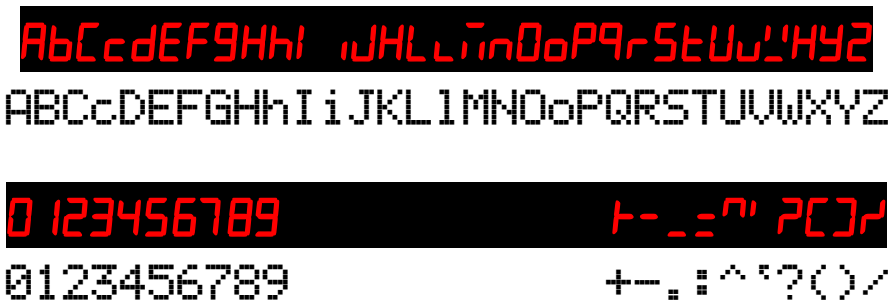


Figure 7

3.2 Communication with the display module

The display module has no input elements such as keys that allow selecting the different functions of the EL 31. To be able to communicate with the built-in display module on the EL-31 an infrared sensor is installed. With a commercially available IR remote control transmitter, as are common for TV sets, commands can be sent to the display module.

The remote control must control the RC5 protocol from PHILIPS. If you use auniversal IR remote control unit, select a device code for a Philips TV-set.

On the IR remote control, the following keys can be used:

VOL+	→	**Up**	Change menu / selection
VOL-	→	**Down**	Change menu / selection
0 to 9	→	**0 ..9**	Selection of item

The 6-digit 7-segment display is used as feedback for the inputs. Unfortunately, the comfort is not great; therefore only short status messages to the user are possible.

For visually handicapped users, there is an acoustic feedback for the frequency- and the voltage display by Morse code via the built-in buzzer.

All settings are stored in the microcontroller of the display.

3.3 Menu structure

Operation is done via menus, which are shown in the figures below.

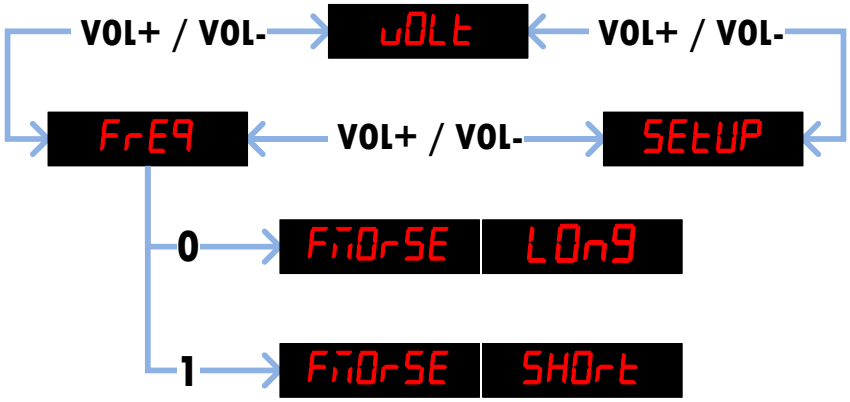


Figure 8

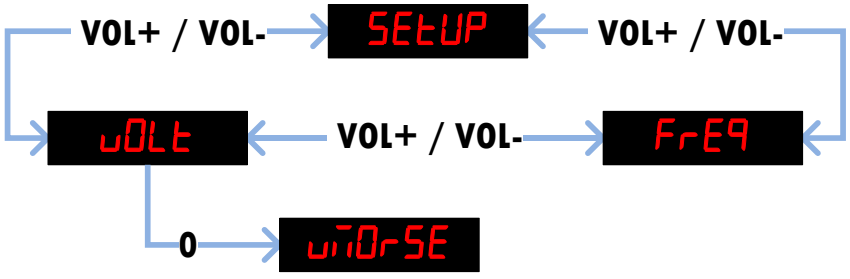


Figure 9

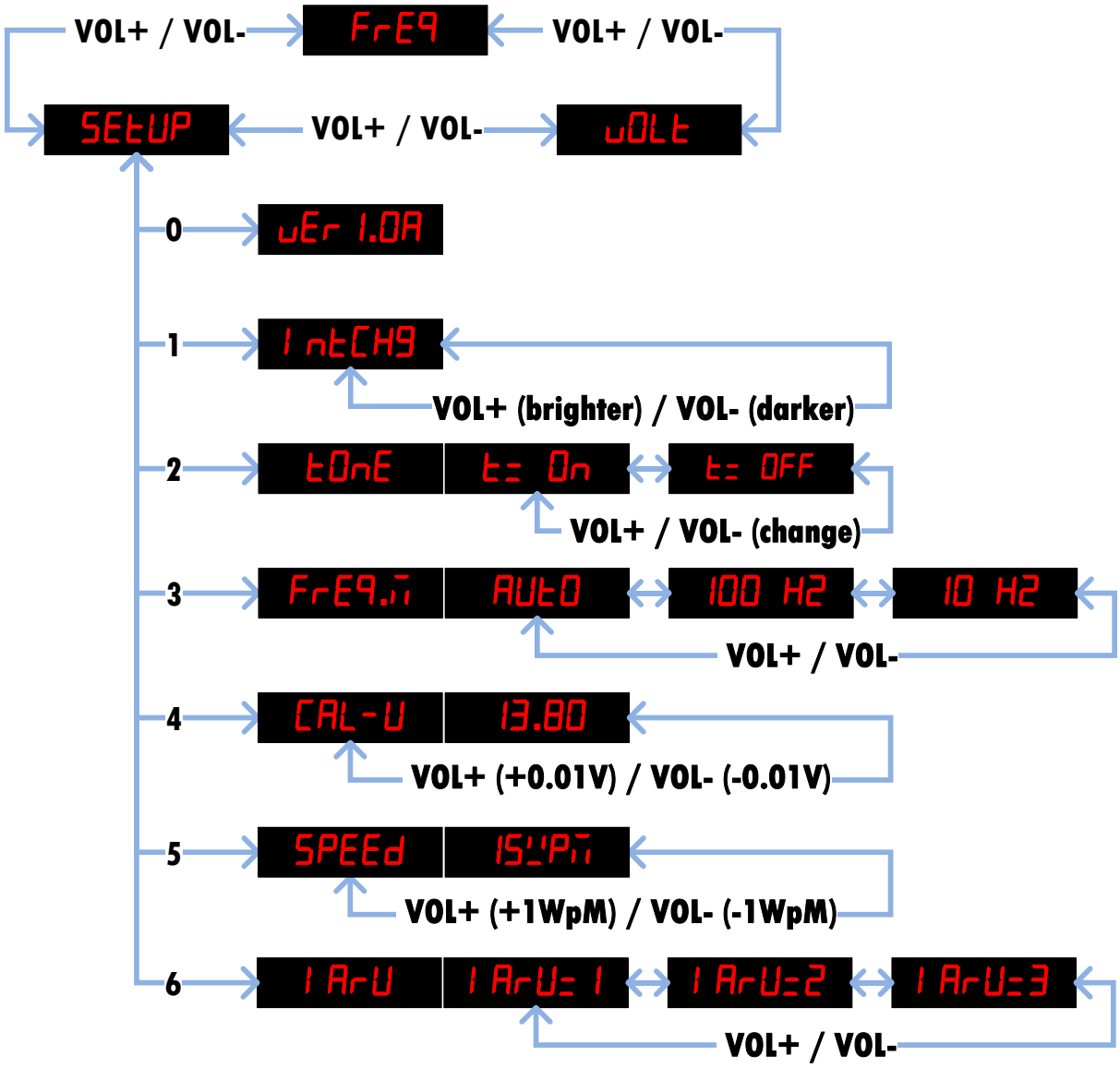


Figure 10

3.4 Modes

3.4.1 Frequency Display

After switching on the FT-301D, the frequency display mode is automatically selected. This is the standard setting and also the basic function of the digital display for the FT-301D. All frequency display options of the original display board are implemented in EL 31.

The frequency is measured with a 10 Hz resolution, even if the frequency is displayed in a 100Hz resolution only.

A big advantage of the new digital frequency display is that the frequency range is not limited anymore within a range of 500 kHz. Since the tuning range of the VFO reaches about 50 to 100 kHz over the lower and upper frequency range, a transfer of the one-MHz digit must be executed.

For example, a frequency of 29.010 MHz (VFO slightly above the 500 kHz range) in the band switch position 10C (28.5 MHz) no longer appears as 28.510 MHz, but correctly as 29.010 MHz.

The new digital display offers the following display modes:

100Hz-Mode:

This mode displays the frequency in 100Hz resolution and corresponds to the original display. We set this mode with the remote control via the menu SEtUP.

- ☐ Press the numeric key no **3** on the remote control. For example AUtO might be displayed.
- ☐ Change to the 100 H2 mode by using the **VOL+** or **VOL-** key.
- ☐ Press the numeric key no **3** again. You are now back in the SEtUP mode.
- ☐ Change to the FrE9 mode by using the **VOL+** or **VOL-** key.

10Hz-Mode:

This mode always shows the frequency in 10 Hz resolution.

We set this mode with the remote control via the menu SEtUP.

- ☐ Press the numeric key no **3** on the remote control. For example 100 H2 might be displayed.
- ☐ Change to the 10 H2 mode by using the **VOL+** or **VOL-** key.
- ☐ Press the numeric key no **3** again. You are now back in the SEtUP mode.
- ☐ By using the **VOL+** or **VOL-** key change to the FrE9 mode.

Since at frequencies of > 9.999.99 MHz the 6-digit display is no longer sufficient, the frequency is always displayed in the format -.537.32. The -. in the one-MHz digit indicates that the display is permanently set at 10Hz format.

Auto-Mode:

This mode of operation always displays the frequency in the highest possible resolution. Below 10 MHz, the resolution is 10Hz and changes over 10MHz in the 100Hz mode.

We set this mode with the remote control via the menu SEtUP.

- ☐ Press the numeric key no **3** on the remote control. For example 10 H2 might be displayed.
- ☐ Change to the AUtO mode by using the **VOL+** or **VOL-** key.
- ☐ Press the numeric key no **3** again. You are now back in the SEtUP mode.
- ☐ Change to the FrE9 mode by using the **VOL+** or **VOL-** key.

3.4.2 Voltage Display

The voltage display is an additional function.

This feature allows you to measure an external voltage in the range of 0 to 20V. Usually the operating voltage of the device (nominal 13.8V) is measured within 100mV and displayed.

☐ Change to the uOLt mode by using the **VOL+** or **VOL-** key.

To obtain an accurate reading, the voltage measurement must be calibrated first (see chapter 2.3.1).

3.4.3 Morse readout of frequency

When the frequency appears on the display, it is possible to emit this information as Morse code via the built-in buzzer.

☐ Change to the FrE9 mode by using the **VOL+** or **VOL-** key.

☐ Press the numeric key no **0** (**zero**). → this results in the "long" output of the frequency; i.e. the frequency is emitted in MHz.kHz (without the 100Hz- and 10Hz- digits)

☐ Press the numeric key no **1** → this results in the "short" output of the frequency; i.e. the frequency is emitted in *kHz* only (without the MHz-, 100Hz- und 10Hz- digits).

3.4.4 Morse readout of voltage

When the voltage appears on the display, it is possible to emit this information as Morse code through the built-in buzzer.

☐ Change to the uOLt mode by using the **VOL+** or **VOL-** key.

☐ Press the numeric key no **0** (**zero**) → this results in the output of the voltage; i.e. the voltage is emitted in *V.100mV*.

4 Software Update

To keep the digital display EL 31 up to date a new software version can be programmed into the EL 31 with the program "USB Updater". For this purpose; a "Loader" software for the PC and a USB cable from the PC to EL 31 are needed.

The required software and all necessary drivers can be downloaded from the website http://shop.elcon.ch

Unzip the zip file into the directory "EL-31 USB-Loader Setup" and open the file "EL-31 USB-Loader Setup \ cd.htm with the Internet Explorer,

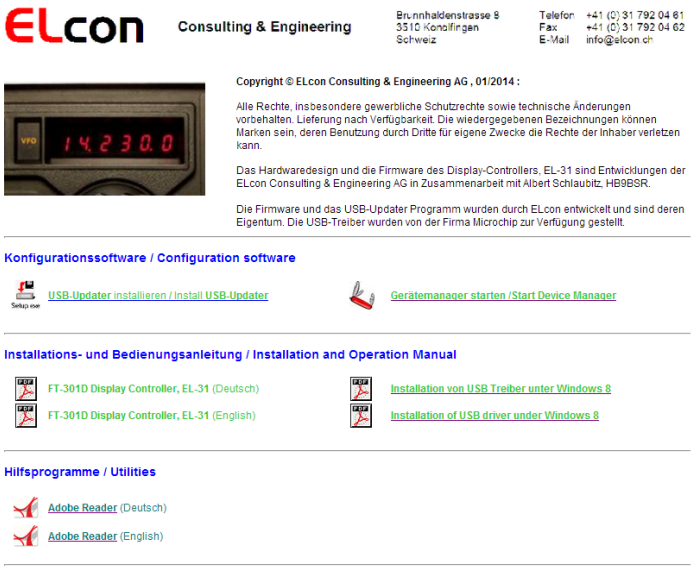


Figure 11

4.1.1 Installing the USB-updater software on the PC

The USB-updater program must first be installed on your PC.

- ☐ Close all applications running on the PC.
- ☐ From the CD or USB stick open the file "... \ USB-Loader Setup \ cd.htm" with an Internet browser → the window appears as shown in Figure 11.
- ☐ Start the "USB-updater" installation program by clicking on the link

  USB-Updater installieren / install **USB-Updater** (see Figure 11).

  and follow the installation instructions.

4.1.2 Installing the USB driver software

So that the "USB-updater" program can communicate via USB connection with the microcontroller, the PC requires a special USB driver. These drivers are located in the ". \ USB-Loader Setup \ USB Updater \ Driver" directory.

Proceed with the installation as follows:

- ☐ Download the latest firmware update "EL 31xxx.elc" or "EL 31xxx.hex" from the website http://shop.elcon.ch and save the file on your PC to a folder of your choice.
- ☐ Turn on the FT-301D.
- ☐ Connect the PC with a USB cable (A / mini B) to the USB connector P4 of the EL 31. The display of the FT-301D shows SW-UP9 SW-UP8 etc. to SW-UP0 . You have the option to cancel the "USB update" within 10 seconds, by removing the USB cable from the EL-31.

☐ When UPdAtE is displayed, the microcontroller of the digital display in the FT-301D is ready to exchange data with the PC.

☐ Once your PC recognizes the new device, a window "Wizard Installation" of new hardware appears.

For some operating systems, the installation of unsigned drivers will be blocked to protect the user. Especially on Windows 8 /8.1 the drivers needs to be installed in a special manner. With the command in Command Prompt "Shutdown.exe / r / o" Windows 8 will launch directly to the boot menu option. Further details are on the website (see Figure 11).

☐ Follow the wizard prompts → step ① to ⑦.
Look carefully at the activated buttons (see ➔) . Depending on the operating system, the window text may differ slightly. (As an example here the installation on Windows 8.1).

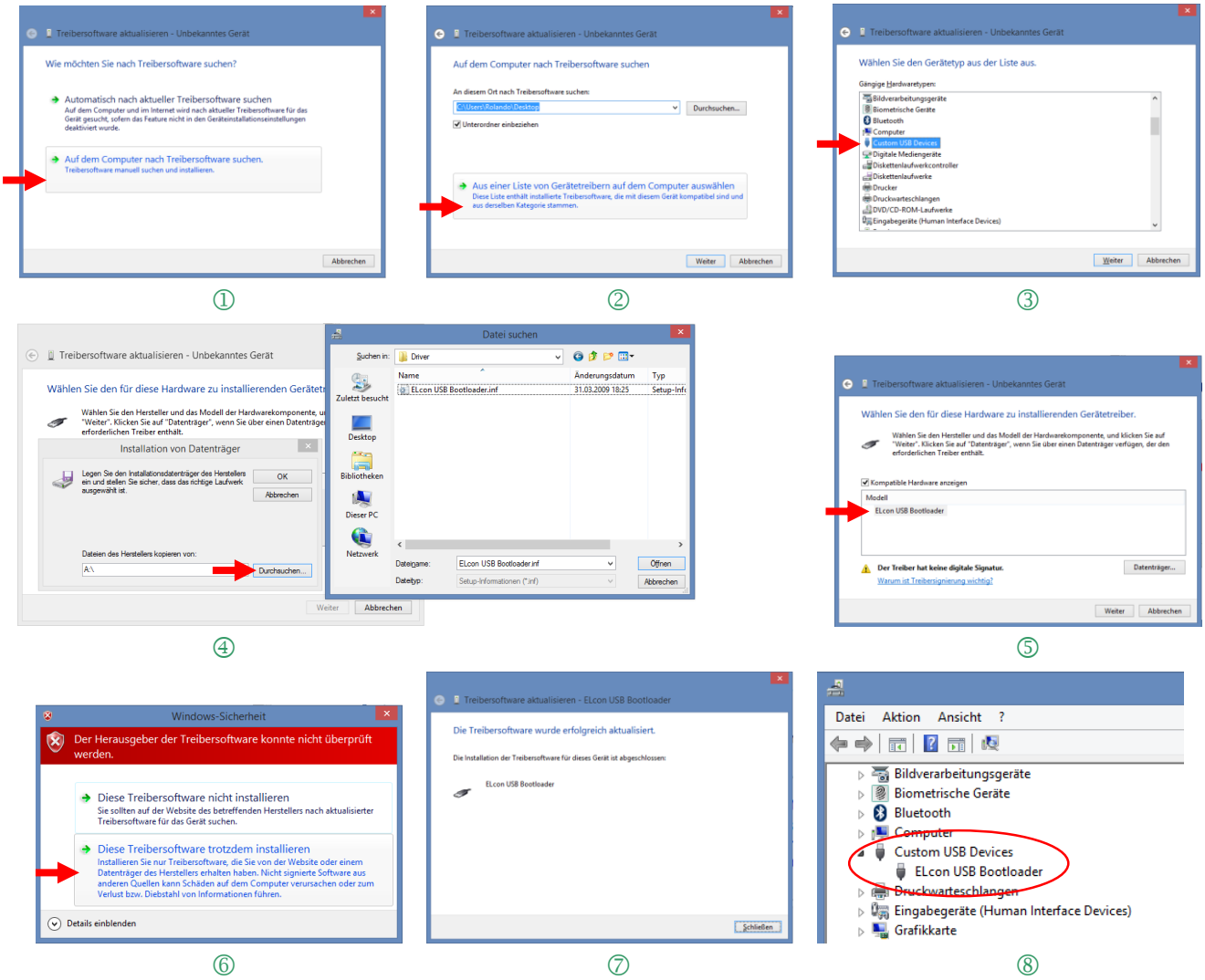


Figure 12

☐ With the Device Manager, the result can be checked under "Custom USB Devices" (see ⑧) → there is a new entry "Elcon USB Bootloader" as long as the connection with the EL-31 exists.

The Device Manager can be started directly from the Web page (see Figure 11).

4.1.3 Transferring the software updates in the EL-31

For the software update proceed as follows:

- ☐ Download the latest firmware update "EL 31xxx.elc" or "EL 31xxx.hex" from the website http://shop.elcon.ch and save the file on your PC to a folder of your choice.
- ☐ Turn off the FT-301D (EL-31).
- ☐ Connect the PC with a USB cable (A / mini B) to the USB connector P4 of the EL 31.
- ☐ Start the program "USB Updater.exe". The program opens the following "USB Updater" program window.

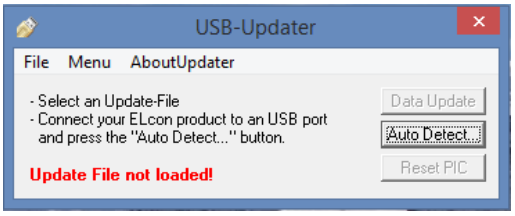


Figure 13

- ☐ Click to [Auto Detect...] button to connect the USB-updater program automatically with the EL-31. The following "Auto Detect" window should show a successful detection of the EL-31 USB boot loader in order to perform the software update.
  Confirm with the key [OK].

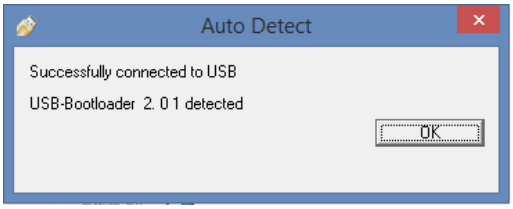


Figure 14

- ☐ Load the update file EL 31xxx.ELC or EL 31xxx.HEX with <File / Open…> or <Ctrl+O>.

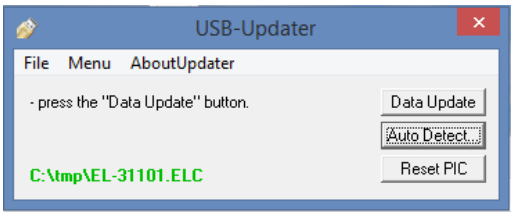


Figure 15

- ☐ Start the data transfer with the key [Data Update].

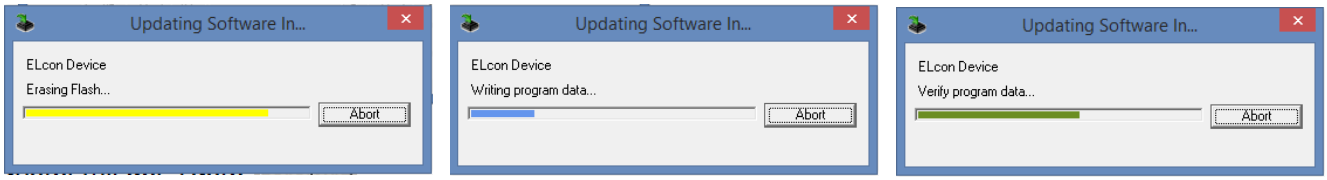


Figure 16

- ☐ Do not interrupt the loading process until the program update is completed and you see the following message:

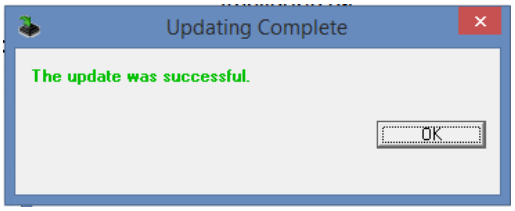


Figure 17

If the data transmitting is not successful, check the correct USB connection to the EL 31 by using the Device Manager and verify if the “Elcon USB Bootloader” is listed in "Custom USB Devices" section.
Then repeat the data update.

5 Appendix

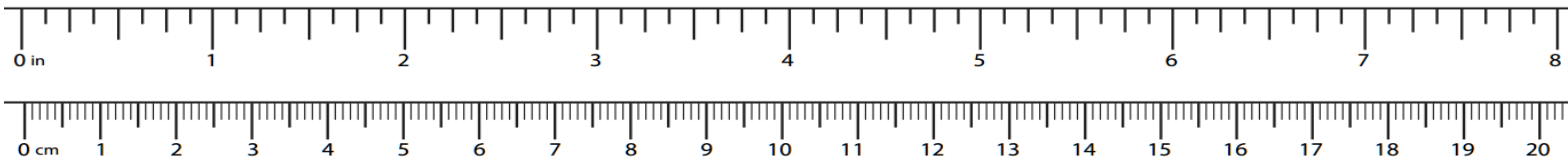
5.1 Specifications

Measuring ranges:

Frequency:	0 -30MHz
Power supply:	5V from FT-301D, about 30-70mA (depending on mode)
Dimensions:	160(L) × 90(B) × 35(H) mm

All specifications can be changed by Elcon without further notice or obligation.

5.2 Rulers



5.3 PCB assembly

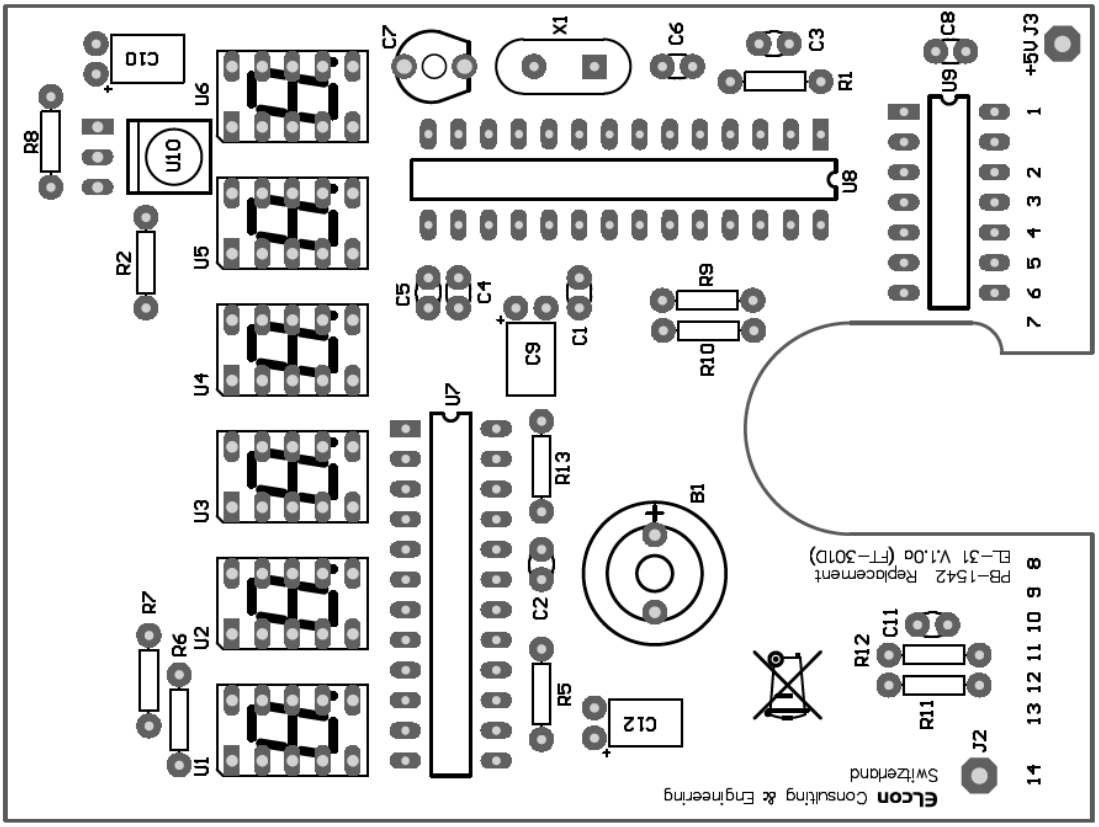


Figure 18

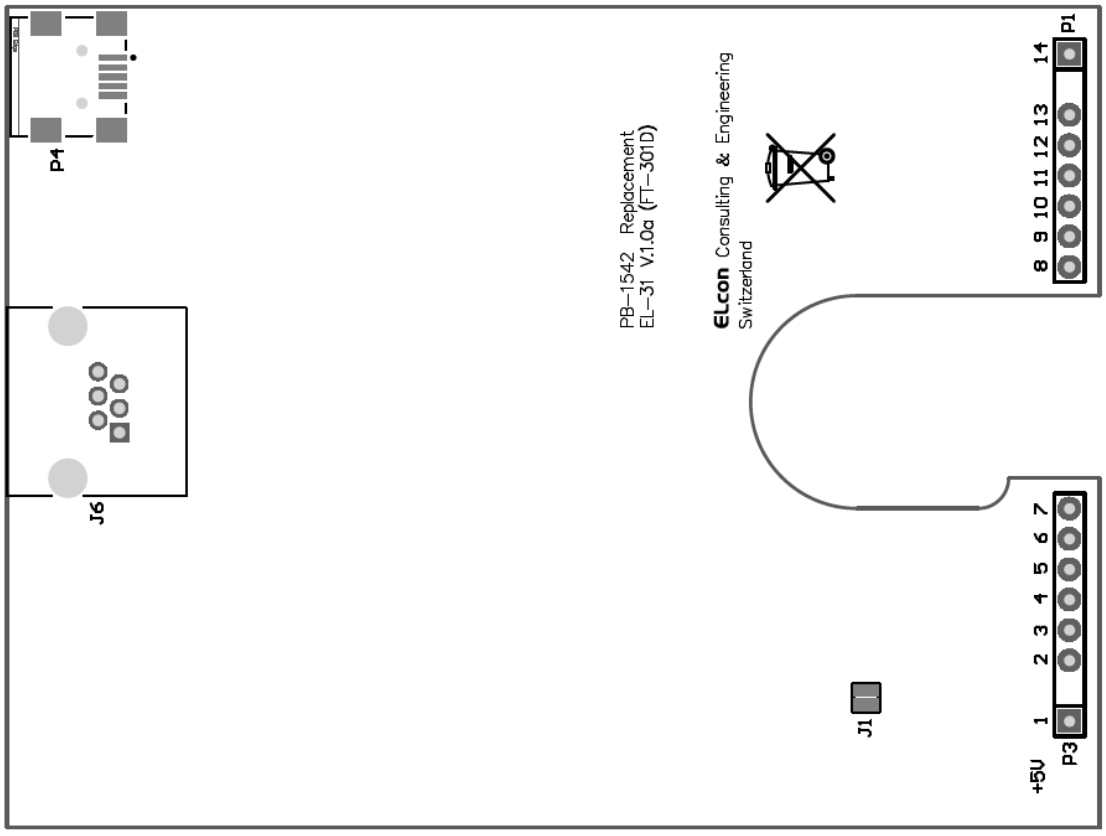
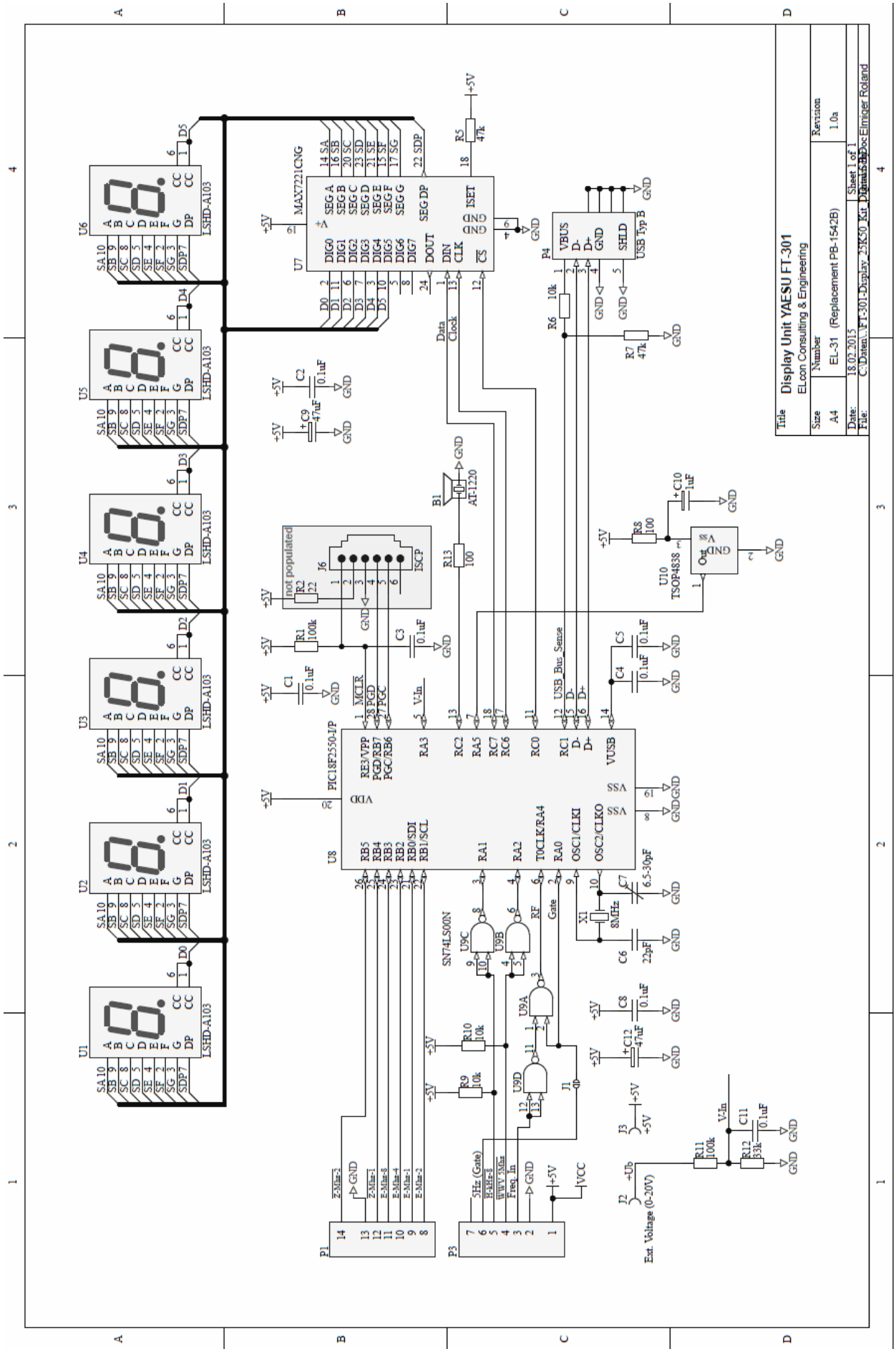


Figure 19

5.4 Schematics