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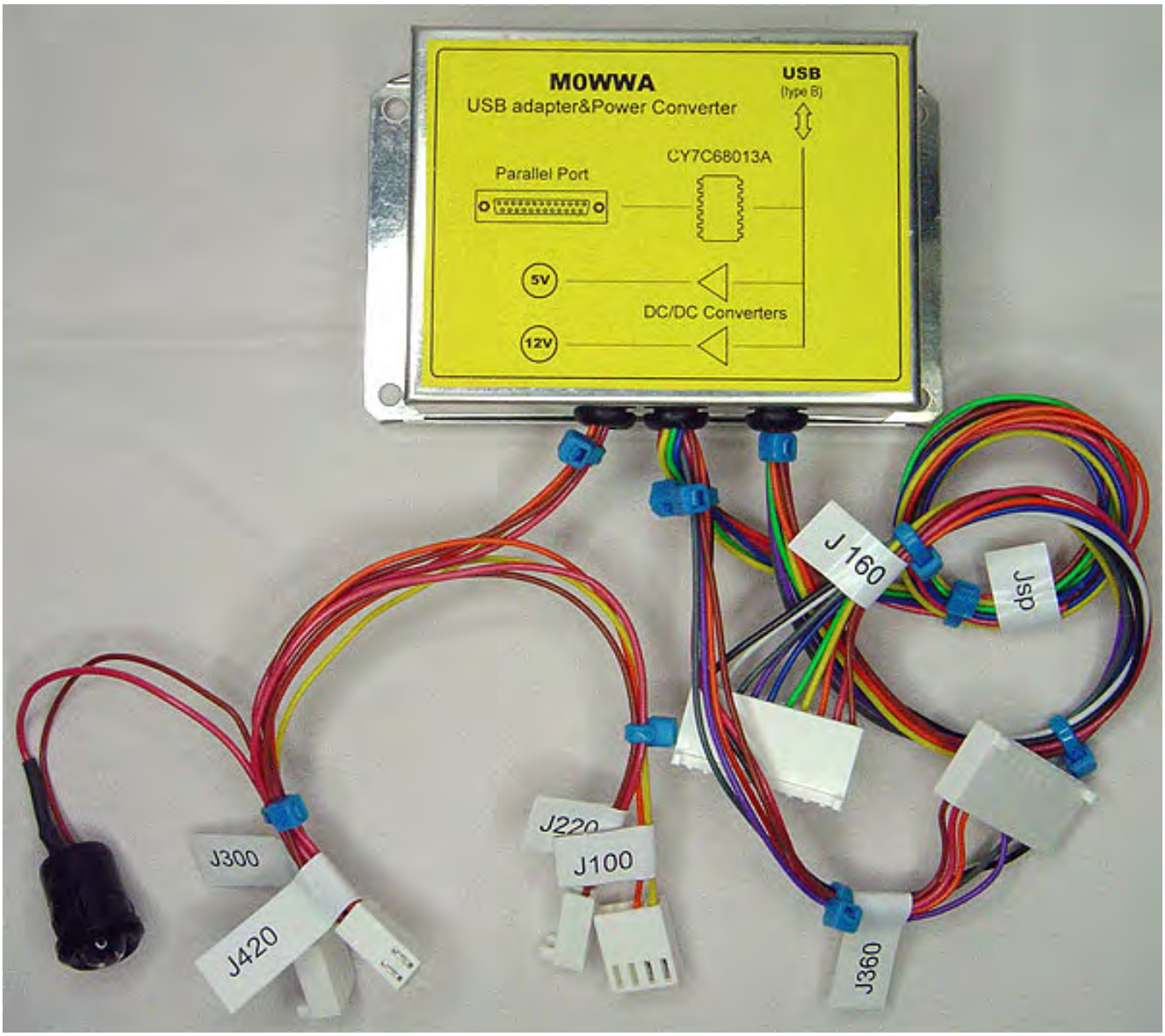


USB Adapter & Power Converter. Assembly manual.

Revision 01. December 2008

Preventing Electrostatic Discharge Damage

There is no climate or work location where the components of your USB Adapter & Power Converter are safe from Electrostatic Discharge (ESD) unless you take specific steps to prevent such damage.
Many of the components in your USB Adapter & Power Converter can be damaged by static discharges of only a few volts far too little for you to notice. It is those low-voltage but destructive discharges that easily happen anywhere and under virtually any environmental conditions.
ESD damage may not be apparent at first. The damaged components may not fail completely. Instead, the damage may result in below-normal performance for an extended period of time before you experience a total failure.

How ESD Damage Occurs

Whenever an object containing a static charge touches a circuit in your USB Adapter & Power Converter, current will rush into the circuit until the components reach the same voltage as the source of the static charge.
If the voltage or current that passes through a component in your USB Adapter & Power Converter during that brief period exceeds its normal operating specifications, it may be damaged or destroyed.

Preventing ESD Damage

ESD damage cannot occur if there is no voltage difference between the components in your USB Adapter & Power Converter and any object that touches them.
That is how anti-static packaging works. Anti-static bags allow the static charge to flow over their surface, so that any part of the bag that touches the components inside are all at the same potential at all times.
Anti-static foam keeps the leads of sensitive components at the same potential.
At your work bench, avoiding a dangerous voltage is achieved most easily by tying everything together and connecting them to a common mains safety ground. This includes your USB Adapter & Power Converter, individual board or other sensitive components as well as everything they may touch at the work table.
Inexpensive static dissipating work mats are readily-available that will steadily and safely drain off any charges built up on parts or circuit board placed on them.
They are supplied with a lead that connects the mat to the common workbench ground.
Also, metal cabinets on test equipment used on the bench should be tied togetherand connected to the common ground.
Most importantly, you must have a way of continuously draining off any static charges that occur on your body. Such charges are easy to create, even while sitting quietly at the work bench. Moving your feet on the floor, shifting position in your chair or even moving your arms so that clothing rubs against itself can all produce destructive static charges. You can discharge yourself by touching an unpainted metal ground, but that will last only until you move in a way that produces a new static charge. The safest technique is to wear a grounded wrist strap with a series 1-megohm resistor that continuously drains off any charges. Such wrist straps are readily available and inexpensive.

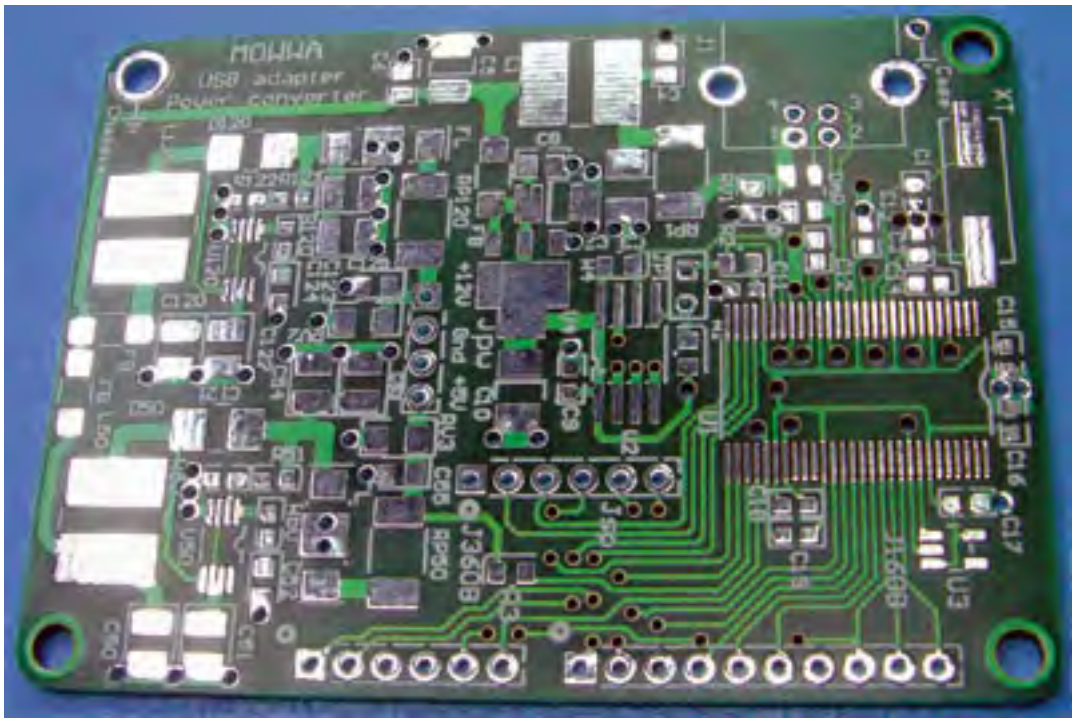
WARNING

DO NOT attach a ground directly to yourself without a current-limiting resistor as this poses a serious shock hazard.
A wrist strap must include a 1-megohm resistor to limit the current flow.
If you choose to touch an unpainted, metal ground to discharge yourself, do it only when you are not touching any live circuits with your other hand or any part of your body.
I strongly recommend you take the following anti-static precautions to avoid trouble:
- Leave ESD-sensitive parts in their anti-static packaging until you install them. The packaging may be a special plastic bag or the component's leads may be inserted in conductive foam. Parts which are especially ESD-sensitive are identified in the parts list and in the assembly procedures.
- Wear a conductive wrist strap with a series 1-megohm resistor. If you do not have a wrist strap, touch a ground briefly before touching any sensitive parts to discharge your body. Do this frequently while you are working. You can collect a destructive static charge on your body just sitting at the work bench. DO NOT attach a ground directly to yourself as this poses a serious shock hazard.
- Use a grounded anti-static mat on your work bench.
- Be sure the iron is ESD-safe with a grounded tip tied to the same common ground used by your mat or wrist strap.

Preparing for Assembly

Overview

The USB Adapter & Power Converter kit version comprises one PCB assembly.
The figure shows the high-quality double-sided plated through hole bare PC board.



Tools Required

You will need the following tools to build the kit:

- Fine-tip temperature-controlled ESD-safe soldering station with grounded tip 370-430°C (700 to 800°F) lonf life type no greater than 1 mm. Use the temperature-controlled station.
- IC-grade, small-diameter solder wire no more that 0.7mm in diameter. Small diameter solder is important to avoid filling adjacent solder pads and creating solder bridges.
- DO NOT use acid-core solder wire or water-soluble flux solder.
- High quality Flux pen solder such as Electrolube.
- Flux residue remover.
- Fine tips Tweezers.
- Wire stripper.
- Small diagonal cutters. Flush-cutting type.
- Magnifying visor or magnifying glass with a hands-free stand.
- Desoldering tools and supplies are invaluable. Narrow solder wick or a good vacuum desoldering are recommended.
- A 12V 1 Amp. Power Supply with Voltimeter and Ammeter.
- Digital Multimeter (DMM)

The following tools are strongly recommended:

- ESD wrist strap.
- Static dissipating work mat.

Soldering and Desoldering

Use adequate ventilation when soldering; avoid inhaling smoke or fumes. Always wash your hands after handling solder, as lead residue is highly toxic.

When applying solder, use the minimum amount required to surround the component lead and make good contact with its printed-circuit pad. You don't need a "fillet" (build-up) of solder. This will avoid unwanted solder bridges.

The solder must flow onto both the component lead and its PC board pad. To ensure that both will be heated at the same time, the tip of the iron should contact both the component lead and the PC board pad before solder is applied.

Solder joints should be clean and shiny. If a joint appears dull or has fine cracks, it is probably cold.

Cold solder joints should be cleaned and re-soldered. First, use solder wick (desoldering braid) to remove the old solder. Then apply fresh solder. If you have many cold solder joints, it probably indicates that your soldering iron temperature is too low, or that the tip or solder itself is defective.

The USB Adapter & Power Converter kit version uses ROHS compliance high-quality double-sided PC board.

Removing components can be difficult, since you must get all of the solder back out of the hole before a lead can be removed.

To do this, you'll need solder wick (desoldering braid) and/or a vacuum desoldering tool. It also takes some practice. A number of suggestions are provided below.

The best strategy for avoiding de-soldering is to place all components properly the first time. Double-check values and orientations, and avoid damaging parts via ESD.

When removing components:

- Don't pull a lead or pin out of a hole unless the solder has been removed or you are applying heat. Otherwise you can literally pull the plating out of the plated-through hole.
- Limit soldering iron contact to a few seconds at a time.
- Use small-size solder-wick. Use the wick on both the top and bottom padswhen possible. This helps get all of the solder out of the hole.
- If you use a vacuum desoldering tool (solder sucker), use a large unit. Small solder suckers are not very effective.
- The safest way to remove ICs and other components with more than 3 leads is to clip all of the pins at the body of the device first, then remove all of the pins individually. You may damage pads and traces by trying to remove such components intact.
- Invest in a PC board vice with a heavy base if possible. This makes parts removal easier because it frees up both hands.

Unpacking and Inventory

Preventing Electro-Static Discharge Damage

The Cypress CY7C68013A microcontroller used in the USB Adapter & Power Converter is sensitive to Electro-Static Discharge (ESD) damage.
ESD damage may not make the circuit fail completely. Sometimes the unit may continue to operate somewhat, creating a very difficult-to-find problem. We strongly recommend that you take the following precautions whenever handling the PC board when the microcontroller is installed.
The precautions are listed in their order of importance:
1. Leave the microcontroller in its anti-static packaging until you install it.
2. Wear a conductive wrist strap with a 1-megohm series resistor when handling the microcontroller or the board with it installed. If you do not have a wrist strap, frequently touch an unpainted ground while working. You can collect a destructive charge on your body just sitting at the work bench.
Do not attach a ground directly to yourself as this poses a serious shock hazard.
3. Use an ESD-safe soldering iron with a grounded tip.
4. Use a grounded anti-static mat on your work bench.

Before starting construction, do a complete inventory, comparing the parts in your kit with the parts list to familiarize yourself with all of the parts and to ensure the kit is complete.

USB Adapter & Power Converter. Bill of materials.

Type	Reference	Description	Quantity
SMD resistor	R2,R4	2K2 Ohms 0805-1%	2
SMD resistor	R3	10K Ohms 0805-1%	1
SMD resistor	R120,R122	40K2 Ohms 0603-1%	2
SMD resistor	R121	332K Ohms 0603-1%	1
SMD resistor	R50-R51	20K5 Ohms 0603-1%	2
SMD resistor	R52	6K98 Ohms 0603-1%	1
Chip cap	C1,C2	12pF/50V 0603 NP0	2
Chip cap	C4,C6,C8	100nF/50v 0805	3
Chip cap	C9-C11-C19	100nF/50v 0603	10
Chip cap	C120,121,123 C124,C50,C51 C53,54	10uF/16V ceramic 1210	8
Chip cap	C52,C122	1n5/50V 0805	2
Tantallum cap	C3-5-7-10	22uF/16V	4
Tantallum cap	C55,C125	10uF/16V Low ESR 0805	2
Chip cap	C120,121,123, C124,C50,C51, C53,C54	10uF/16V	8
IC	U1	CY7C68013A-56PVXI or C/ CYPRESS	1
IC	U2	24LC64/EEPROM64K	1
IC	U3	TPS3820-33DBVT/Supervisory circuit	1

USB Adapter & Power Converter. Bill of materials.

Type	Reference	Description	Quantity
IC	U4	LD1117S33TR/ Volt Reg	1
IC	U50,U120	LM3224MM/Boost Converter	1
SMD	D50,D120	10BQ040/1Amp-40V Schottky	2
SMD	XT	24MHz ACT HC49/US-SMX	1
SMD	RV1,RV3	5V6/1206/Transient Suppressor	2
SMD	RV2	14V/1206/Transient Suppressor	1
SMD	RP1,RP50	Polyswitch/1 Amp	2
SMD	RP120	Polyswitch/0.5 Amp	1
SMD	FL	4000pF PI Filter Tusonix	2
SMD	L1	SMD POWER INDUCTOR 100UH	1
SMD	L50,L120	SMD POWER INDUCTOR 10UH	2
SMD	FB	Bead core 91 Ohm	3
Socket	J1	USB socket type B	1
Spacers	Hex.	M3x8mm.	4
Screws		M3x6mm.	4
Washers		M3	4
PCB			1

Assembling

Do not solder the three ferrite beads “FB”. It will do on Start up section.
Either wear a grounded anti-static wrist strap or touch an unpainted, grounded object before handling the ICs in the next step.
Using Fig. 1 as reference:

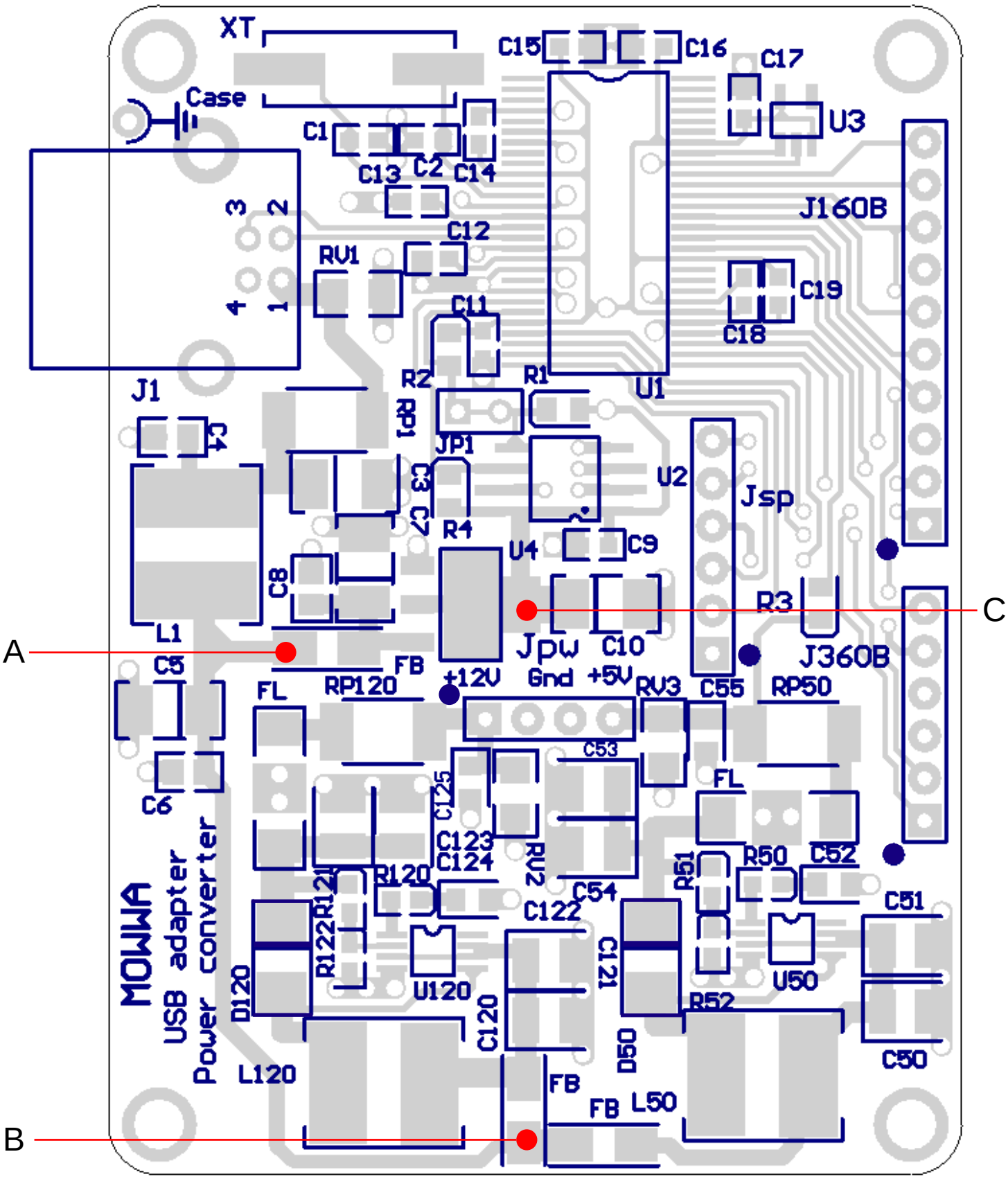
- ☐ U1, U2, U3,U4, U50, U120. Check position
- ☐ C4,C6,C8 Chip caps 100n/0805
- ☐ C52,C122 Chip caps 1n5/0805
- ☐ C55,C125 Caps Tantal 10uF/16V/0805/low ESR. Check position
- ☐ C1,C2 Chip caps 12pF/0603
- ☐ C9,C11-C19 Chip caps 100n/0603
- ☐ C3,C5,C7,C10 Caps Tantal 22uF/16V. Check position
- ☐ R2,R4 Res 2K2/1%/0805
- ☐ R10 Res 10K/1%/0805
- ☐ R120,R122 Res 40K2/1%/0603
- ☐ R121 Res 332k/1%/0603
- ☐ R50,R51 Res 20K5/1%/0603
- ☐ R52 Res 6K98/1%/0603
- ☐ RV1,RV3 Voltage suppressor 5V6/1206
- ☐ RV2 Voltage suppressor 14V/1206
- ☐ FLs PI filters
- ☐ D50,D120 Diodes 10BQ040. Check position
- ☐ C50,C51,C53,C54,C120,C121,C123,C124 Chip caps 10uF/16V/1210
- ☐ RP1,RP50 Polyswitch 1 Amp.
- ☐ RP120 Polyswitch 0.5 Amp.

- ☐ L1 SMD Power Inductor 100UH.
- ☐ L50, L120 SMD Power Inductor 10UH.
- ☐ XT, Quartz Crystal 24MHz.
- ☐ J1 USB socket type B.
- ☐ Solder a piece of wire of 5cms (2inch) at pad labelled “Case” beside the USB socket. Futhermore this wire must be fix to the enclosure (earth) where you will mount the board.
- ☐ Clean the board.
- ☐ Mount the spacers

Visual Inspection.

Use a magnifier and carefully check the board for any missed solder connections or solder bridges.
Verify that there are no leads or solder fillets too high on the board.
Clean the PCB.

Figure1



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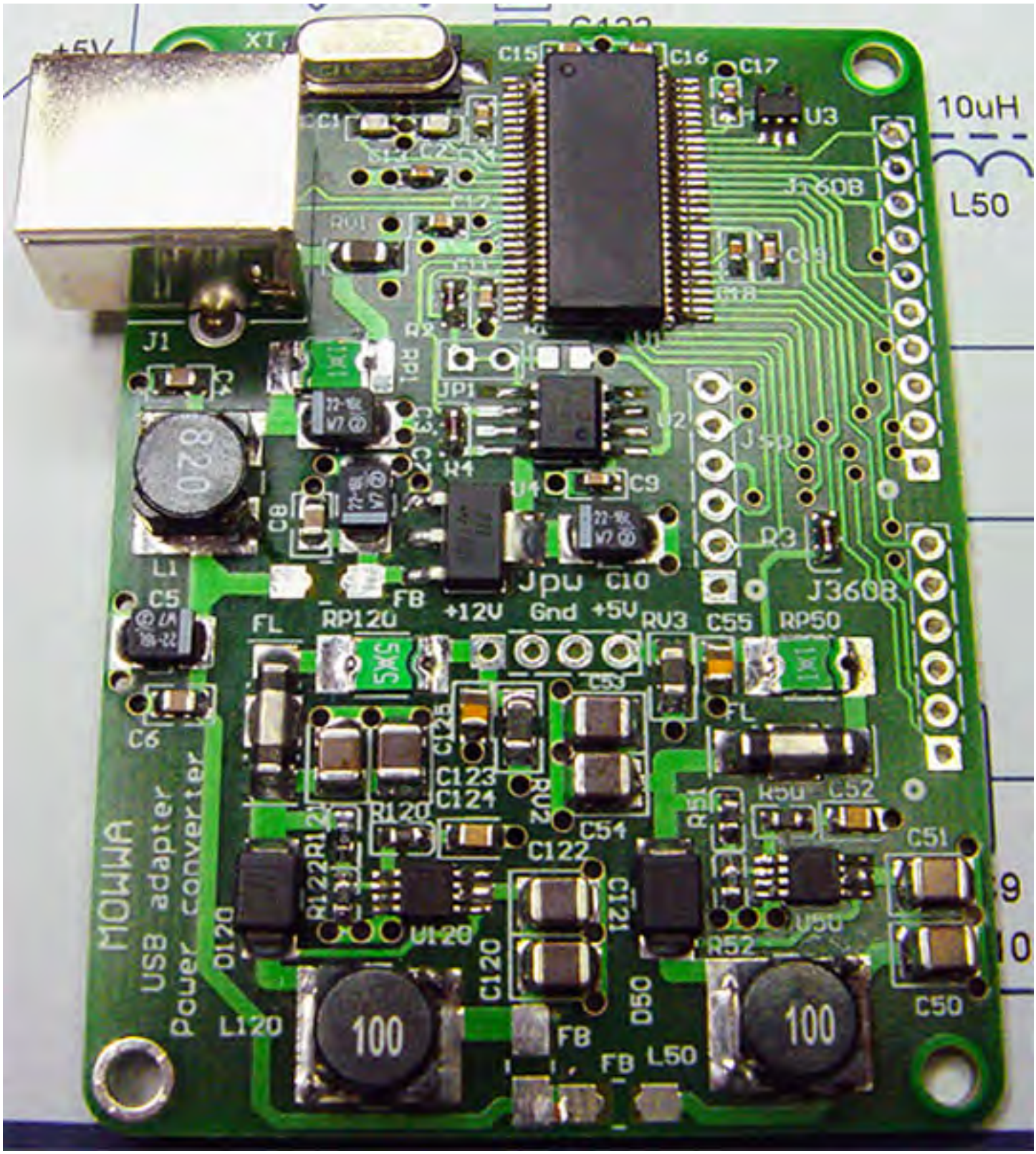
USB Adapter & Power Converter

Assembly Manual

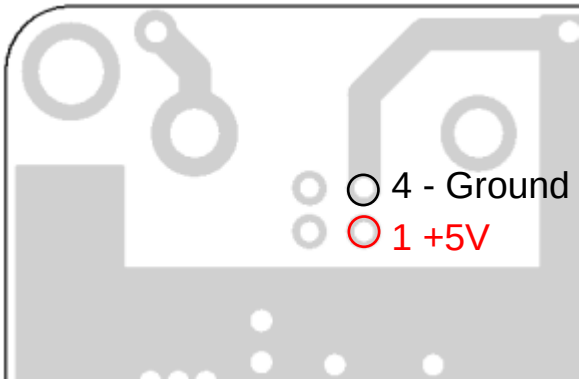


Start up

It's time to apply power! In the following start up you will check out your USB adapter&Power Conv.
If you encounter any difficulties with the procedure:
- Carefully check your setup to ensure all cables are properly connected.
- Inspect again your parts placement and soldering on the PCBs.

Most initial difficulties are eventually traced to an incorrectly placed component or a bad solder connection.
The schematic diagrams can help you decide which part of the circuit to check, based on where in the start up procedure you experience difficulty.

☐ Provisionally solder a pair of cables on J1 pins "1",+5V and "4" ground that will let power the circuit.



PCB bottom view

Don't connect anything else until instructed to do so.

☐ Apply 5V DC from an external power supply and check for 5 volts on points A,B on Fig.1. The ammeter on your power supply must indicate that no current is drawing.

☐ Disconnect the power supply and solder the ferrite bead "FB" located between L1 and U4, reference point A, Fig.1

☐ Connect power and check for 3.3 volts on point C. The ammeter on your power supply must indicate around 35mA.

☐ Disconnect the power supply and solder the ferrite bead "FB" located closed to L120 reference point B, Fig.1

☐ Connect power and check for 12 volts on pin 1 Jpw. The ammeter on your power supply must indicate now around 40mA.

☐ Disconnect the power supply and solder the ferrite bead "FB" located closed to L50 reference point B, Fig.1

☐ Connect power and check for 5 volts on pin 4 Jpw. The ammeter on your power supply must indicate around 45mA.

☐ Remove the pair of cables on J1 pins. Check for solder and shortcircuit.

☐ Plug the USB cable from your PC to the USB socket J1.
A sound event on your PC will indicate that an USB device has been connected.

Assembling the interconnection wire looms.

Now we will assemble the wires to interconnect the USB Adapter&Power Converter with the VNA board.
Depending on your VNA configuration you must connect as follows:

VNA with one detector:
- J160B, carrying control signals for DDS and detector1.
- Jpw, power
- Optional Jsp, S-Parameters peripherals control.

VNA with Dual detectors:
- J160B, carrying control signals for DDS and detector1.
- J360B, carrying control signals for detector2.
- Jpw, power
- Optional Jsp, S-Parameters peripherals control.

Connectors J160B and J360B assignments match with Makarov,VE3IVM boards.
Notice that on the other side of the wires you must assembly connectors matching with those installed on your board.
Remember that if a front panel power indicator LED is included on your assembly a 3K3 Ohms limiter resistor must be installed in order to connect the LED between +12V and ground.
It avoids to draw excessive current from the converter.
A high brightness LED is recommended.

Colour code.

The kit includes coloured cable to help to identify connectors pin numbers. The resistor colour code is used as follows:

Make the wire looms as short as possible to avoid pick up noise.
Left the wires looms apart each other for the same reason.
A good practise is tie each loom at its end to avoid mixing wires

☐ There are two kind of wires 1mm. and 1.8mm. Use the large section ones for Jpw only. Cut the wires needed for each connector. Peel and tin the wires.

Connector J160B DDS and detector 1

☐ Wires are solder on component side. 1mm in diameter wires.

☐ Starting on J160B solder a Brown wire on pin 1. Check for position and shortcircuits.

☐ Solder a Red wire on pin 2. Check for position and shortcircuits.

☐ Solder a Orange wire on pin 3. Check for position and shortcircuits.

☐ Solder a Yellow wire on pin 4. Check for position and shortcircuits.

☐ Solder a Green wire on pin 5. Check for position and shortcircuits.

☐ Solder a Blue wire on pin 6. Check for position and shortcircuits.

☐ Solder a Violet wire on pin 7. Check for position and shortcircuits.

☐ Solder a Grey wire on pin 8. Check for position and shortcircuits.

☐ Solder a White wire on pin 9. Check for position and shortcircuits.

☐ Solder a Black wire on pin 10. Check for position and shortcircuits.

☐ Use a magnifier and carefully check for solder connections or solder bridges. Verify that there are no leads or solder fillets too high on the board.

Connector J360B detector 2. (If your VNA configuration requires)

☐ Wires are solder on component side. 1mm in diameter wires.

☐ Starting on J360B solder a Brown wire on pin 1. Check for position and shortcircuits.

☐ Solder a Red wire on pin 2. Check for position and shortcircuits.

☐ Solder a Orange wire on pin 3. Check for position and shortcircuits.

☐ Solder a **Violet** wire on pin 7. Check for position and shortcircuits.

☐ Solder a **Grey** wire on pin 8. Check for position and shortcircuits.

☐ Solder a **Black** wire on pin 10. Check for position and shortcircuits.

☐ Use a magnifier and carefully check for solder connections or solder bridges. Verify that there are no leads or solder fillets too high on the board

Connector Jsp; S-parameters peripherals. (if required)

- ☐ Wires are solder on component side. 1mm in diameter wires.
- ☐ Starting on Jsp solder a Brown wire on pin 1. Check for position and shortcircuits.
- ☐ Solder a Red wire on pin 2. Check for position and shortcircuits.
- ☐ Solder a Orange wire on pin 3. Check for position and shortcircuits.
- ☐ Solder a Yellow wire on pin 4. Check for position and shortcircuits.
- ☐ Solder a Green wire on pin 5. Check for position and shortcircuits.
- ☐ Solder a Blue wire on pin 6. Check for position and shortcircuits.
- ☐ Use a magnifier and carefully check for solder connections or solder bridges. Verify that there are no leads or solder fillets too high on the board.

Connector Jpw; Power

- ☐ Wires are solder on component side. 1.8mm in diameter wires.
- ☐ Starting on Jpw solder a Brown wire on pin 1. Check for position and shortcircuits.
- ☐ Solder a Red wire on pin 2. Check for position and shortcircuits.
- ☐ Solder a Orange wire on pin 3. Check for position and shortcircuits.
- ☐ Solder a Yellow wire on pin 4. Check for position and shortcircuits.
- ☐ Use a magnifier and carefully check for solder connections or solder bridges. Verify that there are no leads or solder fillets too high on the board.

The cabling of connectors on the PCB side is done!

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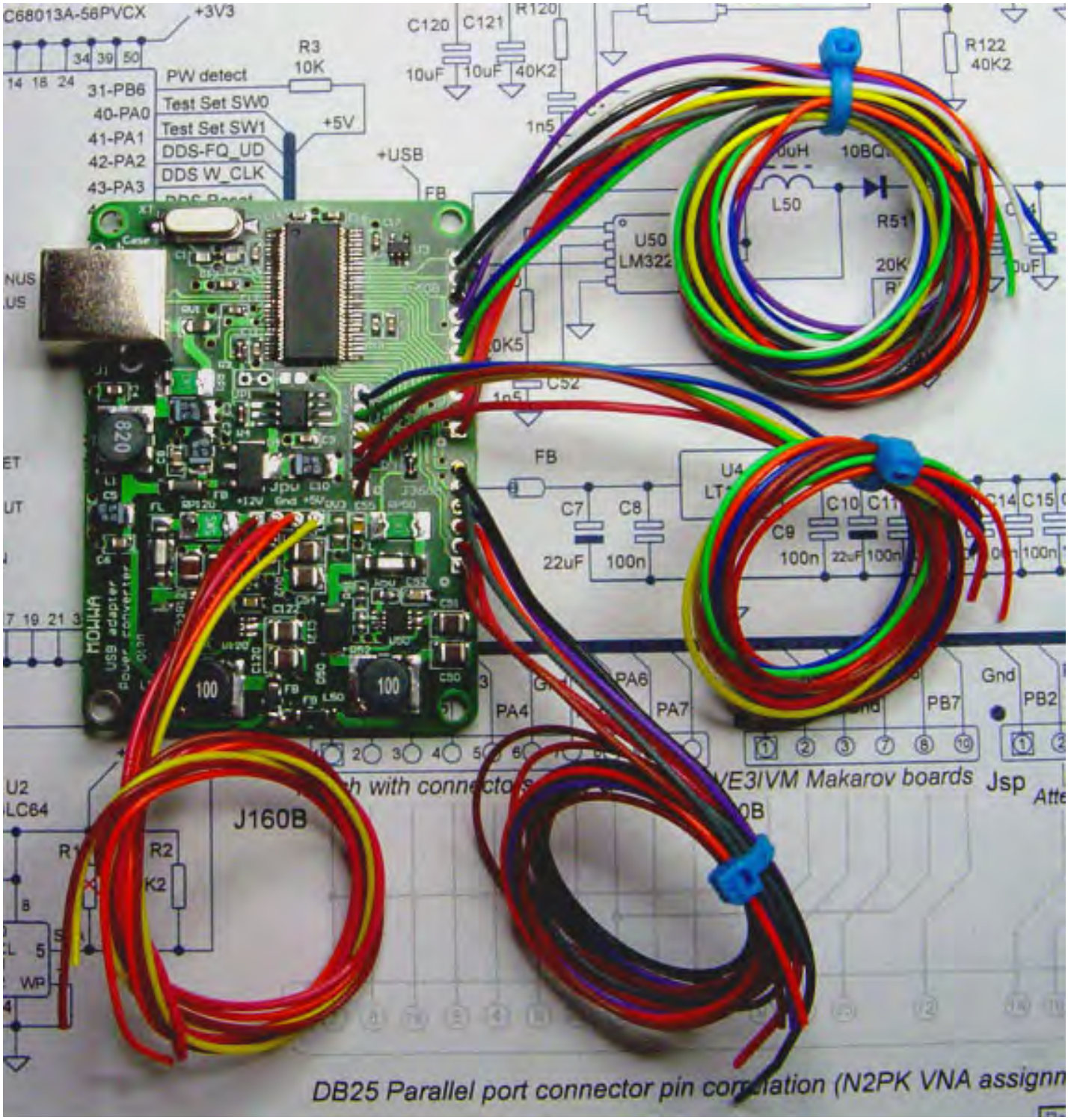
USB Adapter & Power Converter

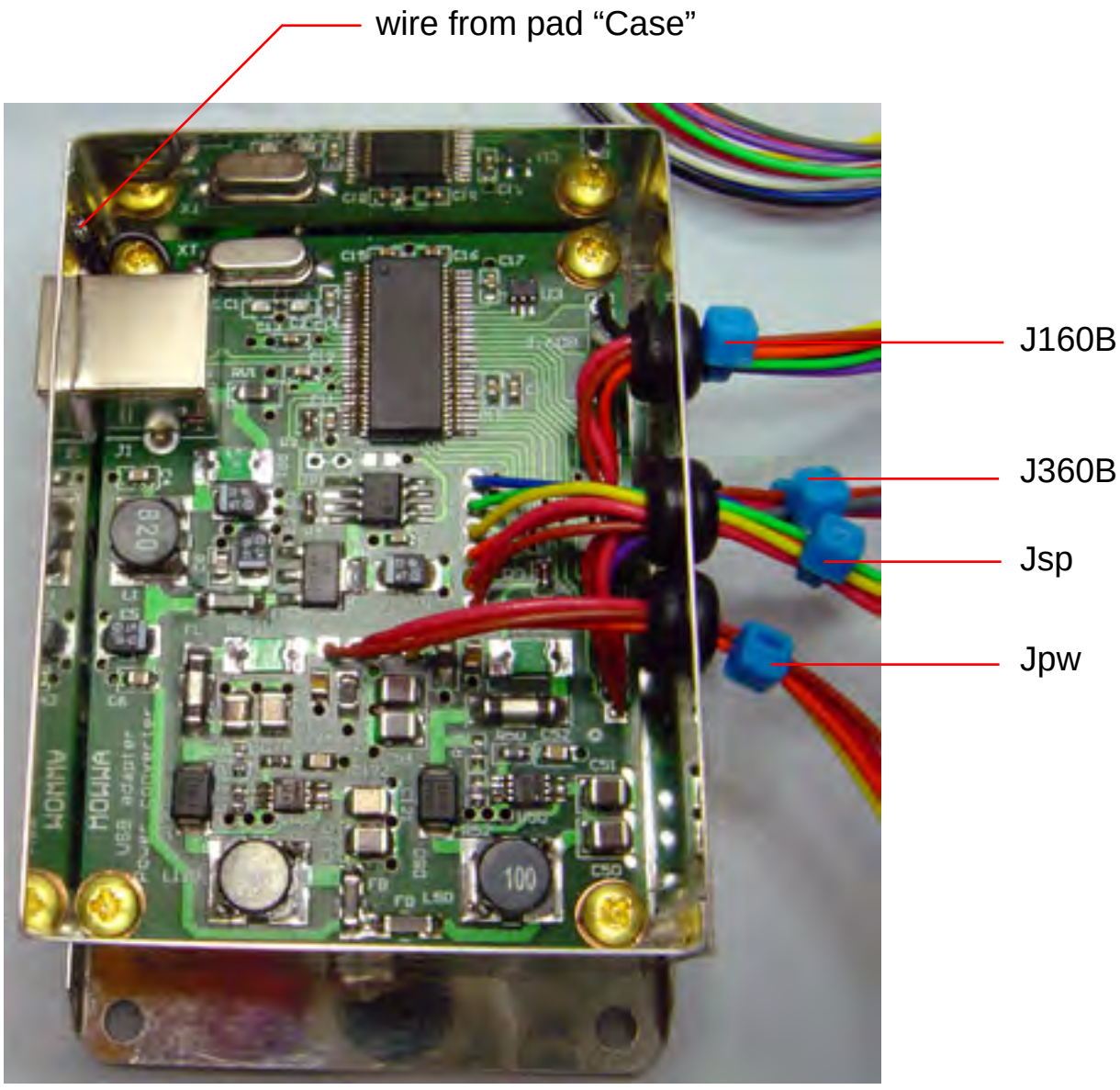
Assembly Manual



Boxing the circuit

- ☐ Fix the PCB inside the box.
- ☐ Solder the wire from pad “Case” on the wall beside the USB socket.
- ☐ With the help of a twizers pass the wires through the grommets as the picture show.
- ☐ Tie each loom at its end to avoid mixing wires.
- ☐ Check carefully this part of the assembly.

IMPORTANT
Do not connect the USB Adapter&Power Converter to the VNA board until you have successfully completed the EEPOM programming and Driver installation.



Congratulations!

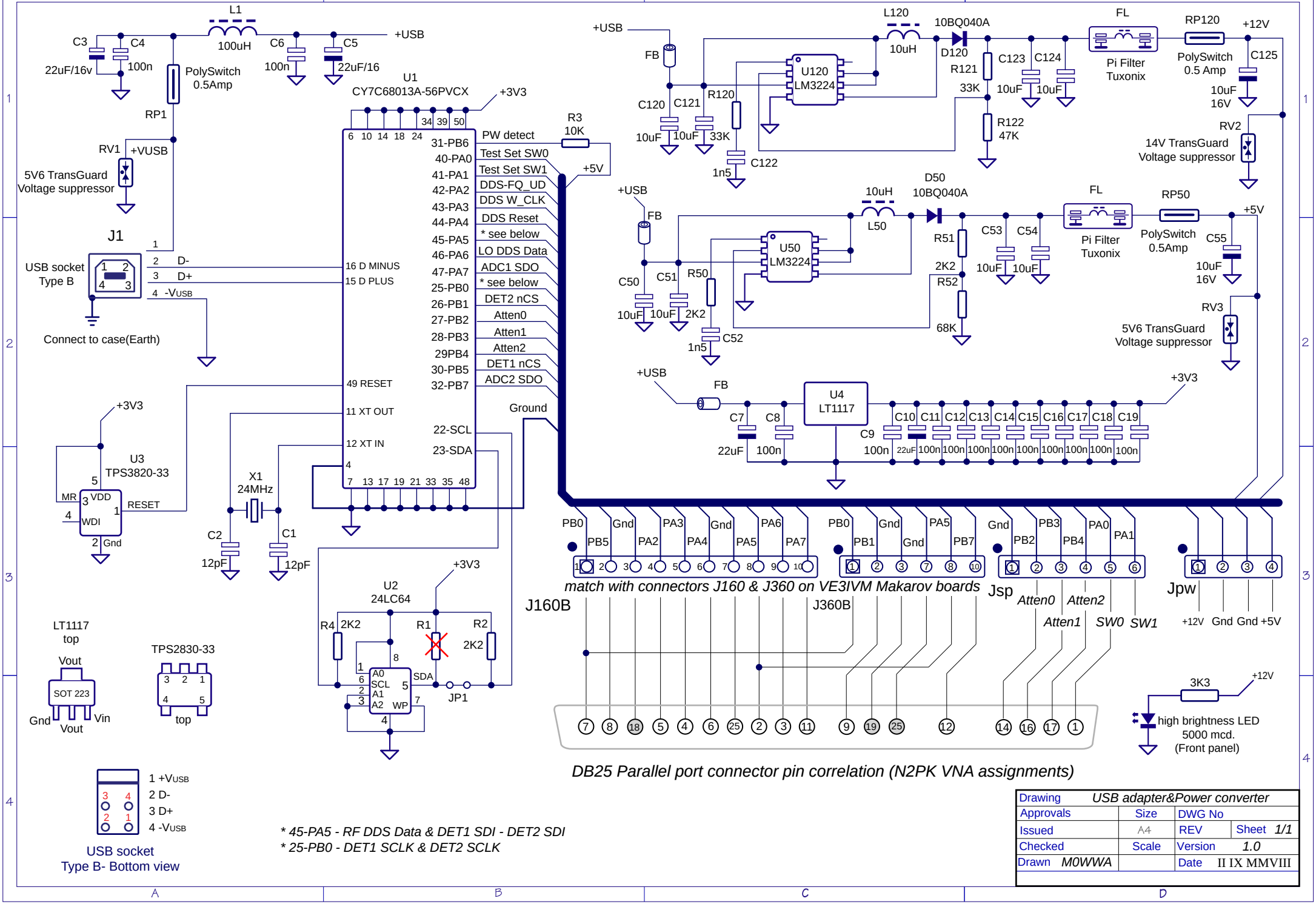
You have completed the assembly of your USB adapter&Power Converter. Enjoy it!

Troubleshooting

If any doubt arises do not hesitate to contact me.

Yours Sincerelly.

M0WWA
Juan Jose de Oñate


L1
100uH
C3
22uF/16v
C4
100n
C6
100n
C5
22uF/16
+USB
PolySwitch
0.5Amp
RP1
RV1
+VUSB
5V6 TransGuard
Voltage suppressor
J1
USB socket
Type B
1
2 D-
3 D+
4 -VUSB
Connect to case(Earth)
U1
CY7C68013A-56PVCX
+3V3
R3
10K
+5V
PW detect
Test Set SW0
Test Set SW1
DDS-FQ_UD
DDS W_CLK
DDS Reset
* see below
LO DDS Data
ADC1 SDO
* see below
DET2 nCS
Atten0
Atten1
Atten2
DET1 nCS
ADC2 SDO
Ground
31-PB6
40-PA0
41-PA1
42-PA2
43-PA3
44-PA4
45-PA5
46-PA6
47-PA7
25-PB0
26-PB1
27-PB2
28-PB3
29PB4
30-PB5
32-PB7
22-SCL
23-SDA
16 D MINUS
15 D PLUS
49 RESET
11 XT OUT
12 XT IN
U3
TPS3820-33
MR
VDD
RESET
WDI
Gnd
X1
24MHz
C2
12pF
C1
12pF
U2
24LC64
R4
2K2
R1
R2
2K2
A0
SCL
A1
A2
WP
SDA
JP1
LT1117
top
Vout
SOT 223
Gnd
Vin
Vout
TPS2830-33
top
1 +VUSB
2 D-
3 D+
4 -VUSB
USB socket
Type B- Bottom view
* 45-PA5 - RF DDS Data & DET1 SDI - DET2 SDI
* 25-PB0 - DET1 SCLK & DET2 SCLK
+USB
FB
L120
10uH
10BQ040A
D120
U120
LM3224
R120
R121
33K
R122
47K
C120
C121
C122
C123
C124
10uF
1n5
FL
Pi Filter
Tuxonix
RP120
PolySwitch
0.5 Amp
C125
10uF
16V
+12V
RV2
14V TransGuard
Voltage suppressor
D50
10BQ040A
L50
U50
LM3224
R50
R51
2K2
R52
68K
C50
C51
C52
C53
C54
RP50
PolySwitch
0.5Amp
C55
RV3
5V6 TransGuard
Voltage suppressor
U4
LT1117
C7
22uF
C8
100n
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
22uF
100n
+3V3
PB0
Gnd
PA3
PA6
PB5
PA2
PA4
PA5
PA7
PB1
PB7
PB3
PA0
PA1
PB2
PB4
match with connectors J160 & J360 on VE3IVM Makarov boards
J160B
J360B
Jsp
Atten0
Atten2
Atten1
SW0
SW1
Jpw
+12V
Gnd
Gnd
+5V
3K3
high brightness LED
5000 mcd.
(Front panel)
DB25 Parallel port connector pin correlation (N2PK VNA assignments)
Drawing
USB adapter&Power converter
Approvals
Size
DWG No
Issued
A4
REV
Sheet 1/1
Checked
Scale
Version
1.0
Drawn
M0WWA
Date
II IX MMVIII

Notes: