



The KDSP-10 interface kit is designed for two primary purposes:

- Seamlessly interface the DSPx module to the W7PUA DSP-10 2-meter radio
- Enable DSP software development and experimentation for the KK7P DSPx module

The KDSP-10:

- Provides regulated power for the DSPx.
- Translates between the DSPx 3.3V I/O levels and the 5 V I/O levels required by the DSP-10. An enhanced 5V driver is now included in Rev B units.
- Handles the change in pin assignment functions between the original ADSP-2181 DSP chip used in the old EZ-Kit Lite and the new ADSP-218xN DSP chip used in the DSPx design.
- Supports the DSP-10 Fast PTT interface.
- A 6-bit DAC has been added in Rev B units to better support the G3XJP Pic-A-Star project.

This manual provides assembly and checkout directions for the KDSP-10. Details on the DSPx are found in the documentation and on the CD-ROM accompanying that product.

Assembly

Parts Inventory

Please inventory the parts provided with this kit against the lists below. In this process you will become familiar with the parts used, and the terms to describe them. You'll also have the opportunity to organize the parts for access during construction.

Check off each item in the space provided. The number following the space is the quantity required. The part numbers referenced are not necessarily marked on the parts. Rather, they are provided for reference if you need to order replacement parts.

Parts Sorting

As you sort the parts, you may find it convenient to place them in a compartmented container for ready access. Be careful of static electricity issues if you use an insulated container to hold the parts. Use of tape to hold sorted parts is discouraged, as there is danger of static buildup as well as contamination of the leads from adhesive residue.

NOTE: Do not put ICs or any semiconductor component (diode, transistor, LED) in a Styrofoam or other plastic container, or damage from static may occur. Leave such parts in the envelope or foam provided until they are called out in the assembly instructions.

Resistors

¼ watt, 5%, carbon film

OK	Qty	Reference	Value	Marking	Notes
	5	R6 R10 R12-14	470 ohm	yellow-violet-brown-gold	
	1	R11	2.2K ohm	red-red-red-gold	
	2	R3-4	5.1K ohm	green-brown-red-gold	
	1	R8	10K ohm	brow-black-orange-gold	
	5	R1-2 R5 R7 R9	47K ohm	yellow-violet-orange-gold	

Resistor network

OK	Qty	Reference	Value	Type	Marking	Notes
	2	RP1-2	4.7K ohm	10-pin SIP resistor pack	ends in 472	may be 10K, 103

Capacitors

OK	Qty	Reference	Value	Type	Marking	Notes
	6	C18-23	220 pF	Ceramic Monolithic	221	
	2	C3 C8	470 pF or 560 pF	Ceramic Monolithic	471 or 561	
	8	C5-6 C9-10 C12 C25-26 C29	0.1 uF	Ceramic Monolithic	104	
	2	C4-7	0.33 uF	Film	330n or 334	
	6	C1-2 C14-17	1 uF	Electrolytic	1 uF or 105	
	4	C11 C13 C24 C27	10 uF	Electrolytic	10 uF or 106	

Connectors and Switches

OK	Qty	Reference	Value	Type	Notes
	1	JP1	3 pin	Male header	
	1	J5	DE-9S	9-pin female right angle connector	
	2	J1 J4	3.5mm stereo	right angle connector	
	1	J2	12 pin	single-row female header	
	1	J3	20-pin	dual-row female header	
	1	P3	2.1mm	power connector	
	1	S3	DPDT	Alternate Action Switch	
	2	S1-2	SPST	Pushbutton Switch	
	1		14 pin	IC Socket	
	1		16 pin	IC Socket	
	1			Cap for S3	
	1		2-pin	Push-on Shunt for JP1	

Note: IC sockets are packed with Semiconductors.

Semiconductors

Diodes and Transistor

OK	Qty	Reference	Value	Type	Marking	Notes
	2	D4-5	1N4002	Rectifier	1N4002	
	3	D1-3	1N4148	Signal Diode	1N4148	
	2	LED1-2	Red LED	LED	none	
	1	Q1	2N3904	NPN Transistor	3904 or 2222	

Integrated Circuits

OK	Qty	Reference	Value	Type	Marking	Notes
	2	U1-2	PI5C3245S	CMOS Switch	3245	
	1	U3	74HC14	CMOS Logic	74HC14	
	1	U4	MAX232	Interface	232	
	1	U5	LM340T	Regulator	340 or 7805	
	1	U6	74HCT541	Buffer	74HCT541	

Miscellaneous

OK	Qty	Reference	Value	Type	Notes
	1			Manual	
	1			PC Board	

Installing Components

Please install the parts in the order shown. After you mount a part, solder it in place. Double check to be sure that the part is snug against the printed circuit board (PCB). After soldering, clip the leads close to the PCB surface.

Use a temperature-controlled soldering iron, set between 700 and 735 degrees F (370 to 390 C). Keep the tip clean. Use rosin-core or no-clean-flux solder. Be sure you follow the directions given with the solder for the flux type. Improper flux, or improper cleaning procedures (if required) may result in corrosion of the soldered joint. Sometimes this takes days or weeks to appear.

Be sure to do all soldering in a well-ventilated room.

Note: Kits built with improper solder or flux void any and all warranties!

Note: It is important that leads be clipped flush with the bottom of the PCB. Use a pair of flush-cutting pliers, or pre-trim the leads before soldering.

As you install the following parts, check the box only **after** you have inspected the solder connections and clipped the leads (unless directed to not clip the leads, or it is obvious they don't need to be clipped).

Pre-bend the leads of resistors close to the body and at right angles. Quarter-watt resistor locations on the PCB have 0.35" (9 mm) centers.



Don't confuse the 470 ohm and the 47K ohm resistors - the color codes are very similar!

- R1 47K ohm ¼ watt 5% carbon film resistor (yellow-violet-orange-gold)
- R2 47K ohm ¼ watt 5% carbon film resistor (yellow-violet-orange-gold)
- R3 5.1K ohm ¼ watt 5% carbon film resistor (green-brown-red-gold)
- R4 5.1K ohm ¼ watt 5% carbon film resistor (green-brown-red-gold)
- R5 47K ohm ¼ watt 5% carbon film resistor (yellow-violet-orange-gold)
- R6 470 ohm ¼ watt 5% carbon film resistor (yellow-violet-brown-gold)
- R7 47K ohm ¼ watt 5% carbon film resistor (yellow-violet-orange-gold)
- R8 10K ohm ¼ watt 5% carbon film resistor (brown-black-orange-gold)
- R9 47K ohm ¼ watt 5% carbon film resistor (yellow-violet-orange-gold)
- R10 470 ohm ¼ watt 5% carbon film resistor (yellow-violet-brown-gold)
- R11 2.2K ohm ¼ watt 5% carbon film resistor (red-red-red-gold)
- R12 470 ohm ¼ watt 5% carbon film resistor (yellow-violet-brown-gold)
- R13 470 ohm ¼ watt 5% carbon film resistor (yellow-violet-brown-gold)
- R14 470 ohm ¼ watt 5% carbon film resistor (yellow-violet-brown-gold)

- You should have **no** ¼ watt resistors remaining.

The following capacitors are ceramic monolithic with radial leads. The capacitor should sit flush to the PCB, with the exposed portion of the leads not more than about 1/32" (1mm) above the PCB.

- C3 470 pF or 560 pF (471 or 561)
- C5 - **do not install now**
- C6 - **do not install now**
- C8 470 pF or 560 pF (471 or 561)
- C9 0.1 uF (104)
- C10 0.1 uF (104)
- C12 0.1 uF (104)
- C18 220 pF (221)
- C19 220 pF (221) (no silkscreen, goes between C18 and C20)
- C20 220 pF (221)
- C21 220 pF (221)
- C22 220 pF (221) (no silkscreen, goes between C21 and C23)
- C23 220 pF (221)
- C25 0.1 uF (104)
- C26 0.1 uF (104)
- C29 - **do not install now**
- You should have **three** 0.1 uF (104) ceramic monolithic capacitors remaining.

Diodes are polarized components. The cathode end is marked with a band. On the PCB, there is a band on the silkscreen at the cathode end, and the PCB pad is square rather than round. Be sure to install the following parts in the correct orientation!

D1 through D3 are small, glass-bodied diodes with hard-to-read numbers. The lead spacing is 0.3" on the PC board for these diodes.

- D1 1N4148
- D2 1N4148
- D3 1N4148

D4 and D5 are larger, with black epoxy bodies. The lead spacing is 0.4" on the PC board for these diodes.

- D4 1N4002
- D5 1N4002

- You should have **no** diodes (not including 2 LEDs) remaining.

Now it is time to install the three surface-mount ICs, U1, U2 and U6. If you have built the DSP-10, you know how to do this! If not, proceed carefully, don't use too much heat or too high a temperature, and use a minimum of solder. Inspect the parts afterwards to be sure there are no solder bridges between pins, all pins are soldered, etc.

- U1 PI5C3245S integrated circuit
- U2 PI5C3245S integrated circuit
- U6 74HCT541 integrated circuit

Install the three remaining monolithic capacitors.

- C5 0.1 uF (104)
- C6 0.1 uF (104)
- C29 0.1 uF (104)

The resistor packs are **polarized**. Pin 1 is common to all nine resistors in the pack. Pin 1 is marked with a dot or stripe on the resistor pack, a square pad on the PC board, and a beveled corner on the part's silkscreen on the PC board.

Solder one pin in the middle of the pack. Inspect to be sure it is flush to the PC board, then solder the remaining pins.

- RP1 4.7K ohm, 10-pin resistor pack (472) (may be 10K, 103)
- RP2 4.7K ohm, 10-pin resistor pack (472) (may be 10K, 103)

Film capacitors are rectangular in shape, with radial leads. They are **not** polarized.

- C4 0.33 uF (330 or 334)
- C7 0.33 uF (330 or 334)

- You should have **no** film capacitors remaining.

Electrolytic capacitors are polarized. The **positive** lead is the longer. The PCB is marked with a + for the positive lead, and the PCB pad is square. The body of the capacitor has a dark band marking the **negative** lead.

- C1 1 uF (1 uF or 105)
- C2 1 uF (1 uF or 105)
- C11 10 uF (10 uF or 106)
- C13 10 uF (10 uF or 106)
- C14 1 uF (1 uF or 105)

- C15 1 uF (1 uF or 105)
- C16 1 uF (1 uF or 105)
- C17 1 uF (1 uF or 105)
- C24 10 uF (10 uF or 106)
- C27 10 uF (10 uF or 106)

You should have **no** electrolytic capacitors remaining.

The 1/8" (3.5mm) stereo jacks are next. They have plastic locator pins near the front of the jack. Don't solder the plastic pins!

- J1 Stereo Jack (you **may** not want to install this for DSP-10 usage)
- J4 Stereo Jack (you **may** not want to install this for DSP-10 usage)

IC sockets are polarized. There is a notch at the end of the socket nearer pin 1. Check the orientation before placing the part on the board. Solder two diagonally opposite pins, then inspect the socket to be sure it is flush to the board surface, no pins are bent or folded under the socket, and so forth. When you have confirmed it is correctly positioned and all pins are in their holes, solder the remaining pins.

- U3 14-pin IC socket
- U4 16-pin IC socket

The 2.1mm power connector is next. The "pins" are tabs and the board holes are round, so there is a lot of empty space around the pin. It is **not** necessary to fill the hole with solder. It is only necessary to ensure that the pin is soldered to the PC board. You may find it easier to bend the tabs slightly so they are near the edge of a hole, and then solder the pin and fill the hole with solder on the side of the pin that has the smaller gap

- P3 2.1mm power connector (you **may** not want to install this for DSP-10 usage)

The DE-9S serial port connector includes a pair of snap-in pins that secure it to the PCB while soldering. After "snapping" the connector in place, verify that no pins are bent under the connector. Next, solder the two mounting tabs, then the pins.

- J5 DE-9S serial port connector (you **may** not want to install this for DSP-10 usage)

The pushbutton switches have leads with a bend in them to help hold them in place on the PCB. The body of the switch normally sits about 1/16" (~2mm) above the PC board.

- S1 pushbutton switch
- S2 pushbutton switch

The three-pin header can be challenging to hold in place and solder. Work quickly, and don't burn your fingers!

JP1 3-pin male header

The female headers accept the DSPx module. It is important that they be flush to the surface of the PCB and perpendicular to it. Solder a pin near the center, inspect and adjust as necessary, then solder the remaining pins.

J2 12-position female header (single row of 12 pins)

J3 20-position female header (double row of 10 pins)

Light-emitting diodes (LEDs) are polarized parts. The LEDs supplied are one of two types.

The first has a flat on one side of the body of the part, corresponding to the silkscreen outline on the PCB. The flat marks the cathode of the device. The other type has no flat side.

Both types have a **shorter** lead that indicates the **cathode**.

The cathode is indicated by a **square** pad on the PCB. This takes the **shorter** lead. This is **opposite** to the rule for electrolytic capacitors.

LED1 Red LED (near S1)

LED2 Red LED (near S2)

The transistor is in a TO-92 black epoxy package. It is **polarized**. Match the outline of the case to the silkscreen, insert the three leads, and gently work the transistor leads down into their three holes until the body of the transistor is about 3/8" (10mm) or so above the surface of the PCB. Then, solder the three leads.

Q1 2N3904 NPN Transistor (3904 or 2222)

The power switch is an alternate-action, push-on/push-off type. It has pins on both sides; only one set is small enough to fit into the PCB. The other set has openings for soldering wires, which will not be used.

The switch should sit down onto the PCB. There are plastic spacers molded into the part to keep it about 1/8" (3 or 4 mm) above the PCB. The switch should be pressed into the board until these spacers are touching the PCB. Verify the switch is neatly positioned, then solder the six pins.

S3 Alternate Action Switch (you **may** not want to install this for DSP-10 usage)

Press the plastic cap onto the end of the switch.

U5 is the 5-volt regulator. It is **polarized**. The metal tab should be towards the edge of the PCB, as indicated by the silkscreen outline. The metal tab is at ground potential.

U5 5-volt regulator (340, 7805)

Install the push-on shunt at JP1. If you are using the KDSP10 in a DSP-10 radio, use the shunt to short the center pin and the pin labeled PTT. If you are using it in a Pic-A-Star, do **not** install it. Otherwise, use it to short the center pin and the pin marked INT.

Carefully inspect the PCB assembly. There should be no unsoldered parts. Check for solder bridges, opens, shorts, cold solder joints, and the like.

There should be nothing installed at connectors P1 (marked “TO DSP-10 P5”), P3 (“TO DSP-10 P101”) or P4. C28, R15 and U8 should also be unpopulated.

Sockets U3 and U4 should be empty. You should have a 74HC14 and a MAX232 IC remaining.

Inspection OK.

It is time to make a quick power check.

Ensure switch S3 is in the “OUT” (OFF) position. Press and release S3 if not.

Attach a +8 to +15 volt DC power source to P3. **Positive** goes to the **center pin** of the 2.1mm connector.

Switch the unit ON by pushing and releasing S3 so that it is in the IN position.

Using a voltmeter (analog or digital), probe socket U3 at pins 7 and 14. Pin 14 (the pin nearest the silkscreen legend U3) should be +4.75 to +5.25 volts with respect to pin 7 (the pin nearest C11).

Disconnect the voltmeter.

Switch the unit OFF by pushing and releasing S3 so that it is in the OUT position.

Disconnect the power supply.

ICs are **polarized**. The end nearer pin 1 has a dot, dimple or notch.

It is often easier to insert an IC into a socket if you straighten the leads. This can be done with long-nose pliers, a pin-straightening jig, or gently rocking the IC against a flat, conductive surface.

Observing anti-static precautions, insert the 74HC14 IC into the socket at U3.

Insert the MAX232 IC into the socket at U4.

Now it is time for another test.

Ensure switch S3 is in the “OUT” (OFF) position. Press and release S3 if not.

Attach a +8 to +15 volt DC power source to P3.

Switch the unit ON by pushing and releasing S3 so that it is in the IN position.

Observe the LEDs. The FL1 LED should illuminate. The RESET LED should blink on for about ½ to 1-½ seconds, then turn off.

Press and release the RESET button

The RESET LED should blink on for about ½ to 1-½ seconds, then turn off.

Using a voltmeter, check U4 pin 2 for a voltage between +7 and +11 VDC. Use the metal shell of the DE-9S serial port connector for a ground reference.

- Check U4 pin 6 for a voltage between -7 and -11 VDC.
- Switch the unit off by pushing and releasing S3 so that it is in the OUT position.

- Disconnect the power supply.
- Carefully unpack the DSPx module from its anti-static bag.
- Insert it into the interface board.
- Verify the board is fully seated into connectors P1 and P2. It is easy to be off by a pin, so double check that there are no connector pins hanging over an edge of P1 or P2.

You are now ready to test the completed assembly!

- Attach a computer to the serial port, running a terminal program and set for 9600 bits/sec, no parity, 1 or 2 stop bits.
- Apply power to the interface board at P3.
- Turn the board on using S3.
- The RESET LED should come on briefly, and there should be a sign-on message on the terminal, with several lines something like:

!!! KK7P DSP Module Version 1.0 Rev D.1 !!!

The first line may have the first few characters cut off. This is normal.

- Press the <ENTER> key on the terminal or computer keyboard. You should see a prompt come back

You type:

This indicates the serial port is functional in both directions.

- The FL1 LED should blink several times per second.
- Attach a low-level audio source to J4, and an amplified speaker to J1.
- You should be able to pass audio through the assembly. This verifies the audio paths, the functioning of the DSPx, and the power supply and serial port of the interface.

If you are building the KDSP10 for use with a Pic-A-Star, you will need to obtain and install C28 (0.1 uF capacitor, 0603 case), R13 (1K resistor, 0603 case) and U8 (Texas Instruments TLC7524CD – do not substitute!).

Refer to the CD-ROM, the TAPR website (www.tapr.org), the DSP-10 Project website (www.proaxis.com/~boblark/dsp10.htm) and the KK7P website (www.kk7p.com) for further information on the DSP-10 and the use of the KK7P DSPx module and interface.

SCHEMATIC



