R-31JP ASSEMBLY MANUAL

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Warranty

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1.   Introduction

The R-31JP is designed for easy assembly by the hobbyist or prototyping engineer. The components are assembled on the top side as marked, i.e., the side with the silk screen overlay of component outlines and designations. All of the integrated circuits are inserted into sockets. The recommended sequence for manual assembly is as follows:

1. Discrete components (resistors, diodes)
2. Sockets
3. Resistor network
4. Push button
5. Slide switch
6. Jumpers
7. 40 and 23-pin headers
8. Discrete components
9. Light Emitting Diodes - LEDs
10. Power header
11. Terminal Blocks
12. DB-9 Connector

The board may then be tested.

The assembly and test steps are explained in detail in the following pages. Please refer to the board layout for part placement locations. Depending on your experience, the assembly process may take between 1 to 3 hours. It is highly recommended that you read all instructions before starting the assembly process.

2.   Soldering

Use a low power (about 30 Watts) soldering iron. Heat the component lead and the pad with the iron, and then apply solder to the lead and pad. Solder should be shiny in appearance. Be careful not to deposit too much solder on the joints. The most common problem with board assembly is shorted pins or tracks due to excessive solder.

Solder may be removed by solder-removal braid, also known as solder wick. Place the wick over the solder and heat the solder through the wick. The wick will absorb the excess solder. Use a good quality solder, such as Radio Shack's silver bearing solder. <u>Soldering is the most important aspect of assembly</u>. Please be patient and strive for excellence!

Please note that solder contains lead. Take the necessary precautions when working with solder. Work in a well ventilated area. Do not inhale the solder vapors. Wash your hands after soldering.

3. Assembly Steps

Familiarize yourself with the board, the components, and the layout. Also refer to the bill of materials at the end of this assembly manual.

Board layout
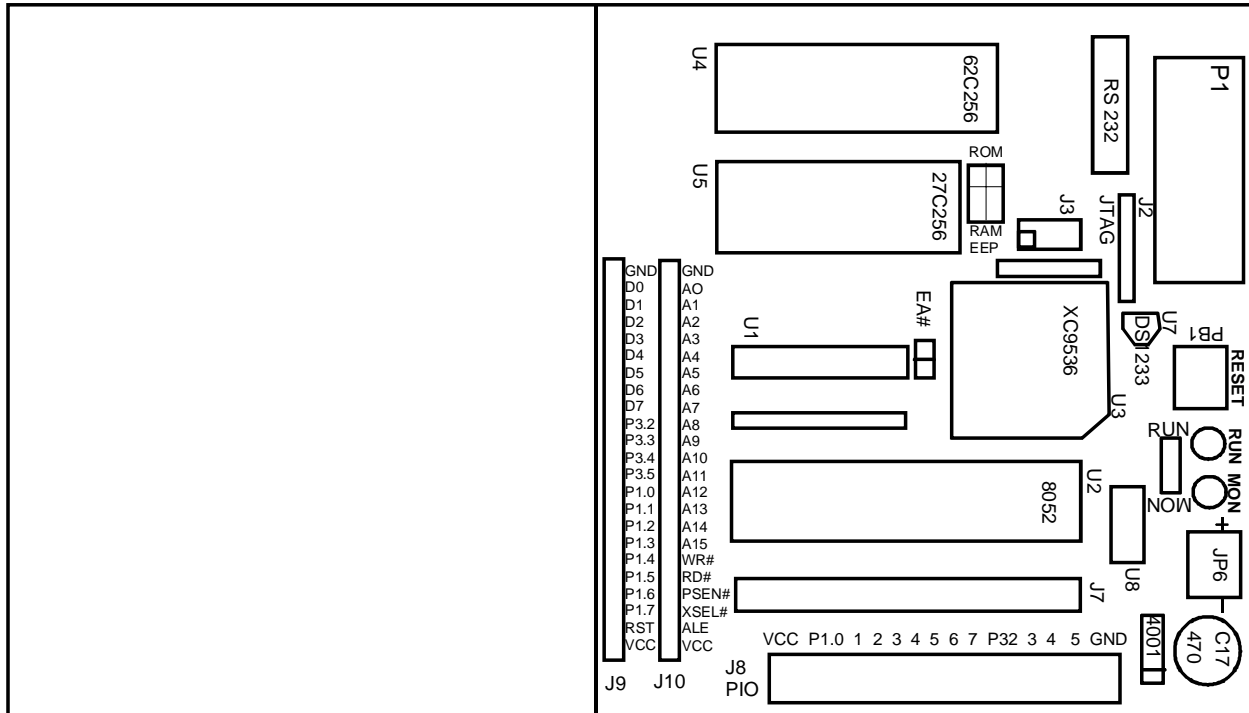
3.1   Discrete components (resistors and diodes)

3.1.1 Resistors

These resistors have no polarity. The resistor values are color coded. Hold the resistor so that the color bands are to the left. A gold rightmost band indicates a 5% tolerance resistor, and a silver band, a 10% tolerance resistor. The first 3 bands give the value. The first and the second band are the two digits, and the third indicates the number of zeros to add after the first two digits. The color code corresponding to each digit is shown below:

0	Black	5	Green
1	Brown	6	Blue
2	Red	7	Violet
3	Orange	8	Grey
4	Yellow	9	White

For example, a 1K (1 Kilo Ohm) resistor is 1000 ohms. The first digit is 1 (Brown) and the second digit is 0 (Black). After the first two digits two more zeros follow. The two zeros are thus indicated by Red. The 1K resistor has a color code Brown-Black-Red. The R-31JP uses 2 resistors as follows:

Quantity	Resistor value	Color code, (left to right)
2	330 OHM 1/2 watt	orange, orange, brown, gold

3.1.2 Diode D3

R-31JP uses the diode D3 (a 1N4001) across the supply voltage in reverse polarity. It shorts the power supply if the power is applied backwards, thus protecting the R-31JP board. Diodes are polarized. The cathode is marked on the diode with a band. The R-31JP board also shows a line next to the cathode pad of the diode. Match the band on the diode with the line on the board.

3.2   Sockets

Sockets use the same designation as the components they hold. Several different size sockets are used. Y1 uses a 8 pin socket, U6 uses a 16 pin socket, U1 uses a 20-pin socket, U3 uses a 44 PLCC socket, U4 uses a 32-pin socket, U5 uses 28-pin socket, and U2 uses a 40-pin socket. The 16, 20, and 8-pin sockets are dual In-line Package (DIP) sockets with 300 mils between rows. The 28, 32, and 40-pin sockets are also DIP sockets, but with 600 mils between rows.

The sockets all have a notch or mark on to indicate pin one. This must be matched with the socket pattern silk-screened on the board. When the notch is to the left, and viewed from the top, the lower leftmost pin is pin 1. On the R-31JP board, the pads of pin 1 of the Integrated Circuits (ICs) are square. All other IC pads are circular. **The orientation of the sockets is critical.** You will be placing the ICs in the sockets using the notch for pin 1 identification. The board will not work and the ICs may be damaged if they are populated backwards. If you do solder a socket in backwards the board will still work, but **you must be extremly careful to orient the IC to the notch silk-screened on the board and not according to the notch on the socket.**

3.3   Resistor network R1, R2

R1 and R2 are a resistor networks which contains resistors with a common terminal. The common terminal is marked on the resistor networks with a line or a dot. The R-31JP board is also marked by a line where the common terminal is to be inserted. In addition, the pad for the common terminal is square. The orientation of these resistors must be correct for the board to work.

3.4   Push button PB1

PB1 is marked as RESET on the board. It is a small momentary push button. Press the push button firmly in the holes so that it lays securely against the board. The push button resets the board. It is also used when the low and high external memory locations are to be swapped in the EPROM and RAM. In order to swap the locations, the reset button must be held down while the slide swich is moved.

3.5   Slide Switch S1

The slide switch is below the LEDs on the board. The switch needs to be held firmly on the board when soldered. The orientation is not important as the switch is symmetrical. Sliding the swich between the MON and RUN locations changes the low and high external memory locations. The default configuration is with the slide switch in the MON position, i.e., to the right.

3.6   Jumpers J1, J2, J3, J4, J5

Jumpers J1, J2, J3, J4, J5 are headers which accept shorting jumpers to configure the R-31JP.

J1, marked EA# on the board, is a 2 post header directly under P1.3/P1.4. in the center of the board. A shorting jumper will need to be placed in this location to operate the board in the default configuration.

J4 and J5 are 3 post headers marked ROM/RAM on the top overlay of the board. J4 and J5 have two positions, connecting the center post to either the right or the left post. These jumpers are a 2 X 3 block of headers. Two shorting jumpers are placed in the (ROM) location to operate the board in the default configuration.

J2 is the header used for programming the PLD on the board. It is a 1x6 header.
J3 is a 2x4 header reserved for future use.

3.7   40 and 23-Pin Headers J7, J9, and J10

JP7, JP9 and J10 are 40 and 23-post headers which are connected to the microcontroller ports and to the system data, address and control signals. Access to all system signals are gained through these headers. If the board is to be operated in a stand-alone fashion, these headers need not be installed. Pin 1 of the header is marked on the board. Also, the pad for pin 1 is square. Orient the headers so that the longer pins are on top of the board, the short side of the pins go through the board and are solder on the bottom.

3.8   Discrete components (capacitors and crystal)

3.8.1 Electrolytic capacitors

Capacitors C4 - C7 and C17 - C19 are electrolytic capacitors. Electrolytic capacitors are polarized components. The R-31JP board is labeled with the values and the positive terminal of the capacitors. The positive terminal of the capacitors is indicated by the (+) sign on the board. The capacitors have labels to indicate their polarity and value. Often, the negative terminal is indicated by a minus (-) sign.

3.8.2 Non-polarized capacitors

Capacitors C1, C2, C3 and C8-C16 are disc or axial capacitors without polarity. The value is usually written on the capacitor. The 10 nanofarad (nF) capacitor may have 0.1 or .1 written on it, indicating 0.1 microfarads. Note that 1000pF=1nF, and that 1000nF=1uF.

3.8.3 Clock Y1

Y1 is the microcontroller clock. The R-31JP kit comes with the 11.0592MHz clock. An 11.059 MHz crystal is convenient to generate almost all of the common Baud rates. The clock is socketed to make changing processor speeds easier.

3.9   Light Emitting Diodes (LEDs) D1 and D2
Either D1 or D2 is lit when the R-31JP is powered, depending on the position of the slide switch. It is recommended that a red LED is used for D1 (MON) and a green LED for D2 (RUN).

The LEDs are diodes, and thus, their polarity must be observed. The LED has two leads. The anode lead is the longer lead. In addition, the LED has a flat section on the rim of its base. This flat cut designates the cathode. The R-31JP board designates the cathode by a line going through the cathode pad. Match the flat side of the LED with the line on the board.

3.10   Power header J6
This header brings the 5 volt operating current to the board. A screw-type terminal block is used. The positive terminal of J6 is marked by a '+' on the R-31JP board. Solder the terminal blocks so that the wire insertion posts are accessible.

3.11   Terminal Blocks J8
These terminal blocks have solder tails with 3.5 separation. J8 is a 14 position terminal blocked connected to PORT 1, 4 bits of PORT 3, ground and the 5+ volt power supply. The terminal blocks may need to be assembled into a block of 14. This may be done by interlocking the dove tails, on the sides of the terminal blocks, together. Solder the terminal blocks so that the wire insertion posts are accessible.

3.12   DB-9 Connector P1
P1 is a short DB9 connector. Solder the pins and the catch pins to the board. P1 accepts the serial modem cable that connects the R-31JP to the host PC.

4.   Visual Inspection

Most of the problems in assembling the R-31JP are due to faulty solder joints. Inspect each solder joint. Look for missing solder, too much solder, shorts between pins or tracks due to excessive solder. Remove excessive solder with solder wick. Care taken for a thorough visual inspection often saves time in the long run.

5.   Power Supply Testing

Before any of the ICs are inserted, connect a 5 Volt power supply to the power header JP6 on the board. Verify the voltage on the Vcc and Ground pins of the sockets for U1, U2, U3, U4, U5, and U6.

The ICs have a notch or mark on one end. This must be matched with the silk-screen notch on the board. When the notch is to the left, and viewed from the top, the lower leftmost pin is pin 1. Pins in the lower row are enumerated, from left to right. For example, the last pin in the bottom row of U5 is pin 14. The pins on the upper row are enumerated from right to left (thus, continuing in the counterclockwise direction). The rightmost pin in the top row of U5 is pin 15, and the leftmost, pin 28.

IC socket	IC	Vcc pin	Ground pin
U5	27C256	28	14
U4	62C256	28	14
U1	74HC573	20	10
U2	8031	40	20
U6	MAX232	16	15
U3	XC9536-15PC44C See schematic	mult	mult

If supply voltages are not observed, inspect all tracks, connections, and solder joints.

6.   Functional Testing

You are now ready to insert the ICs and test the functionality of the board. In order to prevent permanent damage to the ICs, do not attempt this step if discrepancies were observed during the prior tests. Please note that all of the ICs are CMOS (Complementary Metal Oxide Semiconductors), which are affected by static. **Do not insert or remove the ICs while the power is connected to the R-31JP.** Also avoid exposure to static electricity. For example, the ICs may be zapped by static electricity collected on a sweater. Ground yourself, or touch a good conductor to ground before handling the ICs.

Disconnect the power. Insert the ICs, **observing their orientation**. The ICs have a notch or mark on one end. This must be matched with the notch on the board overlay and should match the notch on the socket.

Shorting jumpers will need to be placed in jumper EA# and in the J4 and J5 ROM locations to operate the board in the default configuration. Connect the power supply. Move the slide switch to the MON (right) position. The MON indicator, the red LED, should light up. Press the reset button.

6.1   Communicating with the PC Host

Connect the R-31JP to either the COM1 or the COM2 port of the host PC. Run READS. Once in Reads select the demo program Deom00.ASM. Once in the editor, press F10 for the menu. Select Options to specify which port you are using. Set the communication parameters to 9600 Baud rate, 8 data bits, and 1 stop bit. Save the options so that next time you run READS you need not configure the host. Note that from the editor, you may press the Alt-O hot key combination to activate the options menu.

Activate the menu again (F10) and select TTY to talk to the board. Alternatively, you may press the Alt-T hot key combination to activate the communications environment. Press the RESET button on the   R-31JP. The greeting message "8052 monitor" followed by the asterisk should appear. Press H (or h, since the monitor program is case insensitive) to activate the monitor help screen.

From the host keyboard, type

```
x8000-ffff=0
```

which will fill the RAM chip with 0s. Verify by typing

```
x8000-ffff
```

A Control-C aborts the memory dump. Repeat this test with different values, such as:

```
x8000-ffff=1
```

and

```
x8000-ffff=a
```

Next, assemble the various demonstration programs given on the distribution disk. Download the object codes and run on the R-31JP. Refer to the R-31JP/READS User's Guide and the program listings for specific information on the demonstration programs.

7. Parts Lists

7.1 R-31JP Bill of Materials

The bill of materials given below lists all components by their reference as they appear on the board top overlay. Note that this list does not include the sockets.

Revised: JUNE 30, 1998

List Of Materials

Item	Quantity	Part	Reference	Description
1	12	10nF	C1,2, 3,8-16	Axial capacitor
2	4	1.0uF CAP	C4-7	Electrolytic capacitor
3	1	470uF 16V	C17	Electrolytic capacitor
4	2	47uF 16V	C19, C18	Electrolytic capacitor
5	1	10K 10GANG	R1	Gang Resistor
6	1	10K 6GANG	R2	Gang Resistor
7	2	330 OHM	R3, R4	1/2 Watt Resistor
8	1	RED LED	MON, D1	LED (red)
9	1	GREEN LED	RUN, D2	LEDs (green)
10	1	1N4001	D3	Diode
11	1	MON/RUN	S1	Slide Switch
12	1	RESET	PB1	Push-button
13	1	RS232	P1	DB9
14	1	EA#	J1	1X2 Header
15	1		J3	2X4 Header
16	1	ROM/RAM		2X3 Header
17	8	PIO	J8	Terminal blocks (14)
18		PWR	JP6	Terminal block (2)
19	1	SIGNALS	J7	40-pin header
20	2	BUS	J9, J10	23-pin header
21	1	J-TAG	J2	1X6
22	1	DS1233	U7	
23	1	74HCT573	U1	Octal latch
24	1	P80C31BH	U2	Microcontroller
25	1	XC9536-15PC44C	U3	32K Static RAM
26	1	27C256	U5	32K EPROM
27	1	MAX232	U6	Serial
28	1	11.0592 clock	Y1	Clock

7.2 Socket List

Item	Quantity	Reference	Description
1	1	U1	20 Pin dip socket (machine screw)
2	1	U2	40 Pin dip socket (machine screw)
3	1	U3	44 pin PLCC
4	2	U4	32 Pin dip socket (machine screw)
5	1	U5	28 Pin dip socket (machine screw)
6	1	U6	16 Pin dip socket (machine screw)
7	1	Y1	8 Pin dip Socket

7.3   R-31JP Component Cross Reference

The following is a list of components as they appear in the circuit diagrams. Note that the circuit diagrams are presented as a hierarchy. The sheet name and number indicate which sheet in the hierarchy the component belongs to. The part field gives component names as they appear in the diagrams.

Cross Reference:

Revised: October 5, 1994

Item	Reference	Part	Sheetname	Sheetnumber
1	C1	22pF	CPU	2
2	C2	22pF	CPU	2
3	C3	2.2uF	DECODE	3
4	C4	22uF	SERIAL	5
5	C5	22uF	SERIAL	5
6	C6	22uF	SERIAL	5
7	C7	22uF	SERIAL	5
8	C8	100nF	SERIAL	5
9	C9	100nF	SERIAL	5
10	C10	100nF	SERIAL	5
11	C11	100nF	SERIAL	5
12	C12	100nF	SERIAL	5
13	C13	100nF	SERIAL	5
14	C14	100nF	SERIAL	5
15	C15	100nF	SERIAL	5
16	C16	100nF	SERIAL	5
17	C17	470uF	SERIAL	5
18	C18	47uF	SERIAL	5
19	C19	47uF	SERIAL	5
20	R1	10K	CPU	2
21	R2	2.2K	DECODE	3
22	R3	100	DECODE	3
23	R4	330	DECODE	3
24	R5	330	DECODE	3
25	D1	MON	DECODE	3
26	D2	RUN	DECODE	3
27	D3	1N4001	SERIAL	5
28	S1	MON/RUN	DECODE	3
29	PB1	RESET	DECODE	3
30	P1	RS232	SERIAL	5
31	J1	EA#	CPU	2
32	J2	CFG0	DECODE	3
33	J3	CFG1	DECODE	3
34	J4	PIN1	MEMORY	4
35	J5	PIN27	MEMORY	4
36	J6	PWR	SERIAL	5

37	J7	SIGNALS	PIO	6
38	J8	PIO	PIO	6
39	J9	BUS 1	PIO	
				6
40	J10	BUS 2	PIO	6
41	U1	74HCT573	CPU	2
42	U2	8032	CPU	2
43	U3	GAL20V8	DECODE	3
44	U4	62256	MEMORY	4
45	U5	27C256	MEMORY	4
46	U6	MAX232	SERIAL	5
47	Y1	11.059 MHz	CPU	2