

Mechanical Assembly

Observe antistatic precautions when handling integrated circuit devices. Touch a grounded conductor before touching the chips and work on an anti-static surface if available.

Plug the microprocessor chip, IC1 (AT89S8252), into the 40 pin socket on the CPU board, being careful to position pin 1 at the same end as the notch in the socket.

Plug the EEPROM chip (IC2 (AT24C02), into the 8-pin socket on the CPU board, taking similar precautions for the position of pin 1.

Prepare a power cord using a 2-pin connector housing and two crimp-on pins. Make a mark on one side of the housing to identify the positive terminal (JP5-2). This connector will attach to the CPU board at JP5

Prepare a cable for the mechanical encoder, using a 4-pin connector housing and 4 crimp-on pins. Only three conductors will be needed if a mechanical encoder is used. The fourth (Vcc on JP3-4) conductor is only required for optical encoders. This connector will attach to the CPU board at JP3. Pin JP3-1 is GND, JP3-2 is the A input, and JP3-3 is the B input. Check the data sheet for the mechanical encoder if possible. On most mechanical encoders the center of the three pins will be GND. The pins on either side are the A and B outputs. If it is not clear which pin is A/B, just guess and try it out. If the tuning direction is opposite to the desired direction, simply reverse the connections.

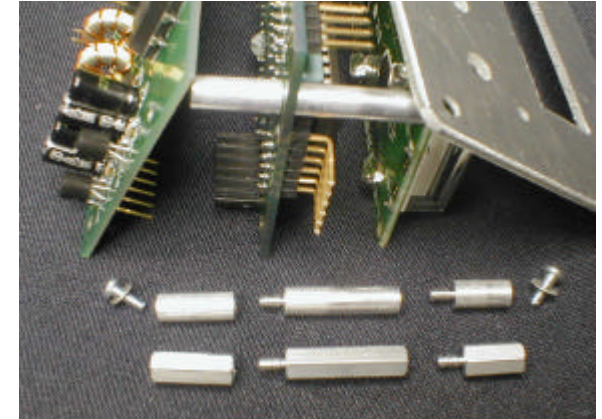
Prepare a cable for the control switches, using an 11-pin connector housing. 11-conductor ribbon cable may be used, but only 7 of the 11 pins will be needed for normal operation. This connector will attach to the CPU board at JP1. The common GND for all the control switches should connect to JP1-1 and/or JP1-11. Connect the RxTx momentary pushbutton to JP1-3, and connect the TS momentary pushbutton to JP1-2. If a mechanical encoder that incorporates a momentary switch is being used, it will be a convenience to connect the TS control line (JP1-2) to that switch. An SPST toggle switch should be connected to JP1-4 to control the SPLIT mode selection. An additional SPST toggle switch may be connected to the TX control line (JP1-5), but it is probably a good idea to route this control line to a backpanel connector for possible connection to a transmitter keying line if automatic Rx/Tx switching is desired. Finally, one more SPST toggle switch may be connected to JP1-10 to enable or disable the LCD panel's LED backlight. Alternatively JP1-10 can be permanently grounded and the backlight will be on all the time.

Assembly of the circuit boards and front panel is best accomplished with threaded standoffs. The PC board holes and component clearances are sized for #2-56 hardware. As shown in Figure 12, three standoffs and two machine screws are required at each of the four mounting holes. The hardware pictured is, from left to right

- #2-56 x 1/4" machine screw & washer
- #2-56 x 1/2" female threaded standoff
- #2-56 x 3/4" male/female threaded standoff
- #2-56 x 3/8" male/female threaded standoff
- #2-56 x 1/4" machine screw & washer (or flat head machine screw)

These items are relatively rare, but the hex versions pictured were found at McMaster-Carr, a machinist's supply company, on the web at < <http://www.mcmaster.com> >

Plug the LCD display panel into JP2 on the top side of the CPU board. Use the 3/4" male/female standoffs to secure the CPU board to the display board.



Plug the DDS board into JP4 on the bottom side of the CPU board. Use the 1/2" female threaded standoffs and #2-56 x 1/4" machine screws to secure the DDS board to the CPU board.

If a front panel has been prepared, secure the front panel to the CPU board with the 3/8" male/female threaded standoffs and #2-56 x 1/4" machine screws.

Plug the mechanical encoder cable connector into JP3, and the control switch cable into JP1. Plug the power cord connector into JP5 on the CPU board, noting that the positive side of JP5 (JP5-2) is closest to the corner of the board.

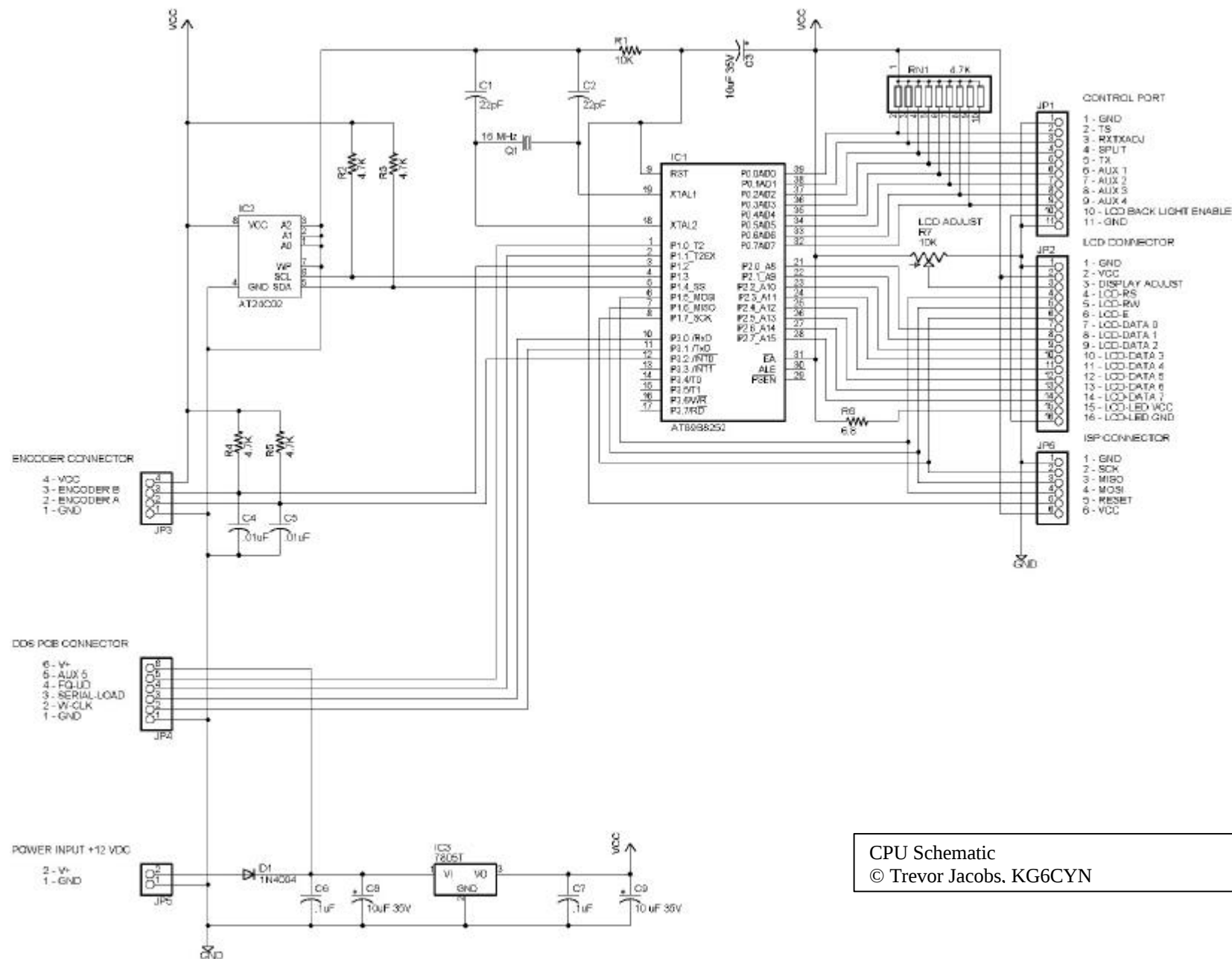
Connect the power cord to a supply of at least 8 volts, but not more than 14 volts. A voltage regulator on the CPU board will provide +5 volts.

Proceed to the power-up checkout procedure.

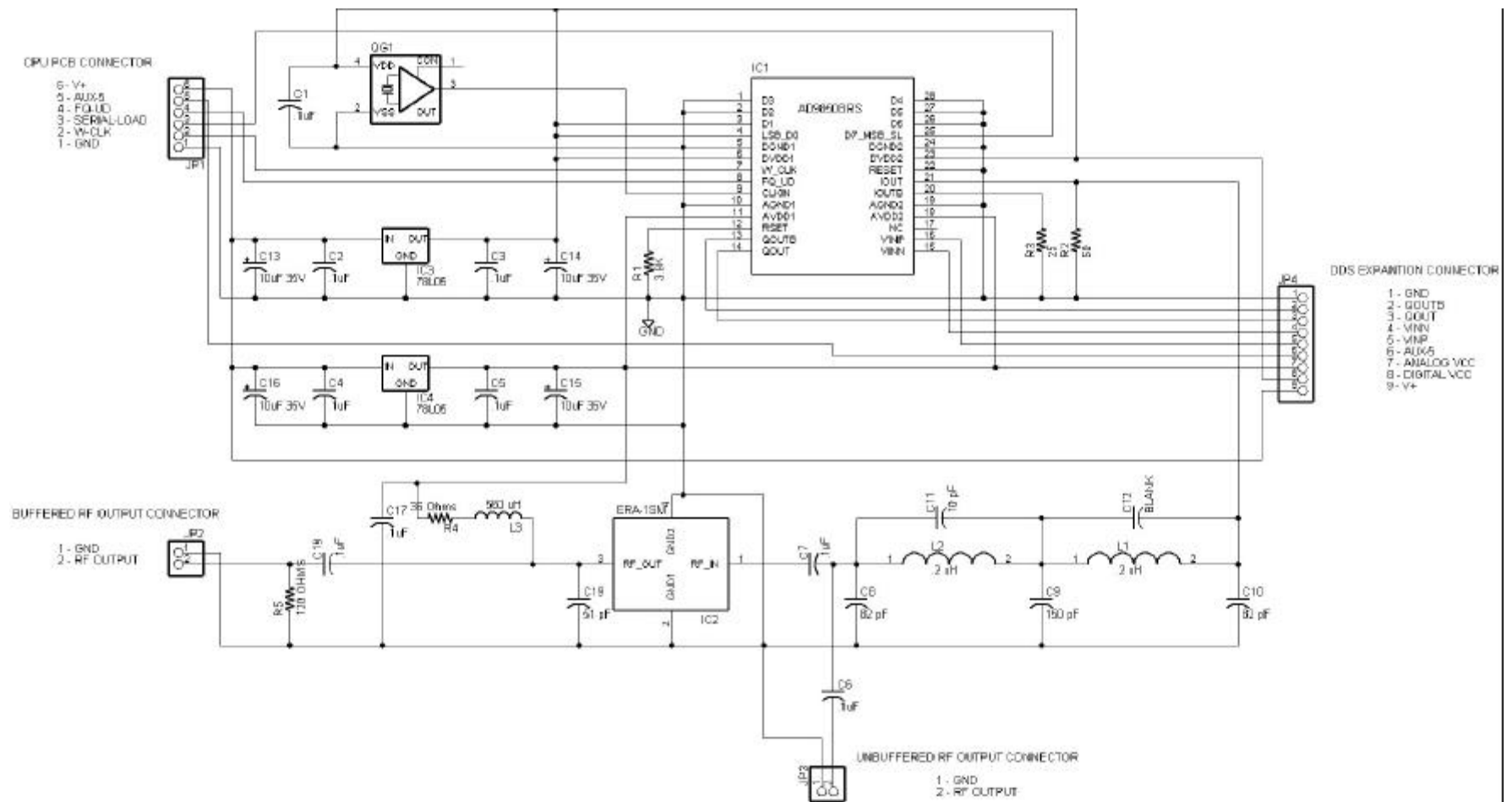
PARTS LIST

CPU PCB Designator	DDS PCB Designator	Value - Description	Quantity	Supplier Part Number	Supplier	Each	Total
C1, C2	C11	10 pF 0805 SMD	1	PCC100CNCT-ND	DIGI-KEY	0.06	0.06
		22pF 1206 SMD	2	PCC220CCT-ND	DIGI-KEY	0.12	0.24
	C19	51 pF 1206 SMD	1	399-1202-1-ND	DIGI-KEY	0.50	0.50
	C8, C10	82 pF 0805 SMD	2	PCC820CGCT-ND	DIGI-KEY	0.05	0.09
	C9	150 pF 0805 SMD	1	PCC151CGCT-ND	DIGI-KEY	0.05	0.05
C4, C5		.01 uF 1206 SMD	2	PCC103BCT-ND	DIGI-KEY	0.15	0.29
C6, C7	C1 - C7, C17, C18	.1 uF 1206 SMD	11	PCC104BCT-ND	DIGI-KEY	0.25	2.70
C3, C8, C9	C13 - C16	10 uF 25V ELECT RADIAL	7	P5567-ND	DIGI-KEY	0.11	0.78
R6		6.8 OHMS 1206 SMD	1	311-6.8ECT-ND	DIGI-KEY	0.10	0.10
	R3	27 OHMS 1206 SMD	1	311-27ECT-ND	DIGI-KEY	0.10	0.10
	R4	36 OHMS 1206 SMD	1	311-36ECT-ND	DIGI-KEY	0.10	0.10
	R2	51 OHMS 1206 SMD	1	311-51ECT-ND	DIGI-KEY	0.10	0.10
	R5	120 OHMS 1206 SMD	1	311-120ECT-ND	DIGI-KEY	0.10	0.10
	R1	3.9K OHMS 1206 SMD	1	311-3.9KECT-ND	DIGI-KEY	0.10	0.10
R2 - R5		4.7K OHMS 1206 SMD	4	311-4.7KECT-ND	DIGI-KEY	0.10	0.39
R1		10K OHMS 1206 SMD	1	311-10KECT-ND	DIGI-KEY	0.10	0.10
RN2		9 x 4.7K OHMS SIP	1	770-101-R4.7K-ND	DIGI-KEY	0.21	0.21
R7		10K OHMS TRIM POT	1	3386P-103-ND	DIGI-KEY	1.18	1.18
Q1		16 MHz HC49US XTAL	1	300-6034-ND	DIGI-KEY	0.75	0.75
	QG1	120 MHz XTAL OSC	1	SE3516CT-ND	DIGI-KEY	5.38	5.38
	L3	560uH AXIAL INDUCTOR	1	43LS564	MOUSER	0.41	0.41
	L1, L2	.2 uH - 8 TURNS #24 T37-6	2	T37-6	KITSANDPARTS.COM	5.00	5.00
LCD		16 CHARACTER x 2 LINES	1	628-L1682B1J	MOUSER	16.60	16.60
D1		IN4004	1	1N4004GICT-ND	DIGI-KEY	0.40	0.40
	IC2	MONOLITHIC AMP (MMIC)	1	ERA-1SM	MINI CIRCUITS	1.42	1.42
IC3		7805 +5V REG TO-220	1	296-1974-5-ND	DIGI-KEY	0.75	0.75
	IC3, IC4	78L05 +5V REG TO-92	2	296-1365-ND	DIGI-KEY	0.42	0.84
IC2		AT24C02 EEPROM	1	AT24C02-10PI-2.7-ND	DIGI-KEY	0.84	0.84
IC1		AT89S8252 CPU	1	AT89S8252-24PC-ND	DIGI-KEY	7.14	7.14
	IC1	AD9850 DDS 125 MHz	1	AD9850BRS	ANALOG DEVICES	14.55	14.55
ENCODER		MECHANICAL ENCODER	1	P80695-ND	DIGI-KEY	2.94	2.94

FOR IC1	40 PIN DIP SOCKET	1	A9440-ND	DIGI-KEY	1.77	1.77
FOR IC2	8 PIN DIP SOCKET	1	A9408-ND	DIGI-KEY	0.57	0.57
	PIN HEADER MALE	2	929450-01-36-ND	DIGI-KEY	1.93	3.86
	PIN HEADER M-LONG	1	929647-04-36-ND	DIGI-KEY	2.68	2.68
	PIN HEADER M-R-ANGLE	1	929550-01-36-ND	DIGI-KEY	2.41	2.41
	PIN HEADER FEMALE	1	929850-01-36-ND	DIGI-KEY	1.91	1.91
	CRIMP TERMINALS	19	WM2200-ND	DIGI-KEY	0.05	0.96
	CONN HOUS 2 POS	2	WM2601-ND	DIGI-KEY	0.18	0.36
	CONN HOUS 11 POS	1	WM2610-ND	DIGI-KEY	0.63	0.63
	CONN HOUS 4 POS	1	WM2603-ND	DIGI-KEY	0.28	0.28
					TOTAL	79.61



CPU Schematic
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DDS Schematic
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