CanSat Assembly Instructions

Integrated Circuit Sockets:
1-24 pin, 1-16 pin, 2-14 pin, 2-8 pin

Align the notch at one end of each socket with the notch shown (at the pin 1 end) on the outline of the socket screened on the circuit board. Be sure that sockets are seated flat upon the circuit board. Solder the two pins on opposite corners of the socket and inspect that the socket is seated properly. If it is not properly seated, reheat one or both pins while pressing the socket against the board. Inspect the socket again. Once it is properly seated, solder all of the remaining pins. DO NOT insert integrated circuits into the sockets at this time.

☐ Install a 24 pin socket at the location of U-1, the Basic Stamp module
☐ Install a 16 pin socket at the location of U-2, the MX-614 modem
☐ Install 14 pin sockets at the locations of U-3, the MAX-3100 UART, and U-4, the 74HC08
☐ Install 8 pin sockets at the locations of U-5, LT-1111 voltage converter, and U-6, the 24LC16 EEPROM
☐ Inspect each of the sockets you’ve installed, checking that every pin has been soldered, and that there are no solder bridges.

Header Connectors
1 - double row 10 pin, 2 - single row 8 pin, 2 - single row 3 pin, 5 – 2 pin

Note that the pins on one side of the header connectors are longer than the pins on the other side. The shorter pins are to be inserted into the circuit board. Follow a procedure similar to that used with the IC sockets. Seat the connector flat of the board and solder one pin only. Inspect to ensure that the connector is flat against the board. Reheat that corner and press the connector firmly against the board if necessary. When you are sure that the connector is properly seated solder all of the remaining pins.

☐ Install a double row, 10 pin header connector at J-1
☐ Install single row, 8 pin header connectors at J-2 and J-3. These connectors are very close to the socket you’ve already installed at U-1. Be very careful to avoid solder bridges.
☐ Install single row, 3 pin connectors at J-7 and J-10
☐ Install 2 pin connectors at J-4, J-5, J-6, J-8, and J-9
☐ Inspect each of the header connectors you’ve installed, checking that every pin has been soldered, and that there are no solder bridges.
Power Control Circuit, Part A – For Battery Power

L-1 47 uH inductor  L-2 100 uH inductor  C-1 33 uF electrolytic capacitor
C-2 1 uF electrolytic capacitor  C-3, C-4 0.1 uF capacitors  R-1 47 ohm resistor
R-2 1K resistor  D-1 1N5818 diode  LED-1 (part of a dual LED package)

- Install resistor R-1 (47 ohm, yellow, violet, black) near the U-5 socket
  Resistors are not polarized and may be installed in either orientation.
- Install the dual LED package LED-1/LED-2 near the lower left corner of the circuit board
- Install resistor R-2 (1 K, brown, black, red)
  Note that R-2 near the LEDs
- Install molded inductor L-1 (47 uH, may be marked with color bands, yellow violet black)
- Install molded inductor L-2 (100 uH, may be marked brown black brown)

  It is possible that L-1 and L-2 may be coils wound onto toroidal ferrite cores. If so, refer to instructions elsewhere in this document describing preparation of toroidal inductors. L-1 would be 9 turns of AWG 24 enameled wire on an FT37-43 core. L-2 would be 13 turns, also on an FT37-43 core.

- Install monolithic ceramic capacitors C-3 and C-4 (0.1 uF, marked 104)

  The following three components are polarity sensitive. Identify the positive lead of each capacitor, and the cathode, or banded, end of the diode before installation.

- Install polarized electrolytic capacitor C-1 (33 uF) The positive lead (marked with +) of C-1 should be inserted into the hole farthest from the edge of the circuit board. It may be necessary to reform the leads of C-1 to allow them to fit the narrowly space holes in the circuit board.
- Install polarized electrolytic capacitor C-2 (1 uF) The positive lead (marked with +) of C-2 should be inserted into the hole farthest from the edge of the circuit board. Again, you may have to reform the leads to match the board’s hole spacing.
- Install diode D-1 (1N5818). Carefully observe the polarity of D-1. Insert it so that the banded end points away from U-5. The outline of D-1 on the circuit board correctly shows this orientation.

Power Control Circuit, Part B – For Use with 5 Volt Regulated Power Supply

J-11 5.5 mm x 2.1 mm coaxial DC power connector

- Install J-11. This connector is very close to L-2, so be sure to avoid mechanically damaging L-2, or creating solder bridges. It is not necessary to completely fill the large mounting holes of J-11 with solder.
- Inspect your work from parts A and/or B. Be sure that all leads have been soldered, that there are no solder bridges, and that the correct components have been installed at each location.
BASIC Stamp, PC Communications Circuits, Program Memory
C-5, C-6, C-7, C-8  0.1 uF capacitors  R-5, R-5  4.7 K resistors

☐ Install monolithic ceramic capacitors C-5, C-6, C-7, and C-8 (0.1 uF, marked 104)

☐ Install resistors R-4 and R-5 (4.7 K, yellow, violet, red). Note that the screened outline on the circuit board shows 1 K at each position. 4.7 K is the correct value.

☐ Inspect your work. Be sure that all leads have been soldered, that there are no solder bridges, and that the correct components have been installed at each location.

UART, Modem, and Radio Interface Circuits
C-9, C-12, C-13, C-14, C-16, C-17, C-18, C-19, C-20  0.1 uF ceramic capacitors
C-10, C-11  22 pF ceramic capacitors  C-15  100pF ceramic capacitor
R-6, R-8, R-9  100 K resistor  R-7  10 K resistor (optional 56 K)
R-10  2.2 K resistor  R-3  1 K resistor
LED-2  light-emitting diode (part of a dual LED package)  Q-1  2N7000 MOS transistor
Y-1 3.59 MHz quartz crystal  VR-1  5 K potentiometer
VR-2  10 K potentiometer

☐ Install monolithic ceramic capacitors C-9, C-12, C-13, C-14, C-16, C-17, C-18, C-19, and C-20. (0.1 uF marked 104) Be very sure that these parts are seated all the way down against the circuit board, especially the three that are adjacent to VR-1 and VR-2 (C-17, C-18, and C-20).

☐ Install Y-1, the 3.58 MHz crystal. In order to be clear of the socket at U-2 it will probably be necessary to bend the leads of Y-1 90 degrees and install it on its side. Notice that the outline screened on the circuit board is for a much larger crystal package, which had to be mounted on its side.

☐ Install monolithic ceramic capacitors C-10 and C-11 (22 pF, blue case, marked 22)

☐ Install resistors R-6, R-8, and R-9 (100 K, brown black yellow)

☐ Install resistor R3 (1 K, brown black red)

☐ Verify that the pins of LED-2 are soldered. Recall that LED-2 is part of a dual LED package previously installed as LED-1.

☐ Install resistor R-7 (10 K, brown black, orange) Note that it may be necessary to substitute a 56 K resistor in order to better match signal levels to the radio equipment.

☐ Install resistor R-10 (2.2 K, red red red)

☐ Install monolithic ceramic capacitor C-15 (100 pF, marked 101) The leads of C-15 may need to be reformed to fit the spacing of the holes in the circuit board.

☐ Install potentiometer VR-1 (5 K, a 1 K part may be substituted).
Install potentiometer VR-2 (10 K) The leads of this potentiometer may be a very snug fit into the mounting holes. Press the parts gently as far down as it will go without forcing it. There may be as much as 2 mm space under the part when it is seated as far as it will go.

Install MOS transistor Q-1 (2N7000) This transistor is sensitive to static discharge. Before picking up Q-1, touch a grounded metal object to dissipate any static charge that may have accumulated on your body or the tools you are using. The part outline screened on the circuit board is incorrect. Be sure the flat side of the transistor is aligned with the shorter flat side of the outline screened on the circuit board, that is, the flat side of the Q-1 package should face J-1. Q-1 need not be pressed all the way down onto the circuit board. Press it gently into place without forcing it.

Inspect your work. Be sure that all leads have been soldered, that there are no solder bridges, and that the correct components have been installed at each location.