PulseStar

Revision 3.0 Receiver

By GAA Custom Electronics

REVISION HISTORY

REVISION	DATE	DESCRIPTION
3.0 -	December 2007	Original release.
3.0a	January 2008	Added adjust detains and changed the value of R13.
3.0b	February 2008	Added details for building a scanner version.
3.0c	November 2008	Extensively revised presentation and content.
3.0d	July 8 2009	Updated for the latest software version and a minor design change. C31 changed to 1000pF and software upgraded to 3.0d.

FOREWORD

This document contains the design data, connection information, parts list and general assembly and tuning information for the PulseStar 3.0 receiver.

This receiver supports three modes of operation:

1) Standard PPM model airplane receiver mode.
2) Connection to a PC for configuration.
3) Operation as a channel scanner.

Connection to a PC for configuration requires a serial interface that is documented in Section 6. In addition to the serial interface you will need the PulseStar application to allow configuration of the receiver. The most up to date data and this application can be found at www.mstar2k.com.

This documentation applies only to Pulsestar Rev 3.0. There are significant differences to all other PulseStar revisions.
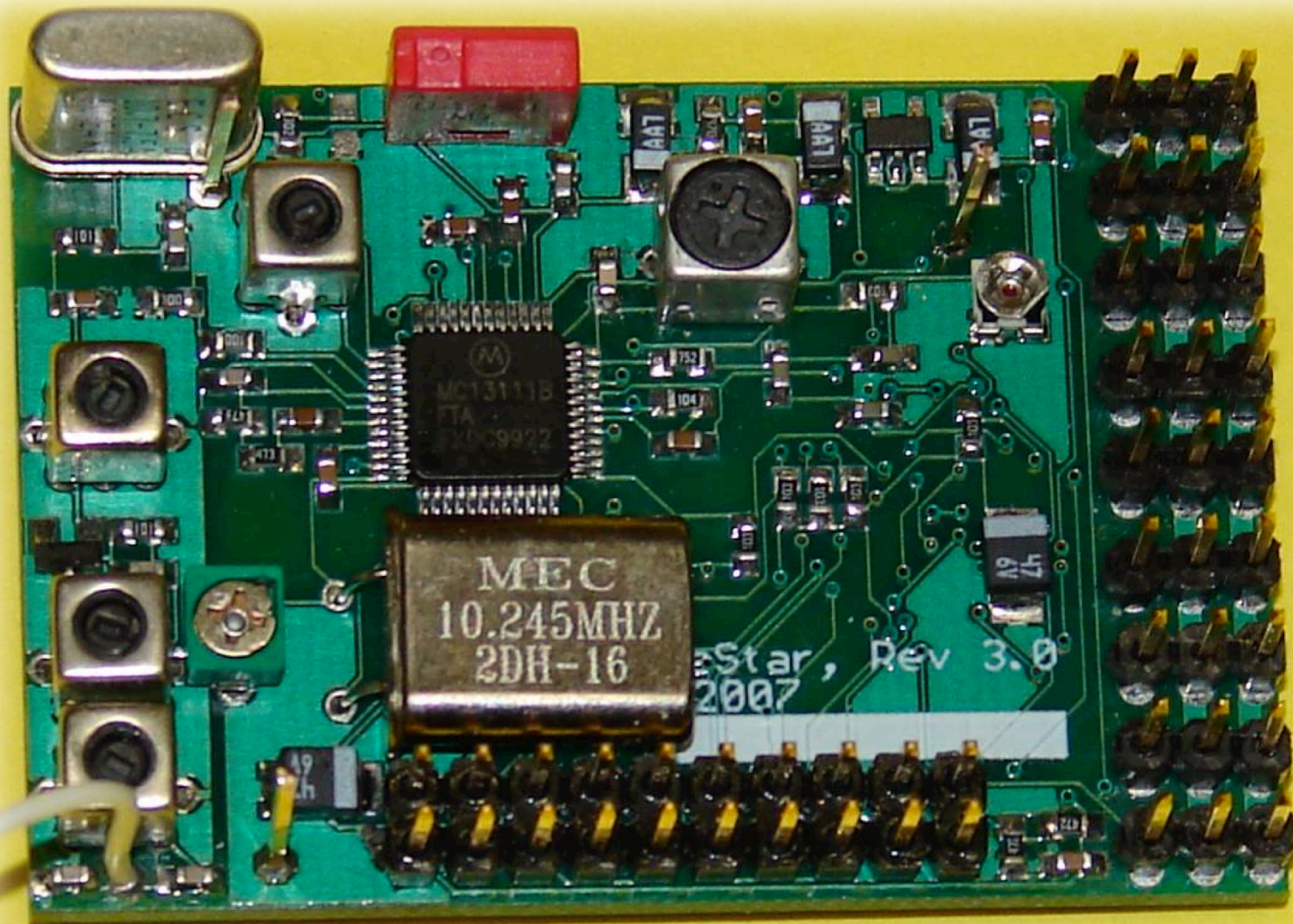
Pulsestar 3.0 Receiver: Specifications

- Power: 4 to 6 volts @ 26 mA
- Weight: 18 grams (no case)   30 grams (w/case)
- Size: 2.1"x1.45"x0.5" (no case)   2.28"x1.6"x0.75" (w/case)
- 8 channel, PPM
- Positive or negative shift
- 50MHz
- Synthesized frequencies
- Data logging capability
- Transmitter imprinting, glitch-proof reception
- Automatic frequency selection
- Battery voltage monitoring
- PC interface via serial adapter provides selection of configuration options and allows firmware updates
- Scanner function available with addition of optional parts
- Direct servo control from Microstar transmitter
- Ability to change frequencies and other receiver parameters directly without a computer via the Pulsestar Configuration Module
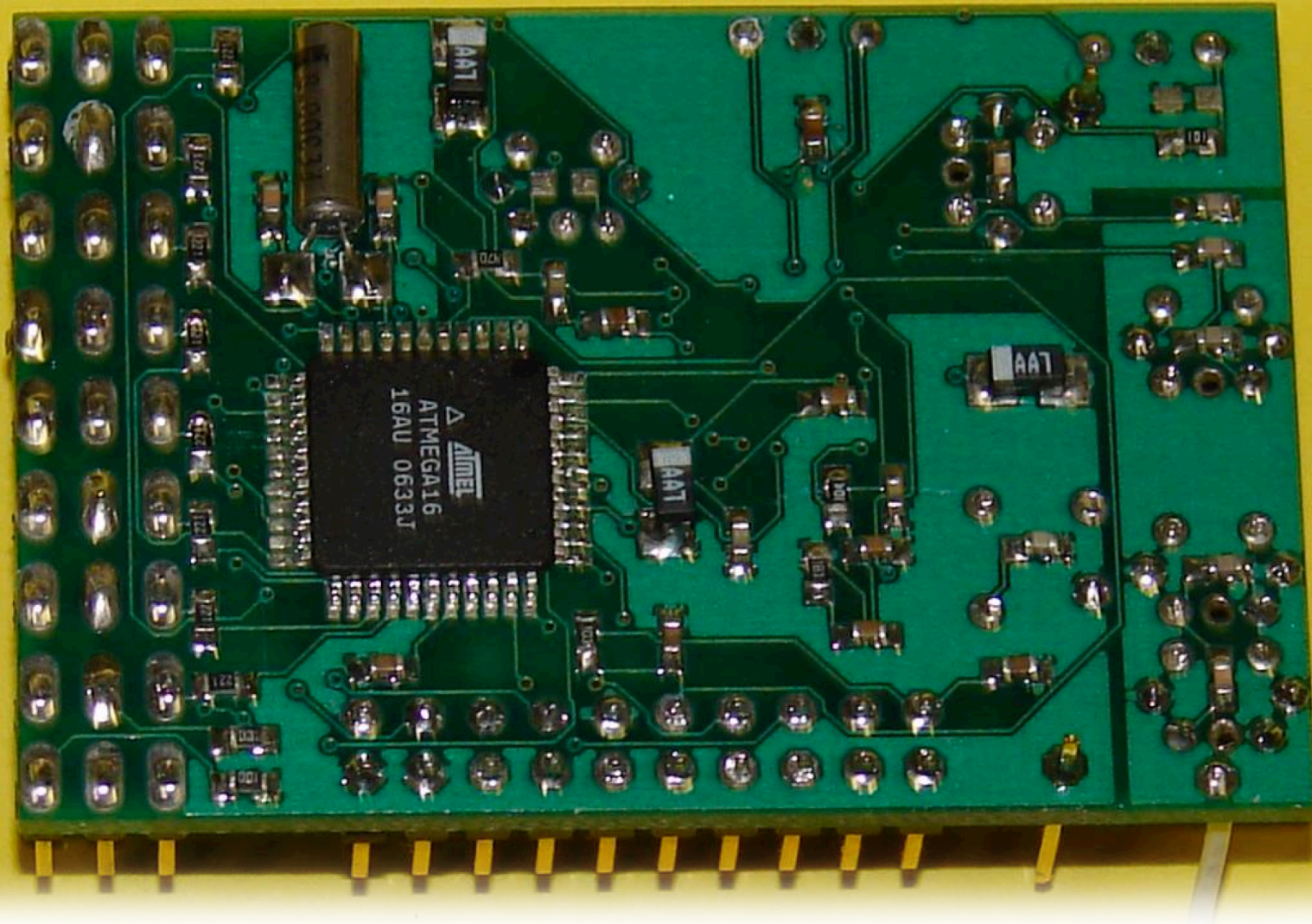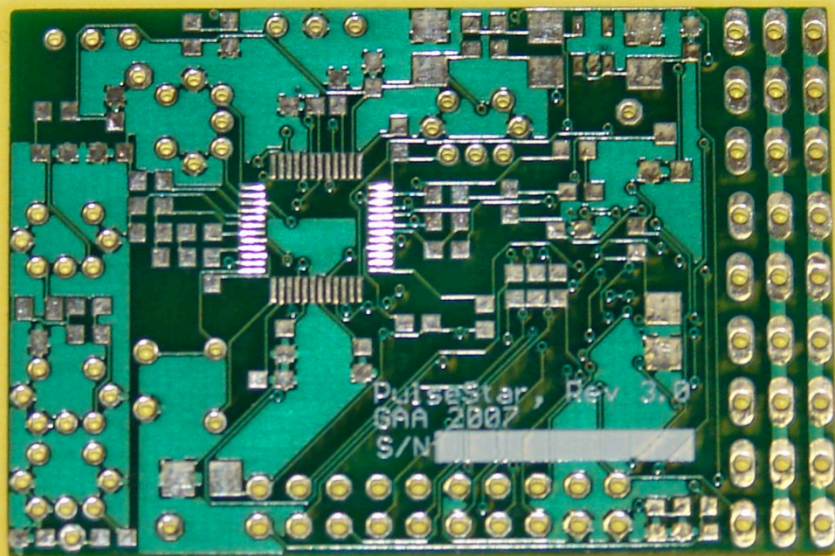
PulseStar 3.0 Receiver Pictorial
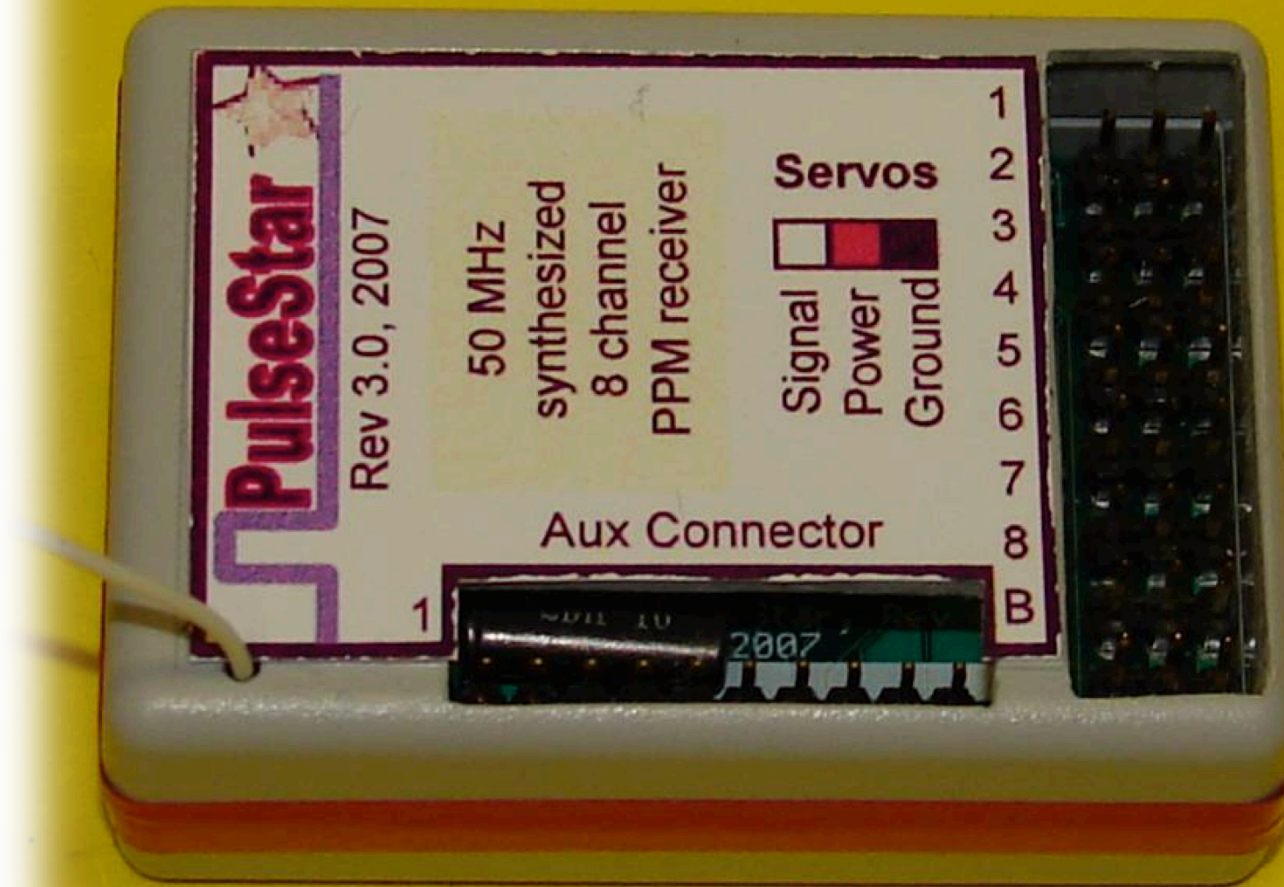
PulseStar 3.0 Receiver Pictorial : Board Top View

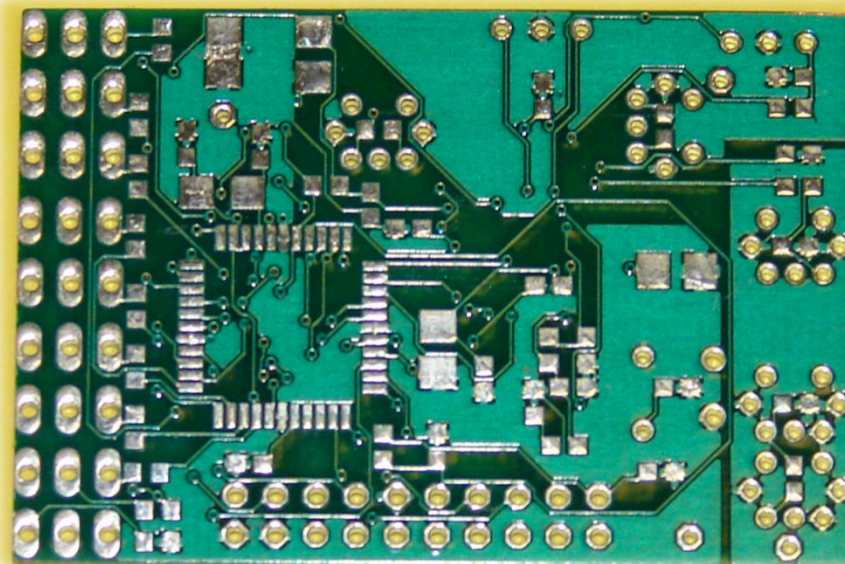# PulseStar 3.0 Receiver Pictorial : Board Bottom View

PulseStar 3.0 Bare PC Board Pictorial

Top

Bottom

PulseStar Rev 3.0 Receiver Schematic

RF pre-amp

A 4 volt regulator is used so all +5 volt labeled points should read +4 volts.

A B C Testpoints

Mounting pads
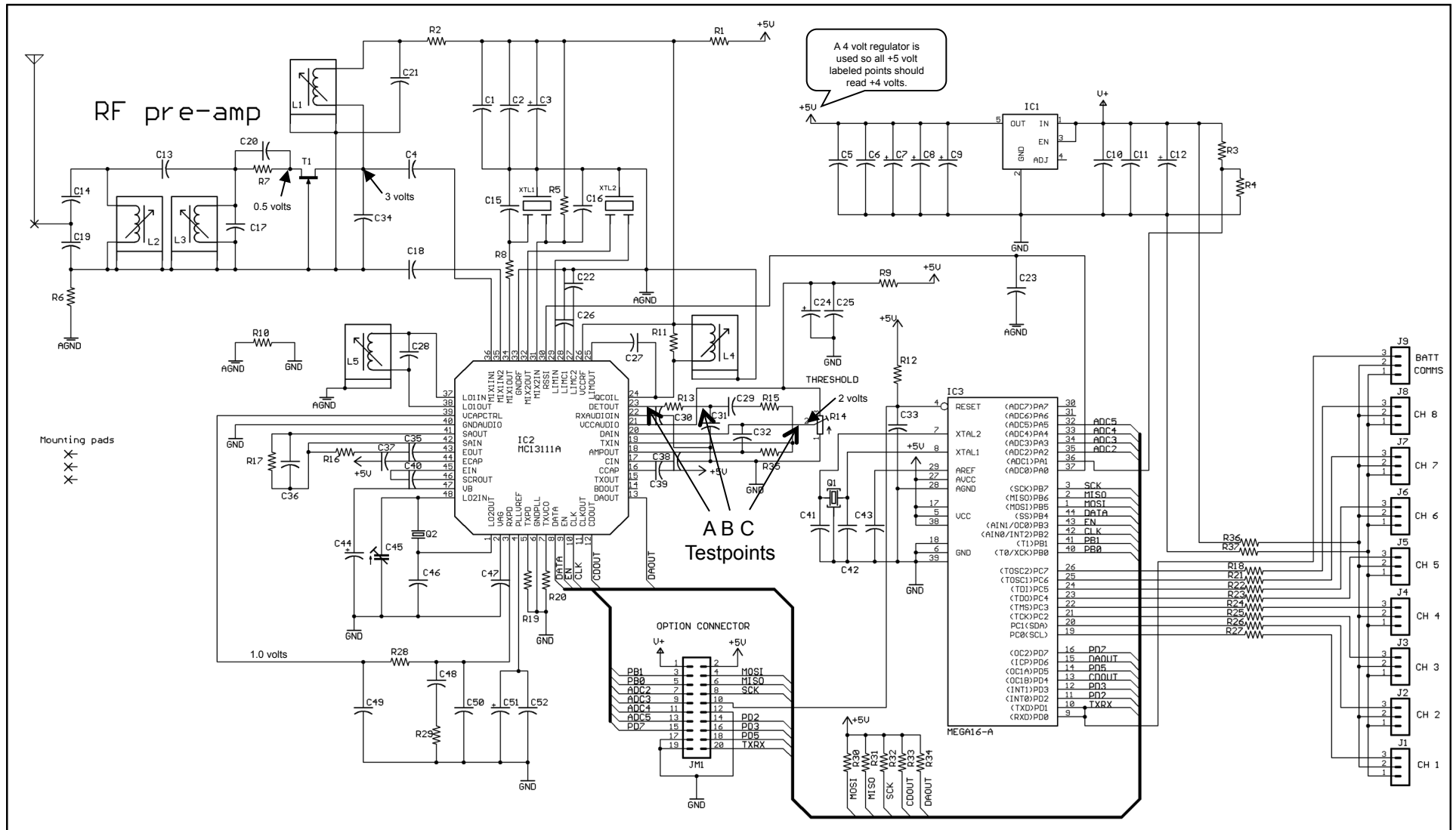
Ground JM1 pin 6 then apply power to start in boot loader mode.

See load maps for pictorial location of testpoints

SECTION 1: PARTS LIST

PulseStar Receiver Parts List, Rev 3.0

Item	Quanity	ID	Part number	Description	Supplier	Cost each	Total cost	Notes
1	1	R10	301-10-RC	10 ohm 0603 resistor	Mouser	0.07	0.07	
2	3	R2,R7,R8	301-100-RC	100 ohm 0603 resistor	Mouser	0.07	0.21	
3								
4	2	R5,R13	301-3.0K-RC	3K 0603 resistor	Mouser	0.07	0.14	
5	2	R1,R9	301-47-RC	47 ohm 0603 resistor	Mouser	0.07	0.14	
6	1	R11	301-22K-RC	22K 0603 resistor	Mouser	0.07	0.07	
7								
8	2	R16,R17	301-47K-RC	47K 0603 resistor	Mouser	0.07	0.14	
9	8	R12,R30,R31,R32,R33,R34,R19,R20	301-10K-RC	10K 0603 resistor	Mouser	0.07	0.56	
10	1	R29	301-18K-RC	18K 0603 resistor	Mouser	0.07	0.07	
11	2	R28,R35	301-100K-RC	100K 0603 resistor	Mouser	0.07	0.14	
12	3	R3,R4,R15	301-4.7K-RC	4.7K 0603 resistor	Mouser	0.07	0.21	
13	8	R18,R21,R22,R23,R24,R25,R26,R27	301-220-RC	220 ohm 0603 resistor	Mouser	0.07	0.56	
14	1	R14	P3V105CT-ND	1M ohm trim pot	Digikey	0.44	0.44	
15	2	C14,C19	140-CC504N101J-RC	100pF 0603 NPO	Mouser	0.05	0.1	
16	3	C13,C41,C42	140-CC504N220J-RC	22pF 0603 NPO	Mouser	0.05	0.15	
17	6	C4,C17,C18,C20,C34,C46	140-CC504N470J-RC	47pF 0603 NPO	Mouser	0.05	0.3	
18	6	C1,C25,C29,C30,C52,C47	140-CC504B103K-RC	0.01uF 0603	Mouser	0.032	0.192	
19	1	C15	140-CC504N6.0D-RC	6pF 0603 NPO	Mouser	0.05	0.05	
20	1	C27	140-CC504N100D-RC	10pF 0603 NPO	Mouser	0.05	0.05	
21	1	C16	140-CC504N1.0C-RC	1pF 0603 NPO	Mouser	0.05	0.05	
22	13	C22,C26,C32,C38,C23,C35,C5,C6,C10,C11,C33,C43,C21	810-C1608Y5V1H104Z	0.1uF 0603	Mouser	0.08	1.04	

PulseStar Receiver Parts List, Rev 3.0

23	6	C3,C9,C12,C24,C44,C51	493-2365-1-ND	10uF 16 volt tantalum	Digikey	0.21	1.26	
24	2	C7,C8	493-2348-1-ND	47uF 6.3 volt tantalum	Digikey	0.28	0.56	
25	3	C2,C31,C49	140-CC504B102K-RC	1000pF 0603 NPO	Mouser	0.17	0.51	
26	3	C39,C40,C37	810-C1608X5R1A474K	0.47uF 0603	Mouser	0.46	1.38	
27	1	C50	80-C0603C822K1R	8200pF 0603	Mouser	0.3	0.3	
28	1	C48	80-C0603C683K5R	0.068uF 0603	Mouser	0.04	0.04	
29	1	C28	140-CC504N180J-RC	18pF 0603 NPO	Mouser	0.05	0.05	
30	1	C36	140-CC504N221J-RC	220pF 0603 NPO	Mouser	0.05	0.05	
31								
32	1	C45	659-GKG30021	7.5 to 30pF trimmer	Mouser	0.56	0.56	
33	1	IC2	MC13111BFTA	Narrowband FM rec	GAACE	5	5	
34	1	IC1	LP2981AIM5-4.0CT-ND	4.0 Volt 150 mAmp regulator	Digikey	1.24	1.24	
35	1	IC3	ATMEGA16-16AU-ND	ATMEL microcontroller	Digikey	6.45	6.45	
36	4	L1,L2,L3,L5	TK5004-ND	0.22uH adj coil	Digikey	4.85	19.4	
37	1	L4	#5PLC-1055Z-ND	455KHz tank	Digikey	1.1	1.1	
38	1	T1	MMBF4416LT1GOSCT-ND	N FET	Digikey	0.32	0.32	
39	1	XTL1	X703-ND	10.7MHz crystal filter	Digikey	3.09	3.09	
40	1	XTL2	TK2334-ND	455KHz ceramic filter	Digikey	2.52	2.52	
41	1	Q1	SE3414-ND	8MHz cylinder crystal	Digikey	1.17	1.17	
42	1	Q2	CRY10.245	10.245MHz crystal	Futurlec	0.75	0.75	
43	1	J1,J2,J3,J4,J5,J6,J7,J8,J9	S1011-36-ND	Header x 1	Digikey	2.37	2.37	
44								
45	1	JM1	S2021-36-ND	Header x 2	Digikey	3.48	3.48	1
46	1		PulseStar PCB 3.0	Circuit board	GAACE	12	12	
47	1		SCR6A-ND	Plastic box 2.26 X 1.61 X.75	Digikey	3.53	3.53	1
48	3	R6,R36,R37	587-1714-1-ND	10uH inductor, 603	Digikey	0.245	0.735	
49	1		153-1083-ND	16 by 4 LCD display for scanner mode	Digikey	29.1	29.1	1

Notes

						Total	101.647

1 Optional

SECTION 2: PULSESTAR 3.0 LOAD MAPS

PulseStar 3.0 Component Side Load Map

Channel 1
Channel 2
Channel 3
Channel 4
Channel 5
Channel 6
Channel 7
Channel 8
Bat/Comms

Antenna connection. Use 42" of 26 gauge insulated wire
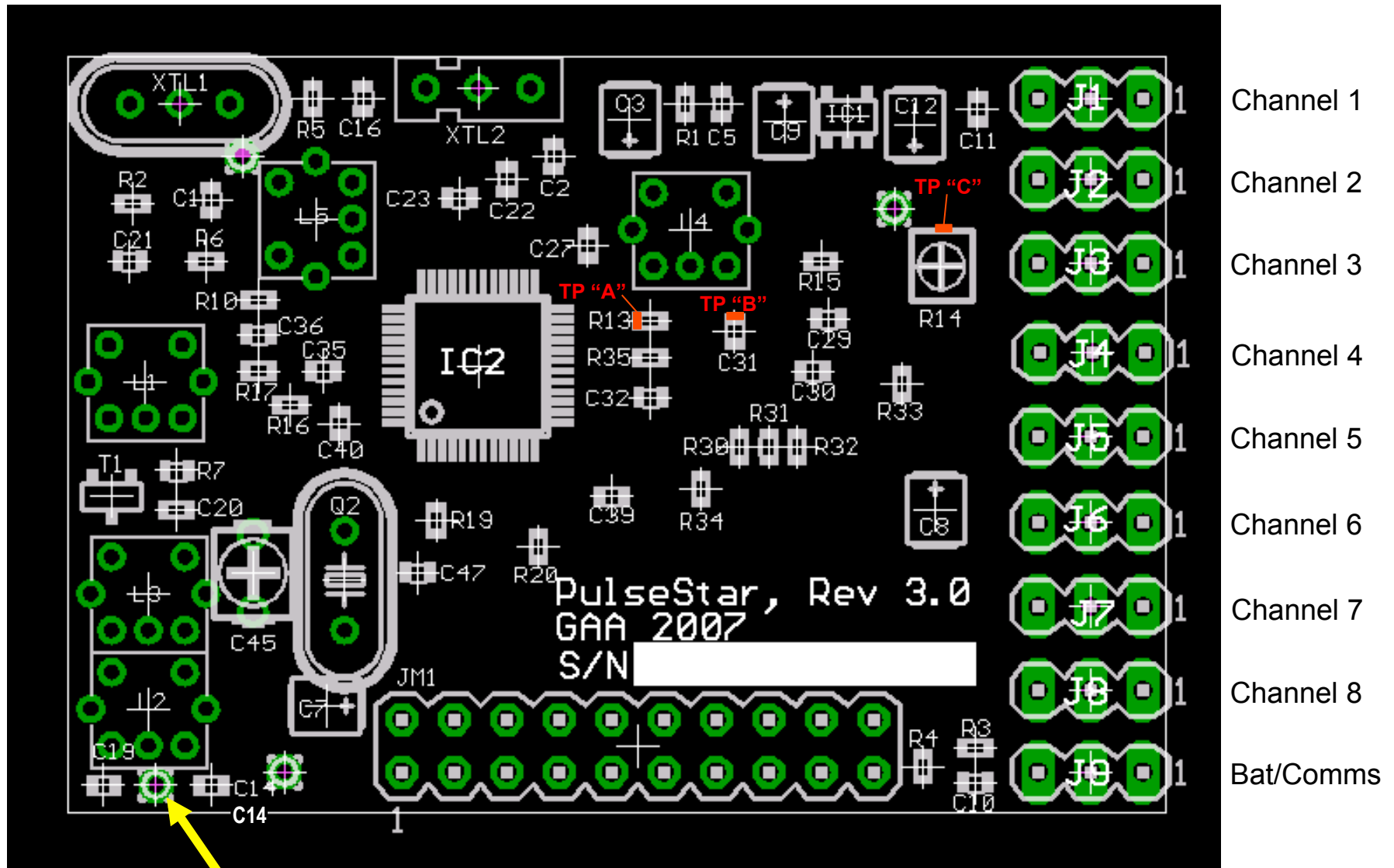
PulseStar 3.0 Solder Side Load Map
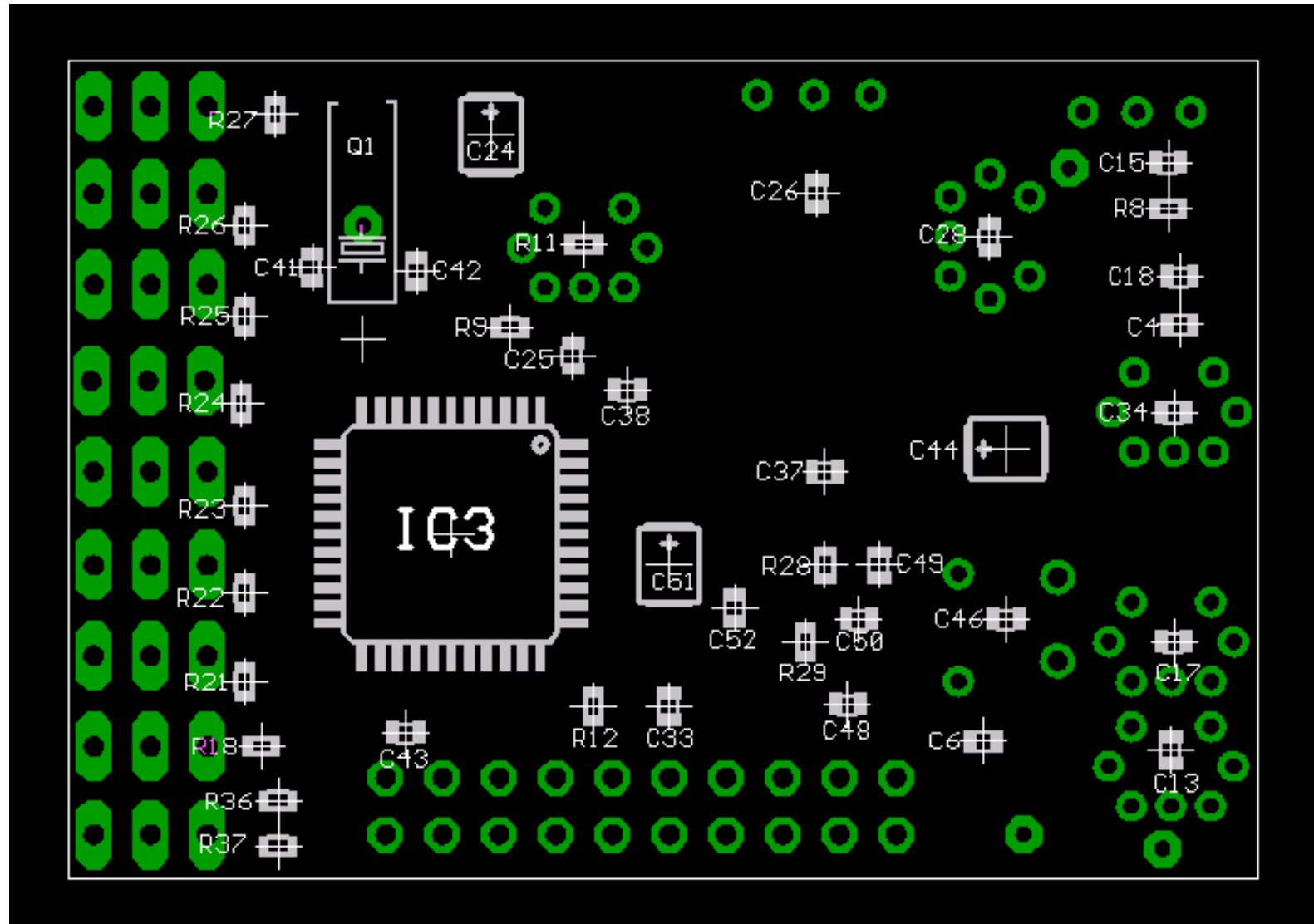
SECTION 3: PULSESTAR ASSEMBLY PROCEDURE

PC Board Trimming And Case Fitment

Prior to assembly, the case must be trimmed to fit into the receiver case. Using sandpaper, a file, or a Dremel tool with a sanding drum or cutoff wheel, CAREFULLY trim the board to the silkscreened border line on all four sides of the board taking off a small amount off the board at a time. Test fit after each cut and continue removing stock until the board will fit into the case easily. **Slightly** round each corner to aid in fitment.

Silkscreened border line (trim-to line)
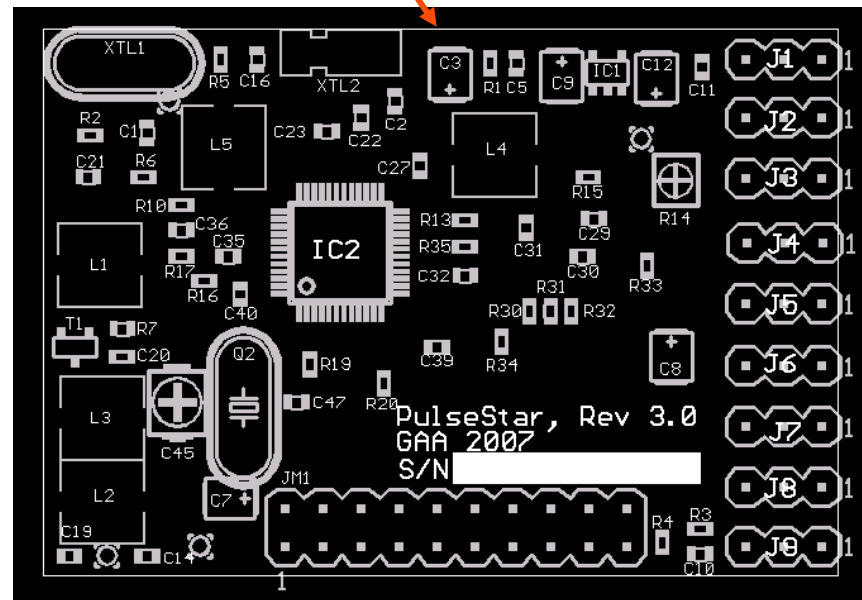
NOTE: Though board above shows components installed, trimming should be accomplished before assembly.

Assembly Order Step 1: Bottom Layer

STEP 1: RESISTORS

1.) 220 ohm resistors (8), part list item 13.
 R18,R21,R22,R23,R24,R25,R26,R27
2.) 47 ohm resistor (1), part list item 5.
 R9
3.) 10K ohm resistor (1), part list item 12.
 R12
4.) 100K ohm resistor (1), part list item 11.
 R28
5.) 18K ohm resistor (1), part list item 10.
 R29
6.) 100 ohm resistors (1), part list item 2.
 R8

STEP 2: INDUCTORS

1.) 10uH inductors (2) part list item 48.
 R36,R37

STEP 3: CAPACITORS

1.) 22pF capacitors (3), part list item 16.
 C13,C41,C42
2.) 0.01uF capacitors (2), part list item 20.
 C25,C52
3.) 0.1uF capacitors (5), part list item 22.
 C6,C26,C33,C38,C43
4.) 0.47uF capacitor (1), part list item 26.
 C37
5.) 1000pF capacitor (1), part list item 25.
 C49

STEP 3: CAPACITORS, continued

6.) 8200pF capacitor (1), part list item 27.
 C50
7.) 0.068uF capacitor (1), part list item 28.
 C48
8.) 47pF capacitors (5), part list item 17.
 C4,C17,C18,C34,C46
9.) 10uF capacitors (3), part list item 23.
 C24,C44,C51
10.) 18pF capacitor (1), part list item 29.
 C28

STEP 4: MISCELLANEOUS

1.) CPU (1), part list item 35.
 IC3
2.) 8MHz crystal (1), part list item 41.
 Q1

Do not install

See "Build Notes"
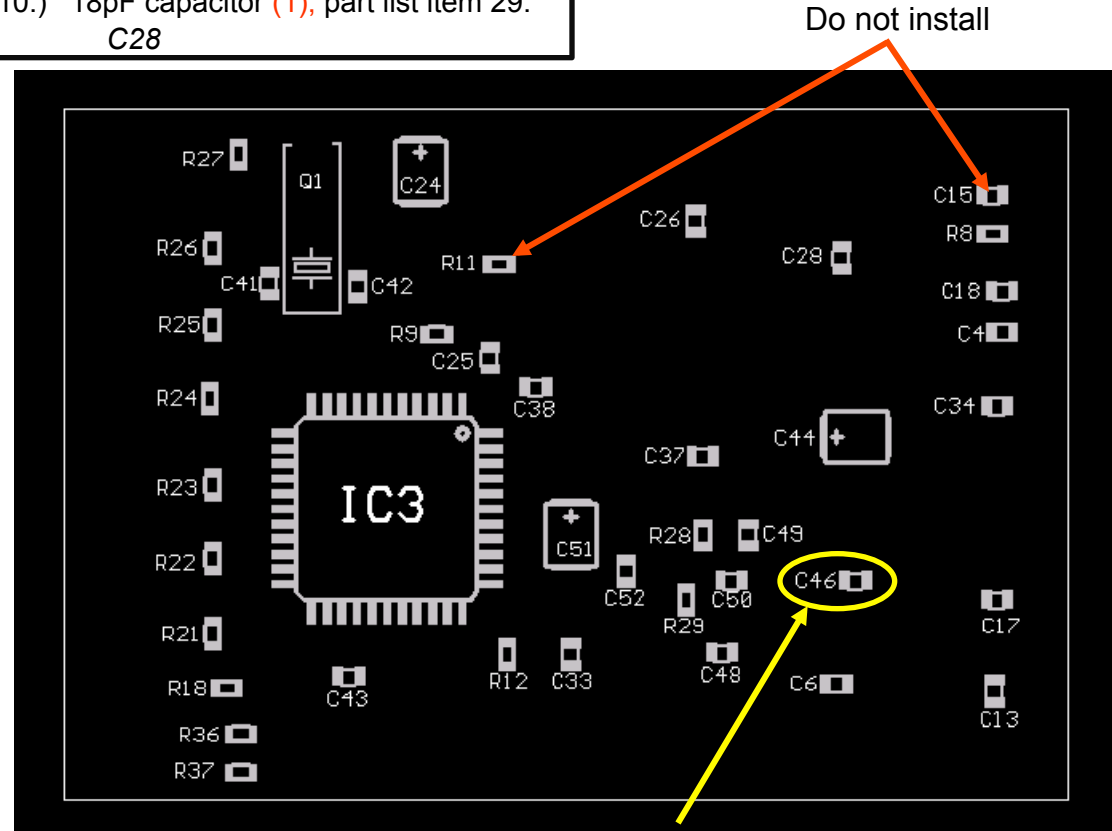
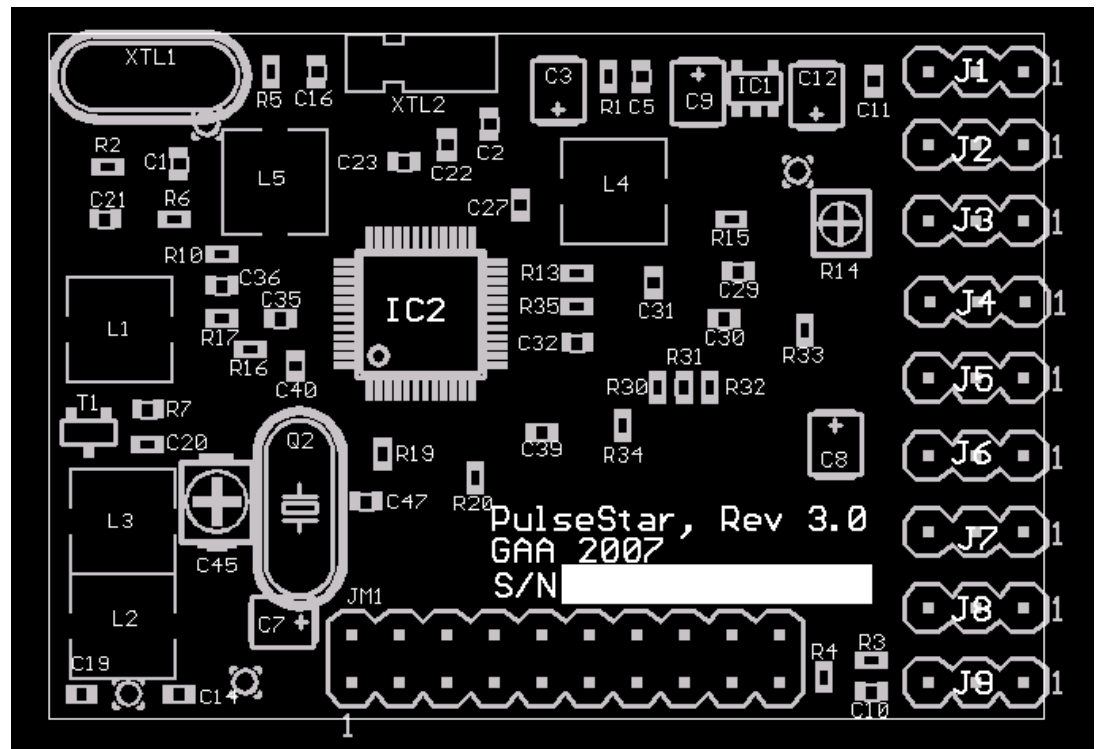# Assembly Order Step 2: Top Layer

STEP 1: RESISTORS

1.) 100 ohm resistors (2), part list item 2.
    R2,R7
2.) 10 ohm resistor (1), part list item 1.
    R10
3.) 3K ohm resistors (2), part list item 4.
    R5, R13
4.) 47K ohm resistors (2), part list item 8.
    R16,R17
5.) 10K ohm resistors (7), part list item 9.
    R19,R20,R30,R31,R32,R33,R34
6.) 100K ohm resistor (1), part list item 11.
    R35
7.) 47 ohm resistors (1), part list item 5.
    R1
8.) 4.7K ohm resistors (3), part list item 12.
    R3,R4,R15
9.) 1M ohm pot (1), part list item 14.
    R14

STEP 2: ICs

1.) Voltage regulator (1), part list item 34.
    IC1
2.) Receiver (1), part list item 33.
    IC2
3.) FET (1), part list item 38.
    T1

STEP 3: CAPACITORS

1.) 0.01uF capacitors (4), part list item 18.
    C1,C29,C30,C47
2.) 0.1uF capacitors (8), part list item 22.
    C5,C10,C11,C21,C22,C23,C32,C35
3.) 220pF capacitor (1), part list item 30.
    C36
4.) 0.47uF capacitors (2), part list item 26.
    C39,C40
5.) 100pF capacitors (2), part list item 15.
    C14,C19
6.) 47pF capacitor (1), part list item 17.
    C20
7.) 1000pF capacitors (2), part list item 25.
    C2, C31
8.) 10pF capacitor (1), part list item 20.
    C27
9.) 47uF capacitor (2), part list item 24.
    C7,C8
10.) 10uF capacitor (3), part list item 23.
    C3,C9,C12
11.) Trim capacitor (1), part list item 32.
    C45

Assembly Order Step 2: Top Layer (Continued)

STEP 4: MISCELLANEOUS ━━━━

1.) 455KHz tank (1), part list item 37.
   L4
2.) 0.18uH coils (4), part list item 36.
   L1,L2,L3,L5
3.) 10.7MHz crystal filter (1), part list item 39.
   XTL1
4.) 455KHz ceramic filter (1), part list item 40.
   XTL2
5.) 10.245 MHz crystal (1), part list item 42.
   *Q2 ***
6.) 3 pin servo connectors (9), part list item 43.
   J1,J2,J3,J4,J5,J6,J7,J8,J9
7.) 20 pin aux connector (1), part list item 45.
   *JM1 ****
8.) 42" antenna wire, 26 gauge typical

STEP 5: INDUCTORS ━━━━

1.) 10uH inductor (1), part list item 48.
   R6

NOTES:

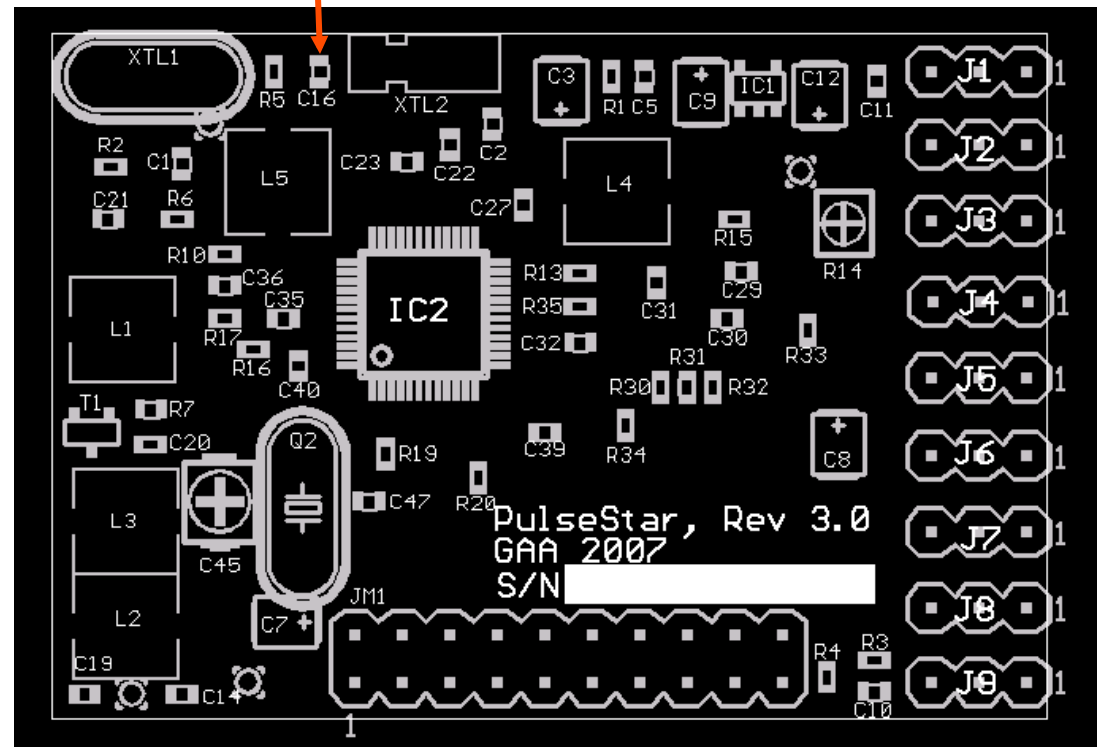*   If you intend to fit the receiver into the case do not stand this part up, bend the leads 90 degrees.

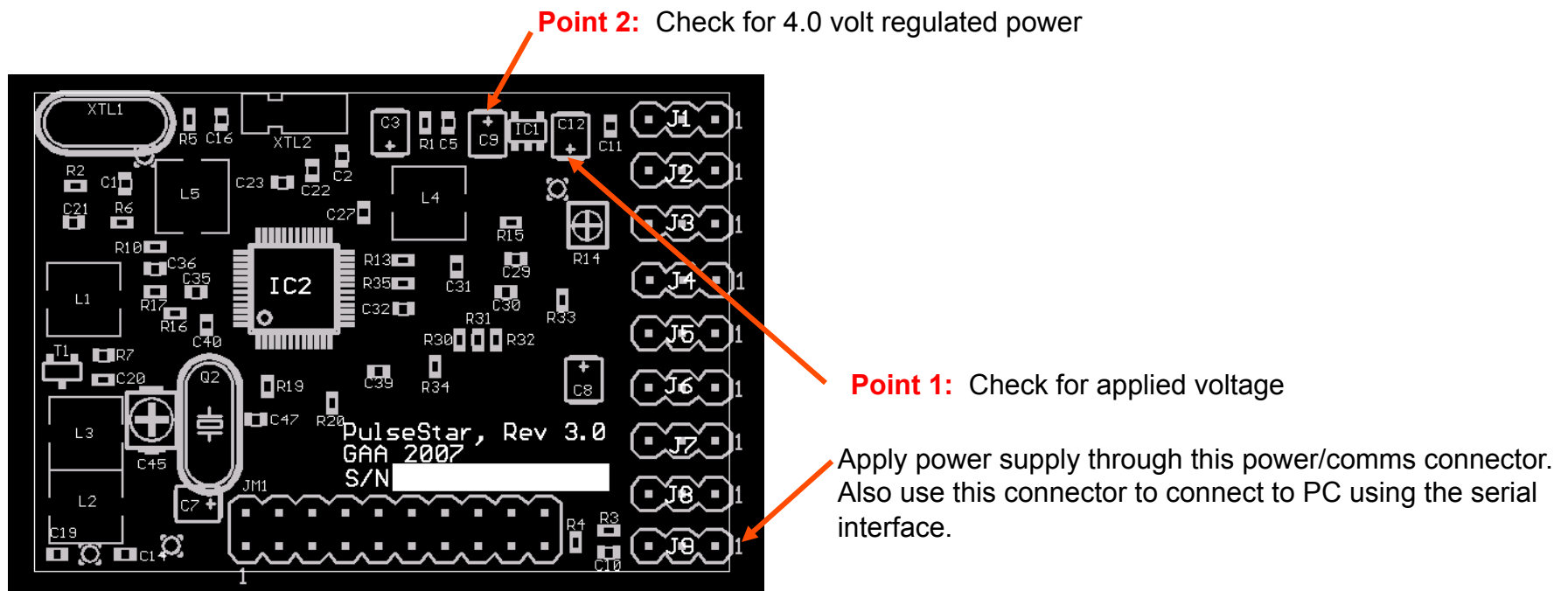**   Optional

Do not install

SECTION 4: TESTING / TUNING PROCEDURE

Initial Power -Up Tests

Required for testing: *1. Voltmeter   2. PC   3. Pulsestar PC application   4. Serial interface and cable*

WITH THE TRANSMITTER OFF

a. Visually inspect the board for shorts or cold solder joints. **Thoroughly clean** the board with a good solder flux remover or isopropyl alcohol.

a. Use an continuity tester to check for a short circuit on the input power connector before applying power..

b. Apply power (approximately 5 volts) through power connector and monitor input current. Should measure about 26 mA.

c. Check for input voltage at Point 1 and regulated 4.0 volts at Point 2.

d. Connect to the PC interface using the serial interface (see page ?) and make sure you can communicate.

Point 2: Check for 4.0 volt regulated power

Point 1: Check for applied voltage

Apply power supply through this power/comms connector. Also use this connector to connect to PC using the serial interface.

Tuning Procedure: Step 1

Required for tuning:
1. Voltmeter   2. Oscilloscope   3. Tuning wands   4. R/C Transmitter   5. PC   6. Pulsestar PC application
7. Serial interface and cable

WITH THE TRANSMITTER OFF

a. Adjust inductor L5 to achieve 1.0 volts at R28.

b. Adjust pot R14 to achieve 2.0 volts at R14's wiper.
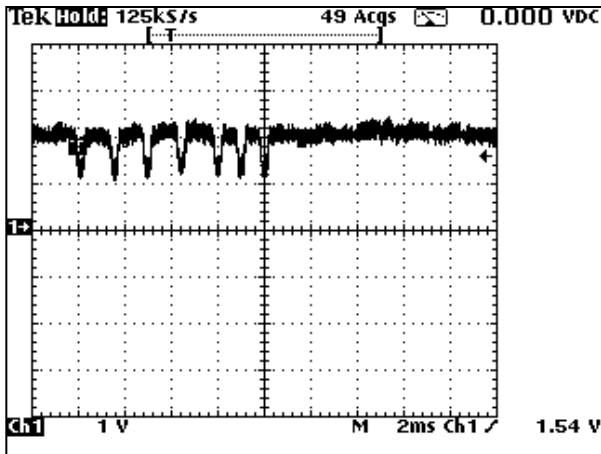
Step 1a: Adjust L5 and monitor voltage at R28 until the voltage equals 1.0 volts

Step 1b: Adjust R14 at the wiper until the voltage equals 2.0 volts
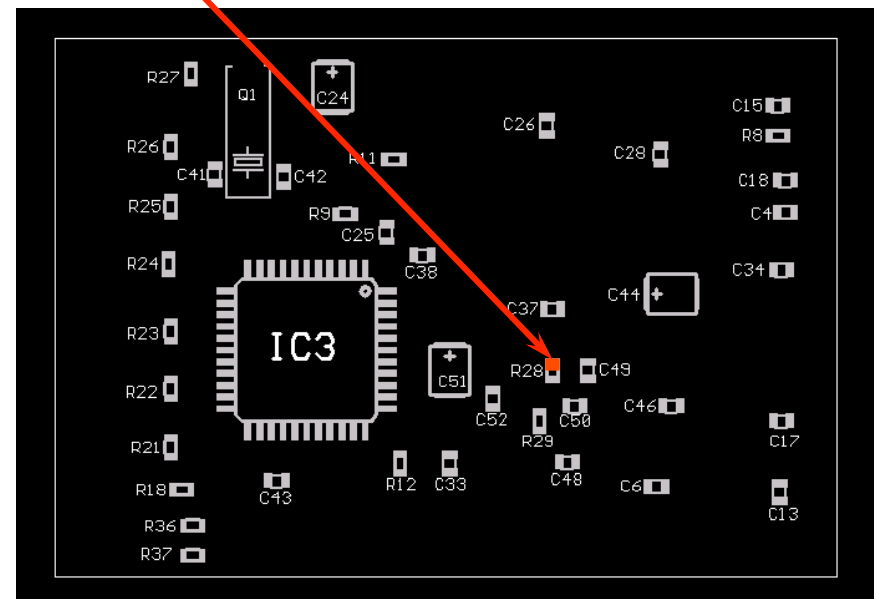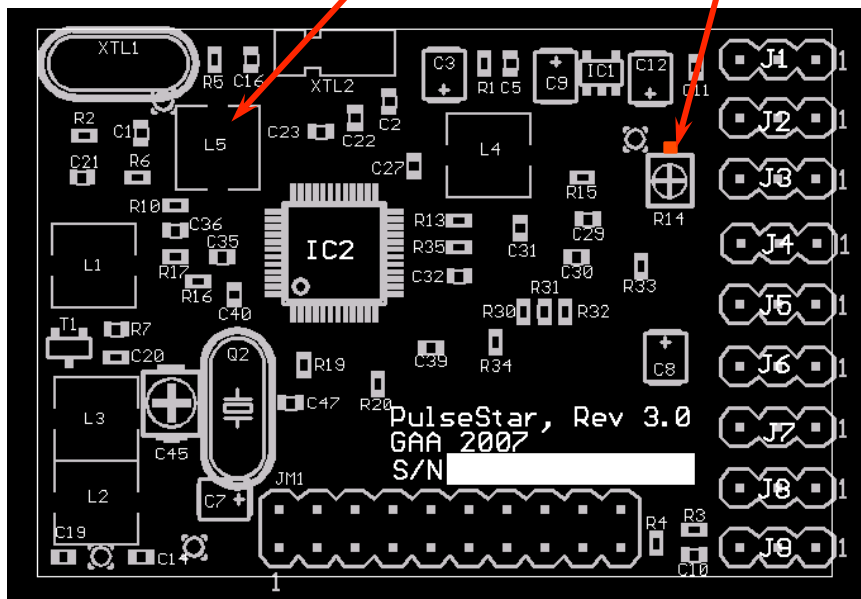
Tuning Procedure: Step 2

Waveforms shown are for a negative FM shift. If positive FM shift is used, the signals will be inverted.

Waveform: Testpoint A   **Waveform: Testpoint B**   **Waveform: Testpoint C**
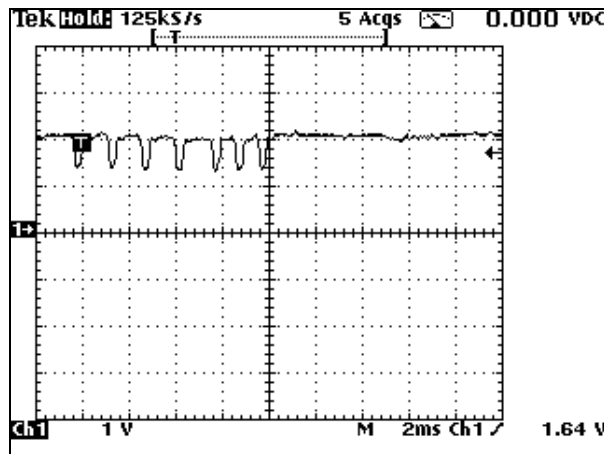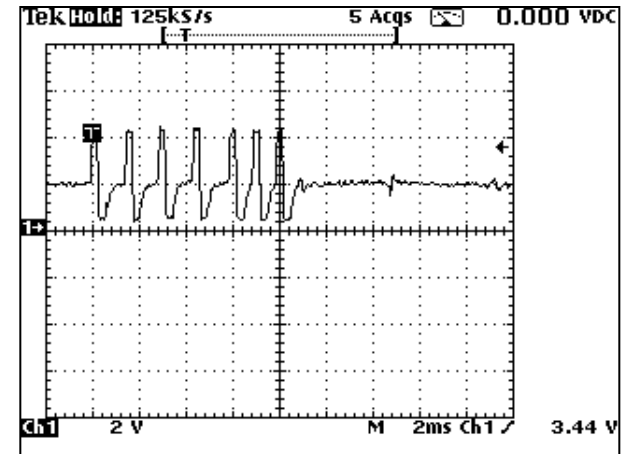
Set scope to 1v and 2ms scales. The above waveforms were taken at test points A, B and C with a six channel signal being sent from the transmitter. The number of pulses should be the number of transmitted channels plus one.
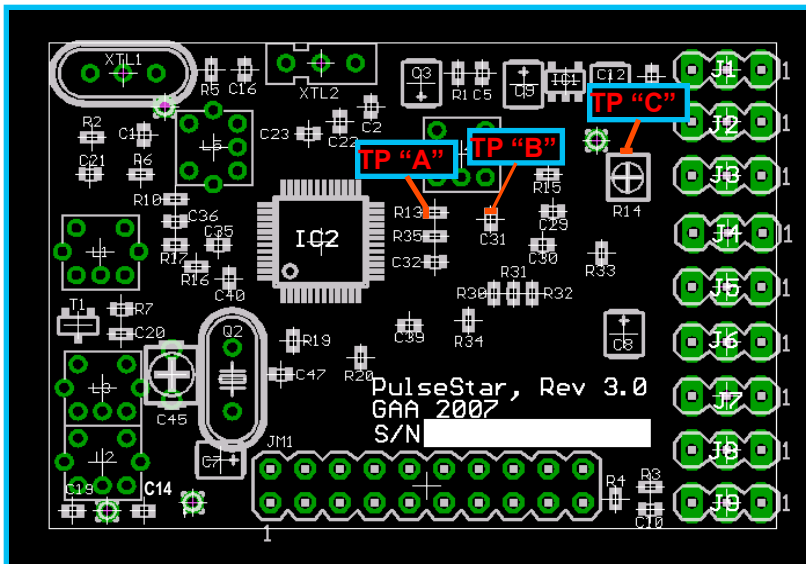
STEP 2: With the transmitter **ON** (antenna **collapsed**) and the receiver channel set to match:

1. Adjust L4 to get waveforms shown at testpoints A and B.

2. Adjust R14 to get the waveform shown at testpoint C.

3. Using the PC interface:
   a.) Select continuous monitoring of signal level.

   b.) Adjust C45, L1, L2 and L3 to maximize the signal level (lowest negative decibel number). If unable to get signal level below -30db, see Build Notes.

SECTION 5: PULSESTAR BOOTLOADER INSTALL

IMPORTANT: You may skip this section if you purchased a Pulsestar board with the receiver and ATMEL chips already installed from either of these sources:

- GAA Custom Electronics
- Kees Talen Pulsestar kit

Step 1: Bootloader Install

The bootloader must be programmed first. This requires an AVRISP programmer, the PC interface and AVR Studio software. AVR Studio may be downloaded free here. The receiver connections to program the bootloader are illustrated below.
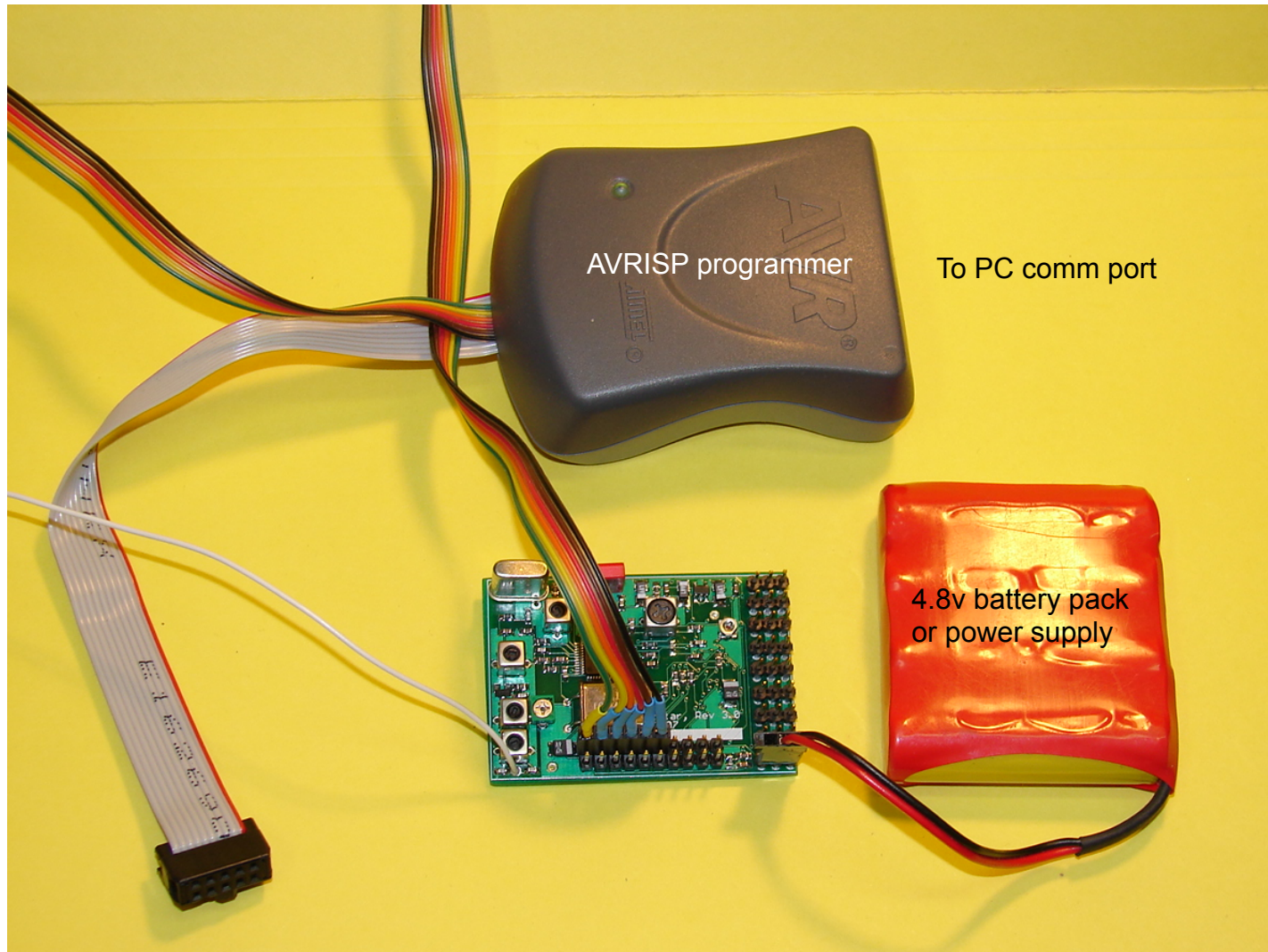
Bootloader Install

NOTE: Screen images may be slightly different in later versions of the software.

Start AVR Studio and select the **AVRISP** programmer as shown below.
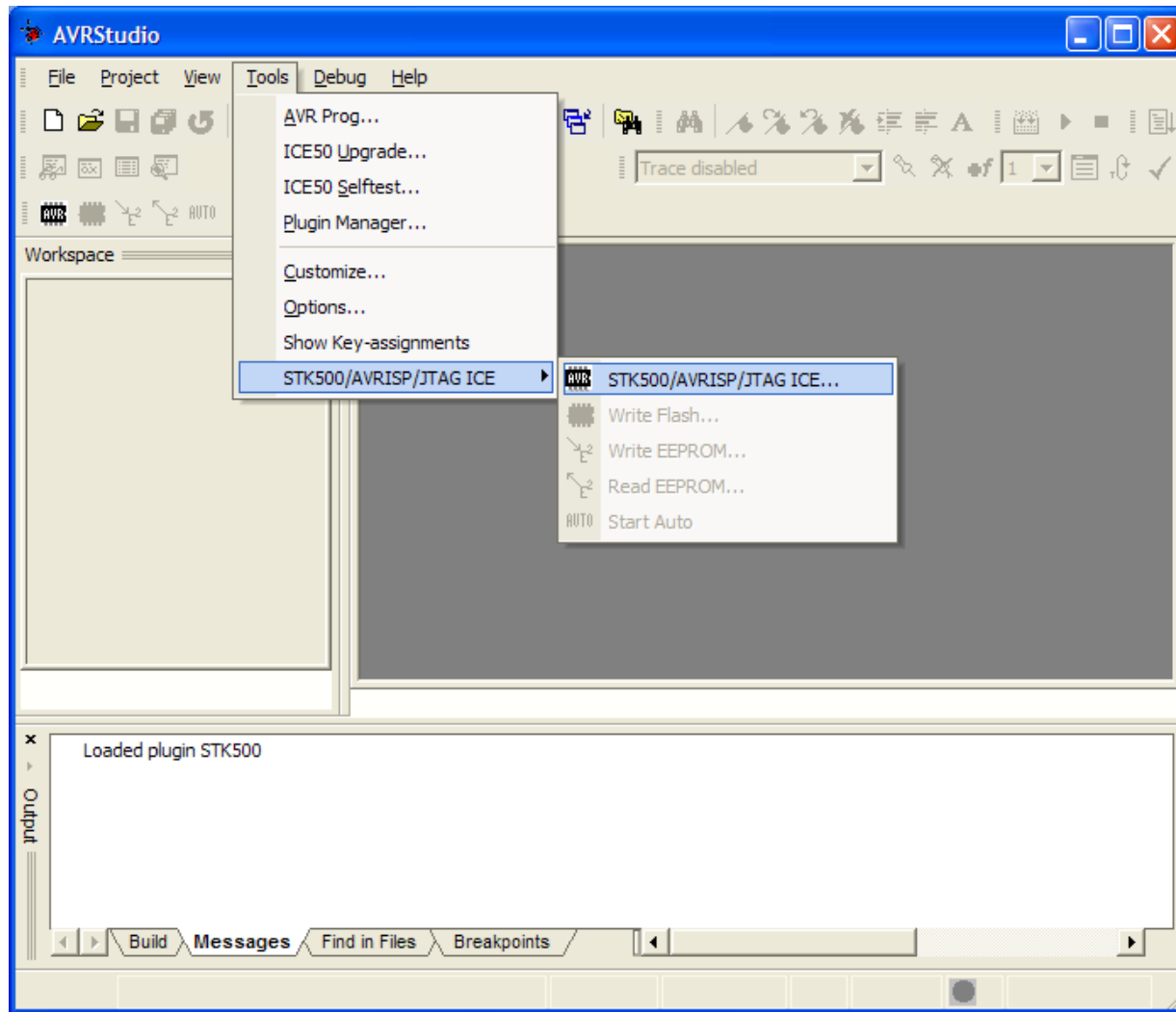
Bootloader Install

NOTE: Screen images may be slightly different in later versions of the software.

After selecting the AVRISP programmer, you will see the following dialog box.
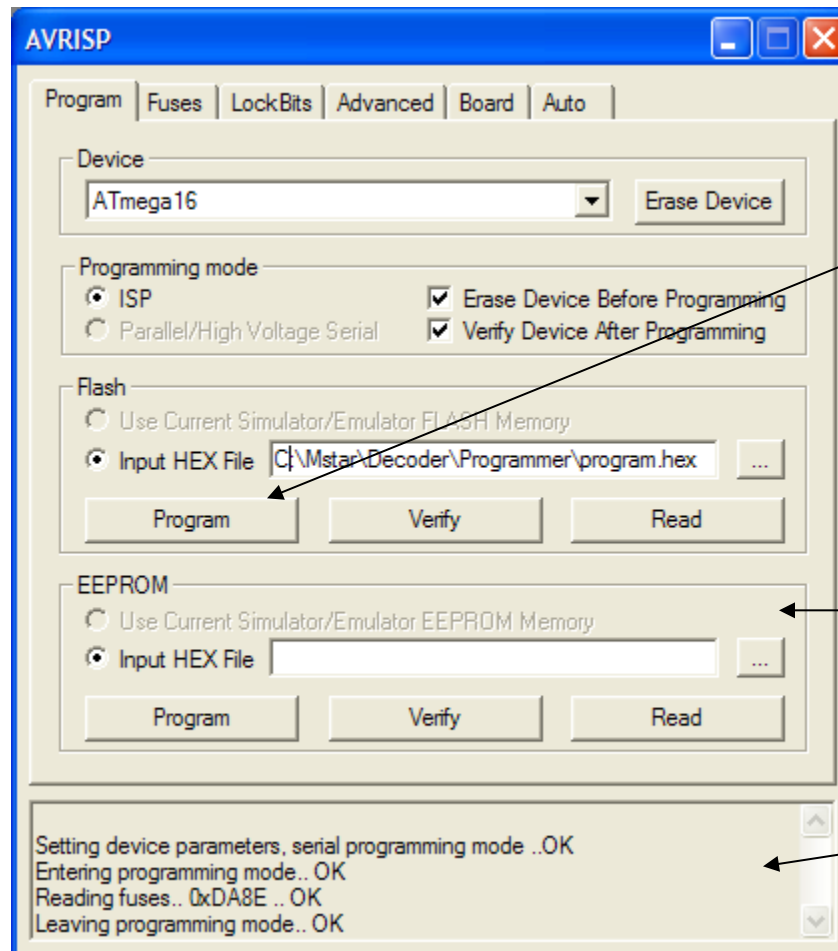
1.) Select ATmega16
2.) Select the bootloader file (bootloader.hex)
3.) Press the program button

Do not use

This box will tell you status.

Bootloader Install

Select the Fuses tab and then check only the options shown below.

AVRISP

Program | Fuses | LockBits | Advanced | Board | Auto

☐ On-Chip Debug Enabled; [OCDEN=0]
☐ JTAG Interface Enabled; [JTAGEN=0]
☐? Serial program downloading (SPI) enabled; [SPIEN=0]
☐ Preserve EEPROM memory through the Chip Erase cycle; [EESAVE=0]
☐ Boot Flash section size=128 words Boot start address=$1F80; [BOOTS2
☐ Boot Flash section size=256 words Boot start address=$1F00; [BOOTS2
☑ Boot Flash section size=512 words Boot start address=$1E00; [BOOTS.
☐ Boot Flash section size=1024 words Boot start address=$1C00; [BOOT!
☑ Boot Reset vector Enabled (default address=$0000); [BOOTRST=0]
☐ Brown-out detection level at VCC=4.0 V; [BODLEVEL=0]
☑ Brown-out detection level at VCC=2.7 V; [BODLEVEL=1]
☑ Brown-out detection enabled; [BODEN=0]
☐ CKOPT fuse (operation dependent of CKSEL fuses); [CKOPT=0]
☐ Ext. Clock; Start-up time: 6 CK + 0 ms; [CKSEL=0000 SUT=00]
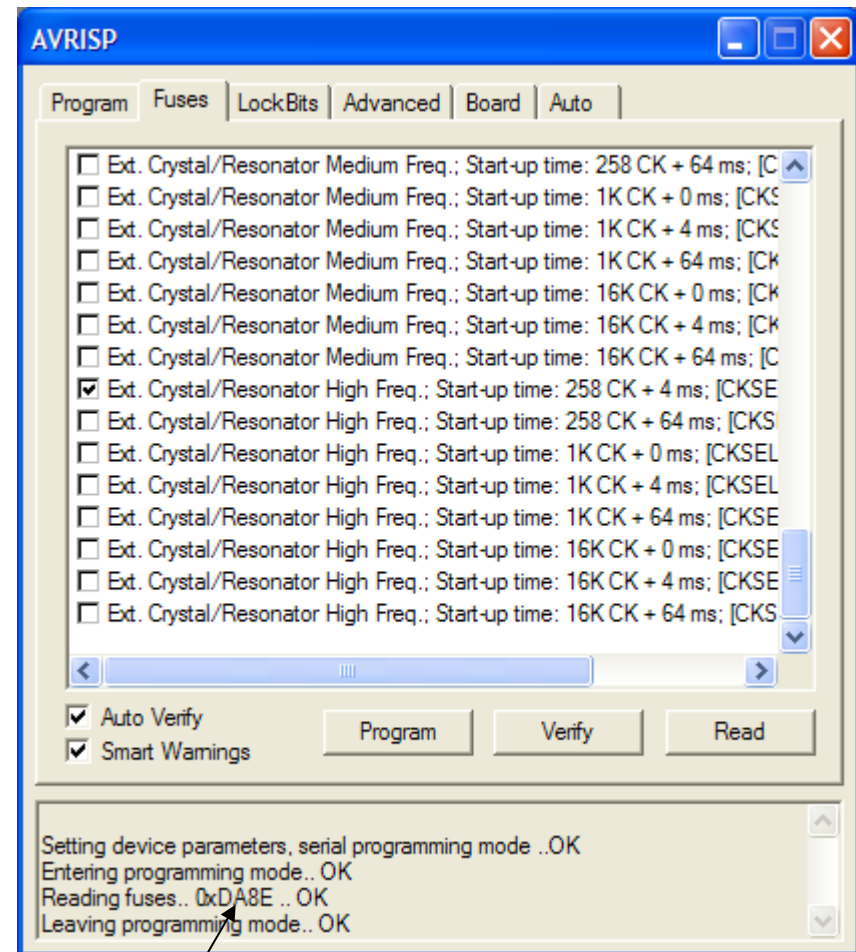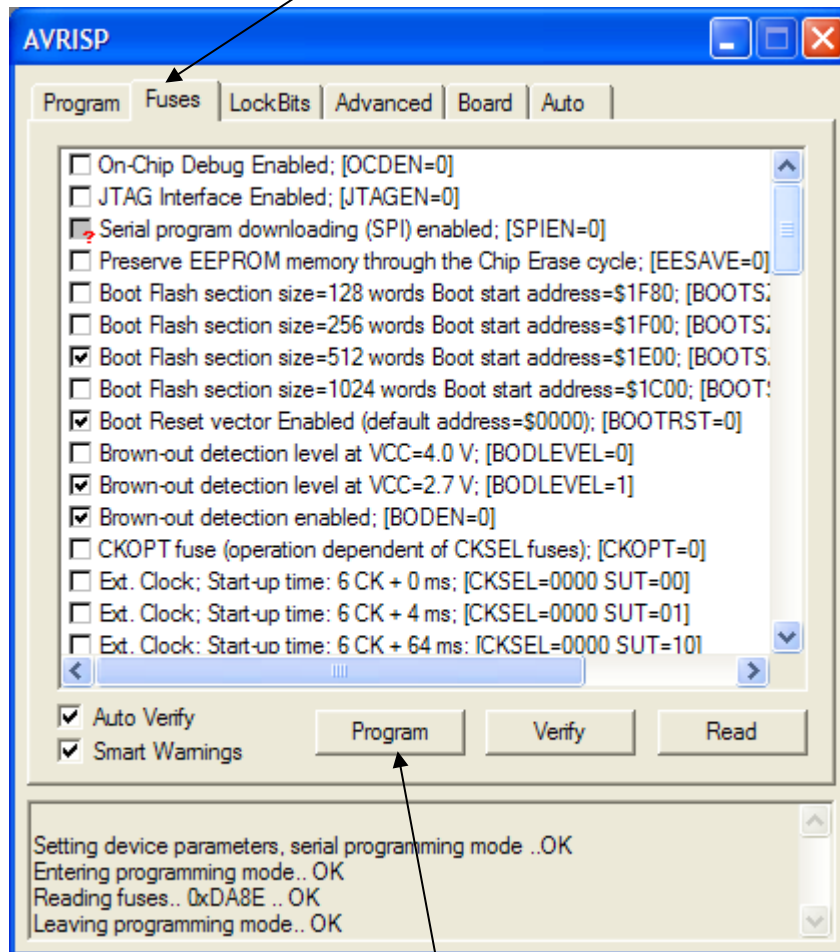☐ Ext. Clock; Start-up time: 6 CK + 4 ms; [CKSEL=0000 SUT=01]
☐ Ext. Clock: Start-up time: 6 CK + 64 ms: [CKSEL=0000 SUT=10]

☑ Auto Verify
☑ Smart Warnings

[Program] [Verify] [Read]

Setting device parameters, serial programming mode ..OK
Entering programming mode.. OK
Reading fuses.. 0xDA8E .. OK
Leaving programming mode.. OK

AVRISP

Program | Fuses | LockBits | Advanced | Board | Auto

☐ Ext. Crystal/Resonator Medium Freq.; Start-up time: 258 CK + 64 ms; [C
☐ Ext. Crystal/Resonator Medium Freq.; Start-up time: 1K CK + 0 ms; [CKS
☐ Ext. Crystal/Resonator Medium Freq.; Start-up time: 1K CK + 4 ms; [CKS
☐ Ext. Crystal/Resonator Medium Freq.; Start-up time: 1K CK + 64 ms; [CK
☐ Ext. Crystal/Resonator Medium Freq.; Start-up time: 16K CK + 0 ms; [CK
☐ Ext. Crystal/Resonator Medium Freq.; Start-up time: 16K CK + 4 ms; [CK
☐ Ext. Crystal/Resonator Medium Freq.; Start-up time: 16K CK + 64 ms; [C
☑ Ext. Crystal/Resonator High Freq.; Start-up time: 258 CK + 4 ms; [CKSE
☐ Ext. Crystal/Resonator High Freq.; Start-up time: 258 CK + 64 ms; [CKS
☐ Ext. Crystal/Resonator High Freq.; Start-up time: 1K CK + 0 ms; [CKSEL
☐ Ext. Crystal/Resonator High Freq.; Start-up time: 1K CK + 4 ms; [CKSEL
☐ Ext. Crystal/Resonator High Freq.; Start-up time: 1K CK + 64 ms; [CKSE
☐ Ext. Crystal/Resonator High Freq.; Start-up time: 16K CK + 0 ms; [CKSE
☐ Ext. Crystal/Resonator High Freq.; Start-up time: 16K CK + 4 ms; [CKSE
☐ Ext. Crystal/Resonator High Freq.; Start-up time: 16K CK + 64 ms; [CKS

☑ Auto Verify
☑ Smart Warnings

[Program] [Verify] [Read]

Setting device parameters, serial programming mode ..OK
Entering programming mode.. OK
Reading fuses.. 0xDA8E .. OK
Leaving programming mode.. OK

Press the program button and make sure this number is DA8E

Bootloader Install

Select the Lock Bits tab and check the boxes shown

AVRISP

| Program | Fuses | LockBits | Advanced | Board | Auto |

- ☑ Mode 1: No memory lock features enabled
- ☐ Mode 2: Further programming disabled
- ☐ Mode 3: Further programming and verification disabled
- ☑ Application Protection Mode 1: No lock on SPM and LPM in Application Se
- ☐ Application Protection Mode 2: SPM prohibited in Application Section
- ☐ Application Protection Mode 3: LPM and SPM prohibited in Application Sec
- ☐ Application Protection Mode 4: LPM prohibited in Application Section
- ☐ Boot Loader Protection Mode 1: No lock on SPM and LPM in Boot Loader
- ☑ Boot Loader Protection Mode 2: SPM prohibited in Boot Loader Section
- ☐ Boot Loader Protection Mode 3: LPM and SPM prohibited in Boot Loader S
- ☐ Boot Loader Protection Mode 4: LPM prohibited in Boot Loader Section

Press the program button

Verify this reads EF

☑ Auto Verify
☑ Smart Warnings

| Program | Verify | Read |

Setting device parameters, serial programming mode ..OK
Entering programming mode.. OK
Reading lock bits.. 0xEF .. OK
Leaving programming mode.. OK

Once this step is completed, the bootloader is installed. You must now install the Pulsestar firmware for the receiver to operate properly. This procedure is the same as that described in Section 6 for Firmware Updates.
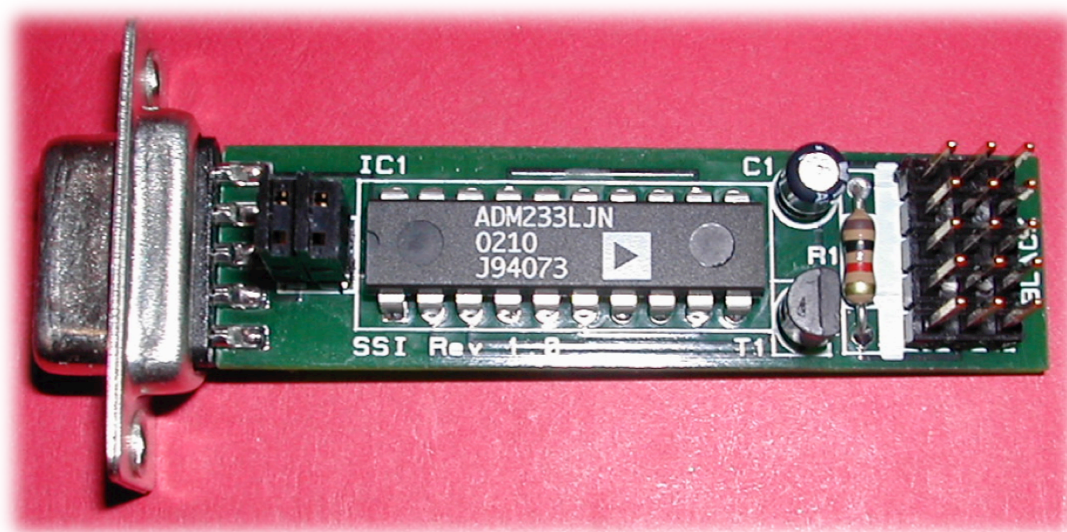
SECTION 6: FIRMWARE UPDATES

Firmware Updates

1. Connect the Pulsestar to the PC using the PC interface. See Section 7 for connection details.

2. Start the Pulsestar PC application and select the "Program" tab.

SECTION 6: THE PULSESTAR SERIAL INTERFACE

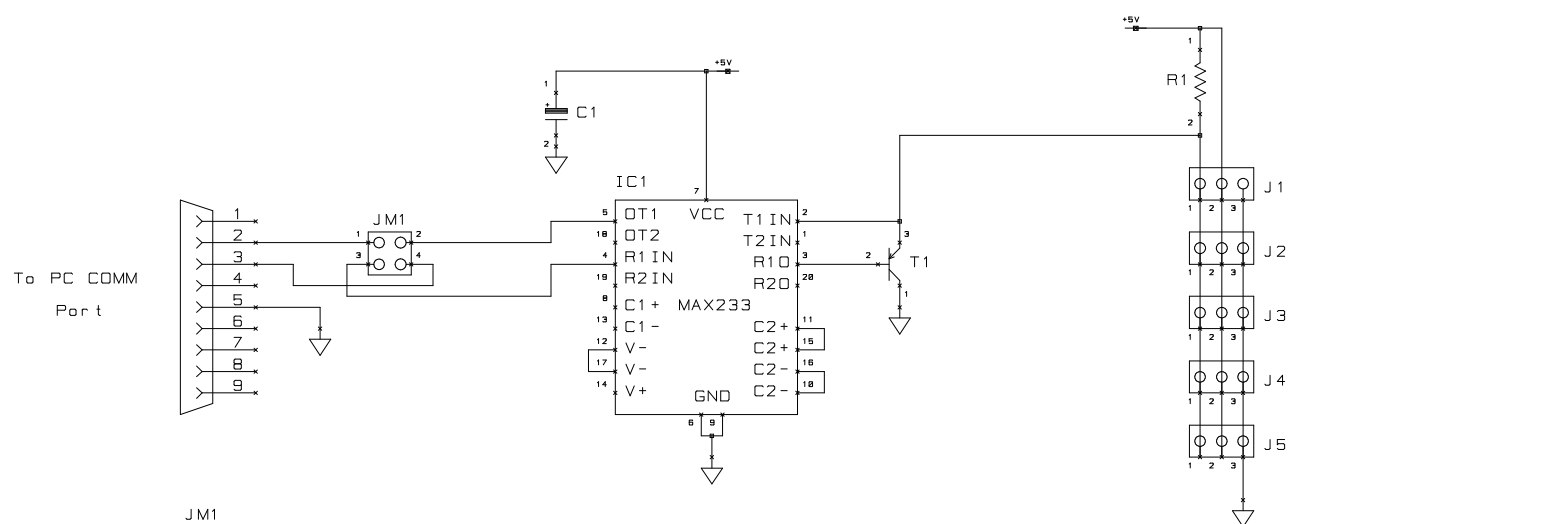# PulseStar 3.0 Serial Interface Pictorial

To PC COMM
Port

To PulseStar
Batt\Comms
connector

Pulsestar 3.0 Serial Interface Schematic

Note:

If multiple servos are connected, each should have a unique address.

+5V

R1

+5V

C1

To PC COMM

Port

JM1

IC1

OT1   VCC
OT2
R1IN
R2IN   T1IN
C1+   T2IN
C1- MAX233 R1O
V-   R2O
V-   C2+
V+   C2+
      GND   C2-
            C2-

T1

J1

J2

J3

J4

J5

JM1
Jumper 1 to 2 and 3 to 4 for normal operation.
Jumper 1 to 3 and 2 to 4 to reverse transmit and receiver.

Connect J1 - J5 to servos.
5 volt power must also be
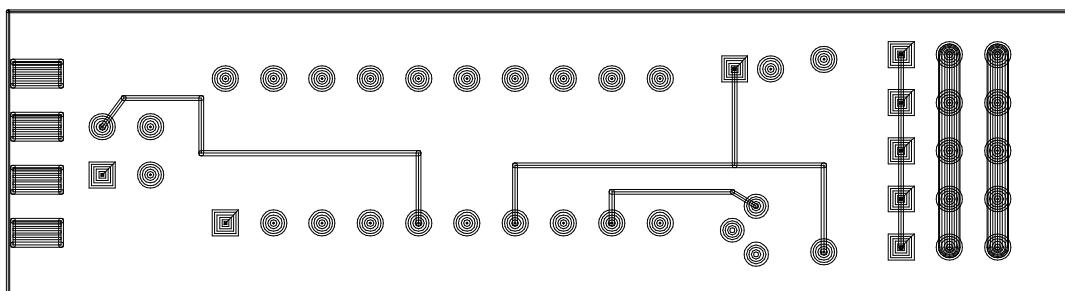applied to one connector.

CONTRACT NO.		COMPANY NAME GAA Custom Electronics			
APPROVALS	DATE	DWG Servo Serial Interface			
DRAWN					
CHECKED		SIZE B	FSCM NO.	DWG NO.	REV. 1.0
ISSUED		SCALE		Gordon Anderson	SHEET 1/1

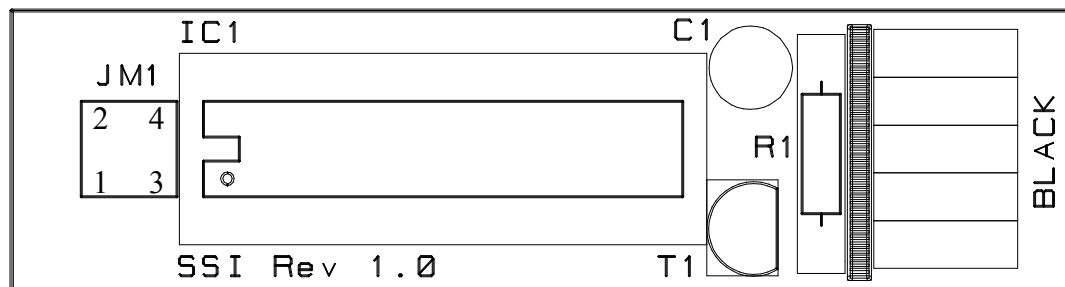The GAA servo serial interface is used with the PulseStar 3.0 receiver.

PulseStar 3.0 Serial Interface PCB Pictorial
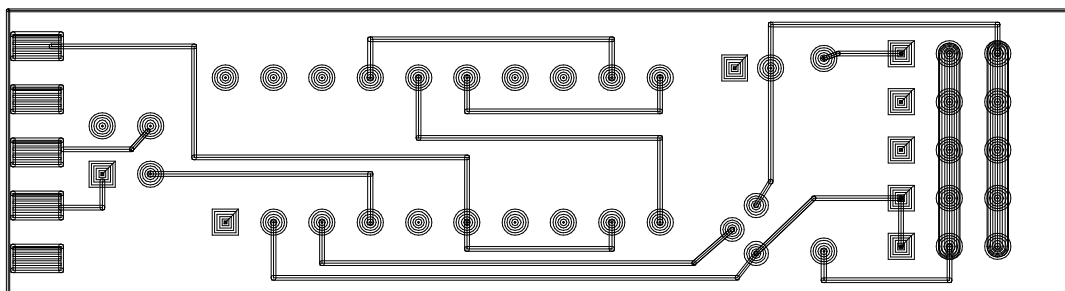
Top traces

Bottom traces

Top silkscreen

IC1
C1
JM1
2   4
1   3
R1
SSI Rev 1.0
T1
BLACK

PulseStar 3.0 Serial Interface Parts List

Item	Quanity	ID	Part number	Description	Supplier	Cost each	Total cost	Notes
1	1	C1	P993-ND	1 uF 50V	Digikey	0.16	0.16	
2	1	R1	1.0KQBK-ND	1K resistor 1/4W	Digikey	0.28	0.28	1
3	1	T1	ZTX755-ND	PNP transistor	Digikey	0.78	0.78	
4	1	IC1	MAX233CPP+G36-ND	Dual rec/xmit RS232	Digikey	7.45	7.45	
5	1		A32510-ND	9pin female D connector	Digikey	2.85	2.85	
6	1	JM1	WM6804-ND	4 pin dual row vertical	Digikey	0.32	0.32	
7	1	J1-J5	WM6415-nd	15 pin signel row vertical	Digikey	0.56	0.56	2
8	1		SSI10	Servo Interface PCB	GAACE	2	2	

Total   14.4

1 Price for 5

2 Cut this pin strip into five three pin connectors
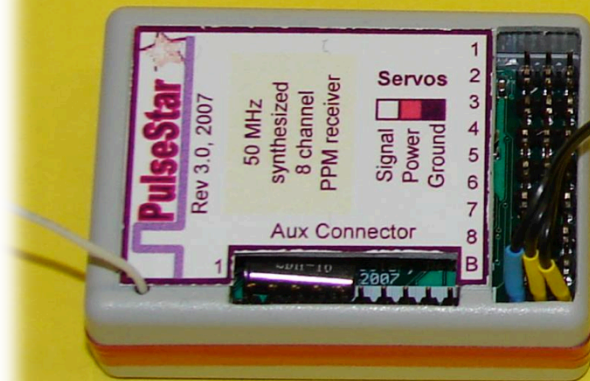
PulseStar To PC Connection: For Use With The PulseStar PC Application

The Pulsestar PC configuration application allows you to control the modes of the receiver. Such as received frequency, channel reversing, channel limits, receiver mode and many, many more options.
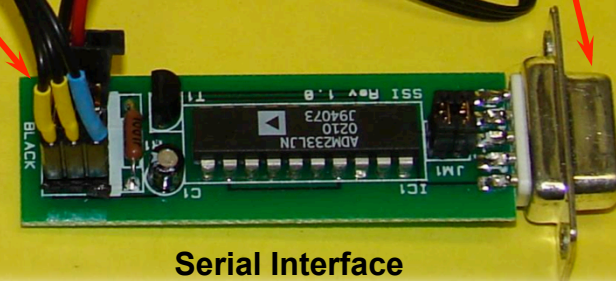
Battery pack or 4.8v DC power supply

It does not matter which connector position is used for the receiver or battery.

PulseStar Receiver

PulseStar
Rev 3.0, 2007
50 MHz synthesized 8 channel PPM receiver

Servos
Signal
Power
Ground

1
2
3
4
5
6
7
8
B

Aux Connector

To PC Comm Port

Serial Interface

SSI Rev 1.0
ADM233LJN
0210
J94073
BLACK

SECTION 7: DIRECT SERVO CONTROL

PulseStar Direct Servo Control

The Pulsestar has the ability to drive servos via a direct connection to a Microstar Transmitter or a PPM signal source. To use this feature, the receiver must be running v3.0c software or higher.

WITH THE TRANSMITTER AND RECEIVER OFF:

a. Install jumper on JM1 from pin 20 to 16, Note this jumper can remain installed for normal operation.

b. Connect the Pulsestar power to a PPM signal source. If using the MicroStar Encoder the PPM signal is available at the AUXOUT pin. [NOTE: See the MicroStar encoder accessory drawings for the direct servo control cable.]

c. Apply power to the transmitter and receiver.
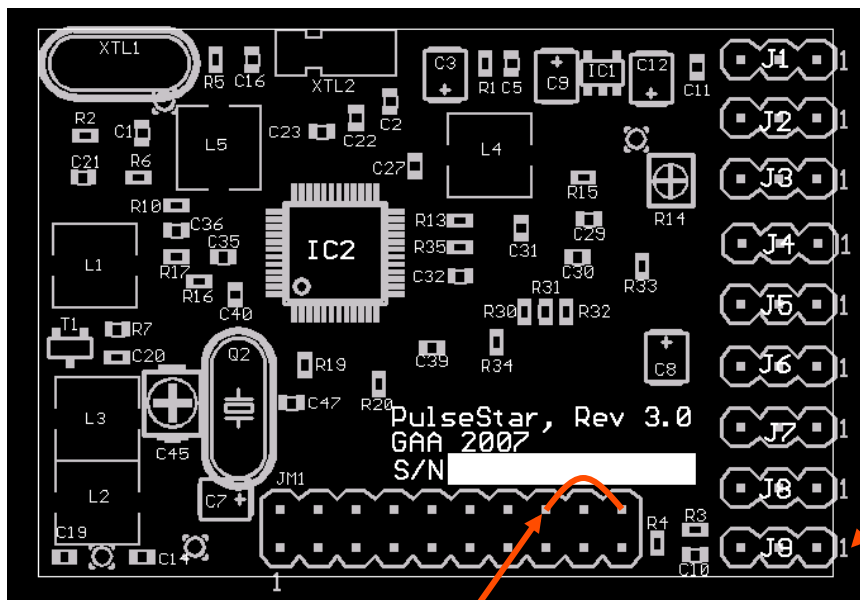
Apply PPM signal to Power/comms connector

Install jumper, JM1 pins 20 - 16

SECTION 8: PULSESTAR SCANNER

Channel Scanner Mode

The PulseStar receiver can be used as a channel scanner with the addition of other optional external components.

Three scanner modes are supported:
1.) Signal level
2.) Channel scanner, 10 channels displayed
3.) Spectrum display

PulseStar receiver is connected to a display in order to support this mode of operation. Yhe Pulsestar amy also be purposely built as a scanner in which case certain components may be omitted.

The scanner mode is selected via the PC application by changing "REC" mode to "SCN" .

(pictured with the older rev 1.1 receiver)
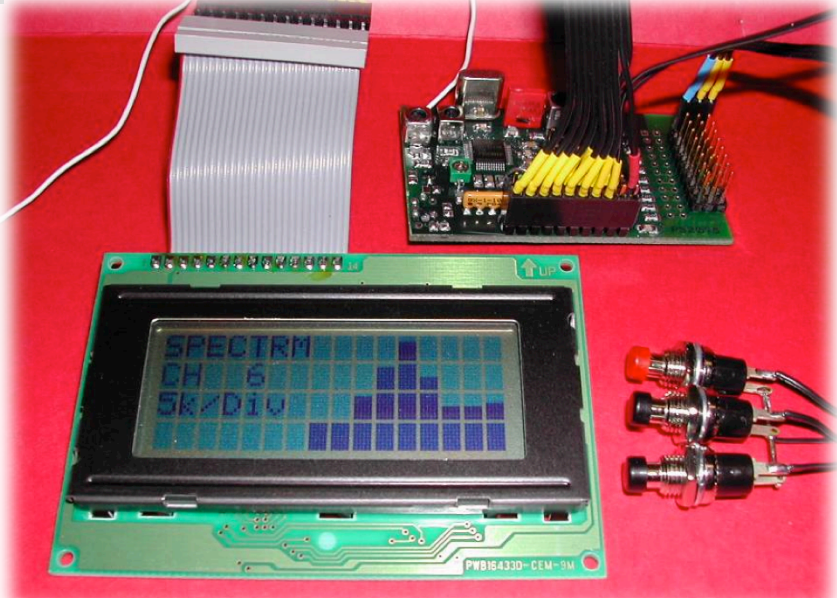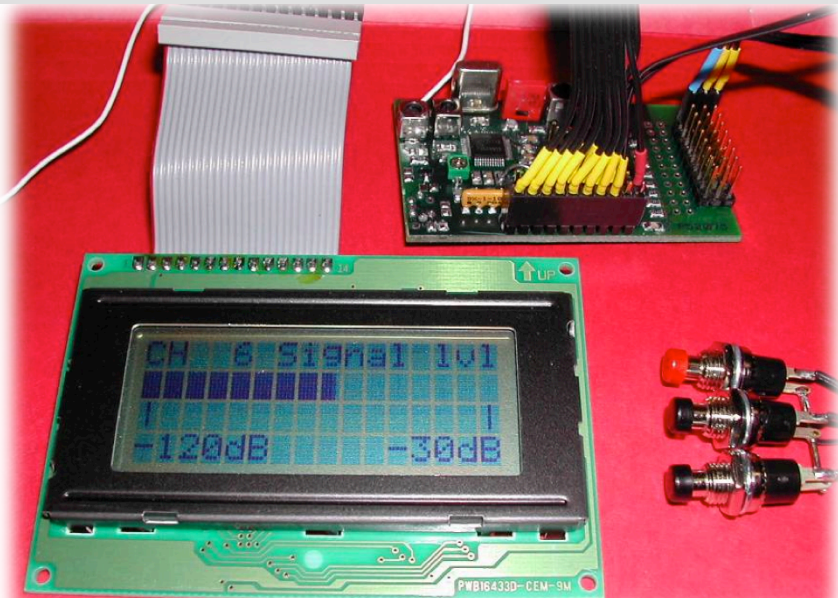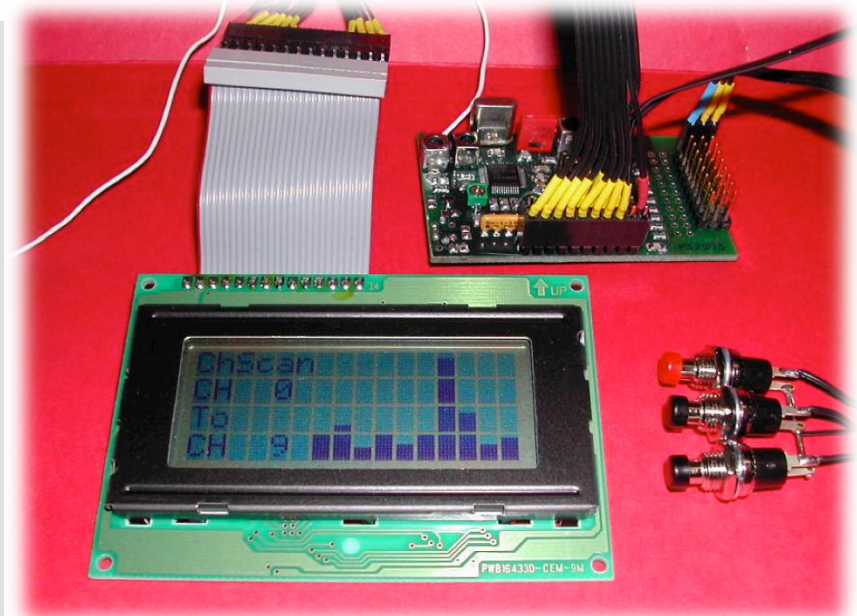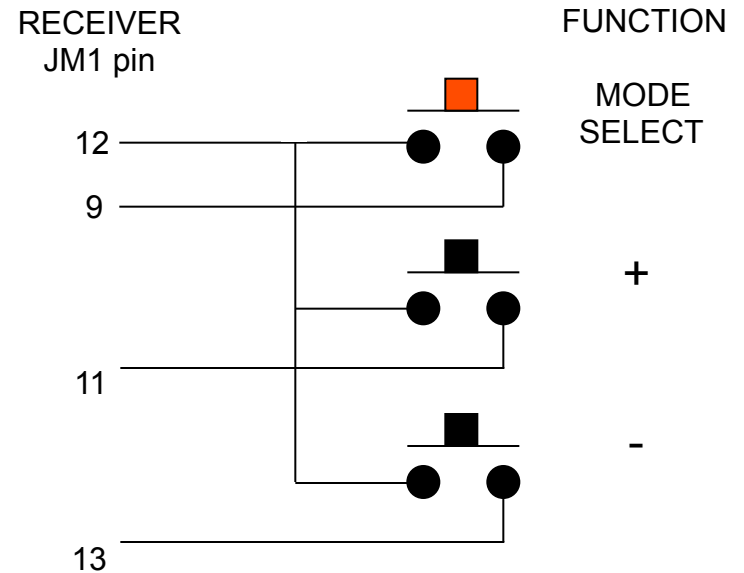
A Dedicated PulseStar Scanner

PulseStar Scanner Patch Cable

DISPLAY CONNECTIONS

RECEIVER JM1 PIN		DISPLAY CONNECTOR PIN
17	-------------------------	1 and 3
1	-------------------------	2
7	-------------------------	4
14	-------------------------	5
16	-------------------------	6
5	-------------------------	11
15	-------------------------	12
3	-------------------------	13
18	-------------------------	14

SWITCH CONNECTIONS

RECEIVER   FUNCTION
JM1 pin

                                 MODE
                                 SELECT
12
9

                                 +

11

                                 -

13

Patch cable picture goes here.

PulseStar Scanner: Components Not Required For Dedicated Scanner

The dedicated scanner version of the receiver can be built with a number of components omitted to speed the assembly process. Below is a table that defines the parts that are not requires in the dedicated scanner mode.

Capacitors	Resistors	Misc
C13	R2	J1
C14	R7	J2
C17	R14	J3
C19	R18	J4
C20	R21	J5
C21	R22	J6
C34	R23	J7
	R24	J8
	R25	L1
	R26	L2
	R27	L3
		L4
		T1

- The antenna is connected to the end of C4 that is connected to T1.

- Tuning only requires the adjustment of L5.

SECTION 9: PULSESTAR CONFIGURATION MODULE

Configuration Module Operation

The configuration fixture allows you to monitor the received signal strength as well as monitor and set receiver parameters and the channel number. This is a very simple device with one LED and one push button switch. To use the fixture plug it in to JM1 with the receiver power off, you should also remove the servos from the receiver during these tests.

Test 1, signal strength:
Turn the receiver on and you should see the LED flashing. The flash rate is determined by the signal strength, the faster it flashes the stronger the received signal. Turn the transmitter on and off to see the effect on the flash rate. The receiver will use its default channel number for this test. To advance to the next mode press and release the button one time.

Test 2, receiver modes:
The LED will now be flashing a code of three flashes. If the flash is short the code is 0 and if the flash is long the code is 1. For example a long flash followed by 2 short flashes is code 100. The code functions are listed below:

Flash number	Function
1	Scan mode, 0=off, 1=on. This is the auto frequency scan mode.
2	Imprint, 0=off, 1=on. This is the transmitter imprint function.
3	Shift, 0=Pos,1=Neg. This is the sync pulse polarity.

To advance / change the settings press and release the button when there is a pause in the LED flashing. This will cause the flash pattern to advance in a binary count fashion, 000,100,010,110, etc.

When you are finished making changes you need to press and hold the button for 3 seconds. Its important that you press and hold the button during the time the LED is flashing out the code for the button press and hold to be recognized as a signal to move to the next mode.

Configuration Module Operation

Test 3, channel number:
The LED will now be flashing a code of four flashes. These flashes indicate the channel number with short flashes being a 0 and long flasher being a 1. The channel number is a four bit binary code:

Flash code	Channel
0,0,0,0	0
1,0,0,0	1
0,1,0,0	2
1,1,0,0	3
0,0,1,0	4
1,0,1,0	5
0,1,1,0	6
1,1,1,0	7
0,0,0,1	8
1,0,0,1	9

To advance / change the settings press and release the button when there is a pause in the LED flashing. This will cause the flash pattern to advance in a binary count fashion as shown in the table above.
When you are finished making changes you need to press and hold the button for 3 seconds. Its important that you press and hold the button during the time the LED is flashing out the code for the button press and hold to be recognized as a signal to move to the next mode.

The receiver will then save all changes that were made to its internal EEPROM memory. Wait 10 seconds after this last button press and hold, the LED should be off, then unplug the receiver and remove the configuration plug.

Configuration Module Schematic

RECEIVER
JM1 PIN

220 ohm

LED

2

4

6

Build on 0.10" female pin strip

8

10

Mode

12

14

16

18

20
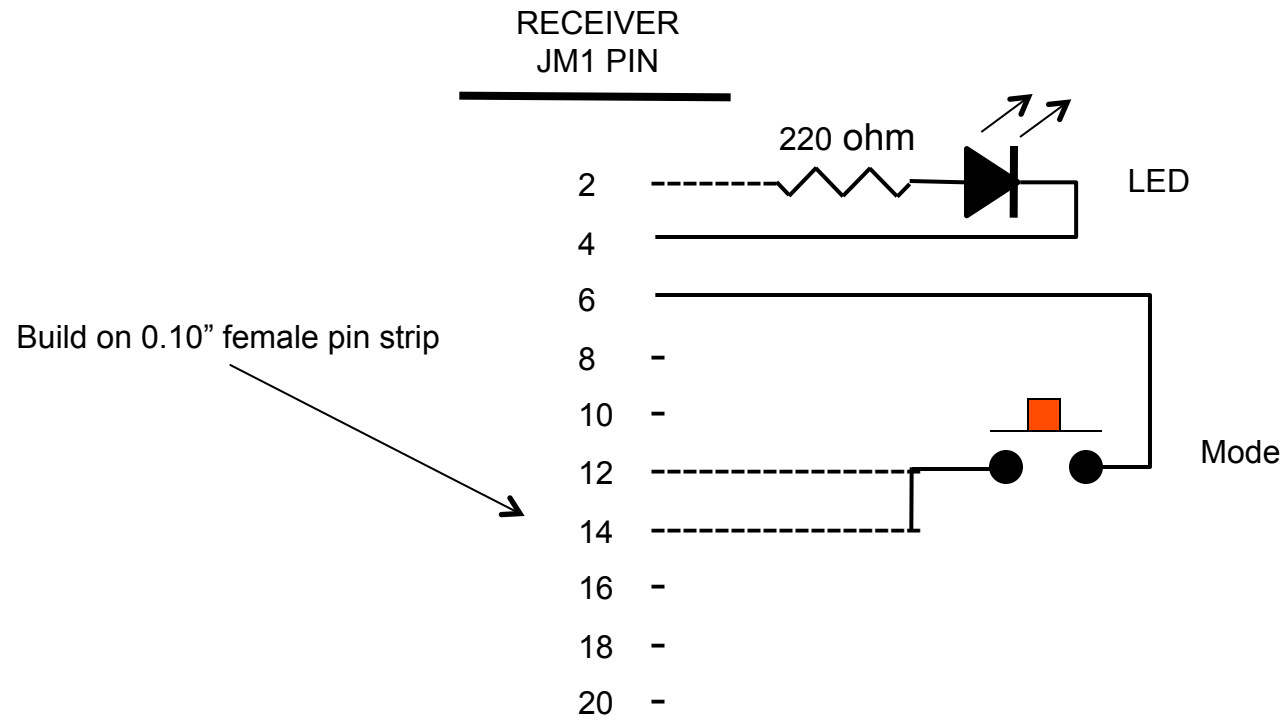
SECTION 9: BUILD NOTES

PulseStar 3.0 Build Notes

1. When tuning the Pulsestar, the Transmitter Imprint, Check Sum and Channel scan modes should be set to OFF. This is done via the PC application.

3. When tuning for signal strength, the normal signal strength expected is about -30db (this will be full scale on the signal strength bar graph in the PC interface). If you cannot achieve this level, remove capacitor C45 and retune.

5. Check the corner of L4 that is closest to C3 as this is a potential short area. It is recommended that all four corners of L4 be trimmed prior to installation to eliminate any possibility of shorts.

7. To eliminate stress on the antenna connection, a piece of shrink tubing can be added around L2 with the antenna wire located under the tubing.

9. If you are using the Serpac plastic enclosure, the PCB will need to be trimmed to fit the case PRIOR to assembly. Please note that care should be taken when soldering crystals XTL1 and XTL2. Assure these crystals do not extend out past the board after soldering.