CTCSS TONE GENERATOR
Model 1118

INSTRUCTION MANUAL

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Section 1 Specifications

Introduction

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Specifications

CTCSS Tone Generator Specifications

The Model 1118 CTCSS Tone Generator is used in conjunction with the Model 8195A or 8197 Ageless Oscillator to generate precision synchronized CTCSS tones. The master oscillator must be equipped with the appropriate option 14 output. There are 2 versions of the 1118; the 1118-2 a version with an enclosure, and the 1118-1, a rail mount version. This manual lists the pins and connectors for the 1118-2 first, then the pins and connections for the 1118-1 in brackets [ ].

1.1 FEATURES

The Spectracom CTCSS Tone Generator offers the following features:

- Accuracy: Continuous self-calibrated to GPS provides $\pm 1.0 \times 10^{-11}$ frequency accuracy.
- PTT input and an adjustable delayed PTT output.
- TIA compliant CTCSS reverse burst.
- Inhibit input that disables CTCSS tone generation.

1.2 SPECIFICATIONS

1.2.1 OUTPUTS

1.2.1.1 STANDARD CTCSS FREQUENCY OUTPUT (CONTINUOUS TONE CONTROLLED SQUELCH SYSTEM)

Signal:	67-254Hz sinewave derived from GPS disciplined oscillator with configurable 180-degree inverted “reverse burst” tone during delayed PTT output. See table 1-1 for tone frequencies and H1 jumper position.
Connector:	12 pin pluggable header J4 pins 6 and 7 [or 6 Pin Header J6 pin 1, and 3 Pin Header J5 pin 1].
Signal Level:	Adjustable with a potentiometer from 0.0 to 4.0 volts P-P (1.4 Vrms) into 600 ohms.
Source Impedance:	33 ohms
Harmonics:	25dB below the CTCSS fundamental minimum
Spurious:	25dB below the CTCSS fundamental minimum
PTT Operation:	CTCSS tones are gated by PTT with a configurable PTT hold or millisecond reverse burst.

Code	Tone Freq.	Actual Tone Freq.	H1 Pos	Code	Tone Freq.	Actual Tone Freq.	H1 Pos	Code	Tone Freq.	Actual Tone Freq.	H1 Pos
XZ	67.0	67.000	B	1B	107.2	107.333	B	6A	173.8	174.000	A
WZ	69.3	69.333	B	2Z	110.9	111.000	B	6B	179.9	180.000	A
XA	71.9	72.000	B	2A	114.8	115.000	B	7Z	186.2	186.333	A
WA	74.4	74.333	B	2B	118.8	119.000	B	7A	192.8	193.000	A
XB	77.0	77.000	B	3Z	123.0	123.000	B	M1	203.5	203.666	A
WB	79.7	79.666	B	3A	127.3	127.333	B	8Z	206.5	206.666	A
YZ	82.5	82.666	B	3B	131.8	132.000	B	M2	210.7	210.666	A
YA	85.4	85.333	B	4Z	136.5	136.666	B	M3	218.1	218.333	A
YB	88.5	88.666	B	4A	141.3	141.333	B	M4	225.7	225.666	A
ZZ	91.5	91.666	B	4B	146.2	146.333	B	9Z	229.1	229.000	A
ZA	94.8	95.000	B	5Z	151.4	151.333	A	M5	233.6	233.666	A
ZB	97.4	97.333	B	5A	156.7	156.666	A	M6	241.8	242.000	A
1Z	100.0	100.000	B	5B	162.2	162.333	A	M7	250.3	250.333	A
1A	103.5	103.666	B	6Z	167.9	168.000	A	0Z	254.1	254.000	A

TABLE 1-1 CTCSS Standard Frequency Chart

1.2.1.2 Delayed PTT Output

Signal:	Digital
Connector:	12 Pin Pluggable Header J4 Pin 9 [or 6 Pin Header J6 Pin 6,]
Signal Level:	Output structure is a Solid State Switch consisting of two MOSFETS (AC and DC operation) that present a high resistance when off and less than 0.4 ohms when on.
Pulse Width:	Follows PTT Input plus an adjustable delay (100 – 500 milliseconds), factory set to 150 milliseconds.
Delay Control:	The trailing edge of the PTT output is delayed 100 – 500 milliseconds from the trailing edge of the PTT input, factory set to 150 milliseconds.
Delayed PTT Operation:	CTCSS tones are gated by PTT; the PTT input active immediately causes the PTT Output to go active. PTT inactive will cause the PTT output to go inactive after the PTT delay. The delay is factory set to 150 milliseconds.

1.2.2 INPUTS

1.2.2.1 PTT Input

Signal:	Digital CMOS levels
Connector:	12 Pin Pluggable Header J4 Pin 5 [or 6 Pin Header J2 Pin 5].
Signal Level:	CMOS 0.5-4.5 volts or contact closure to ground, minimum sink current = 0.01 amps. Turn on current equals 10 ma and turn off current equals 1ua. Turn on voltage equals 0.8 volts and turn off voltage equals 4.5 volts
Impedance:	2700 ohms
Polarity:	H3 position A for PTT on with closed circuit H3 position B for PTT on with open circuit

1.2.2.2 Synchronized CTCSS Digital Inputs

There are 4 possible CTCSS inputs labeled CTCSS #1, CTCSS #2, CTCSS #3 and CTCSS #4. The different CTCSS frequencies are set on the 8195A or the 8197 driving the CTCSS filter board assembly. They are input to the CTCSS filter assembly on connector J1 or J3. J2 is a loop thru connector for connecting more CTCSS filter boards to the same 8195A or 8197 output. If the loop thru connector is used the termination should be set on the last CTCSS filter board in the string. The CTCSS inputs are individually selected and terminated with jumpers. Use either jumper pair H6 and H7 for CTCSS #1, H8 and H9 for CTCSS #2, H10 and H11 for CTCSS #3, or H12 and H13 for CTCSS #4 to select one of the CTCSS inputs.

Signal:	RS-485
Connector:	DB15 male connector J1 pins 7 and 8 for CTCSS #1, pins 5 and 6 for CTCSS #2, or DB9 connector J3 pins 3 and 8 for CTCSS #3, pins 1 and 6 for CTCSS #4.
Impedance:	120 ohms or high impedance. A jumper can individually terminate each CTCSS input: jumper H14 for CTCSS #1, jumper H15 for CTCSS #2, jumper H16 for CTCSS #3 or jumper H17 for CTCSS #4.

1.2.2.3 18 kHz Clock input (CTCSS #1 and 2)

Signal:	RS-485
Connector:	DB15 male connector J1 Pins 3 and 4
Impedance:	120 ohms or high impedance selected by jumper H19.

1.2.2.4 18 kHz Clock input #2 (CTCSS #3 and 4)

Signal:	RS-485
Connector:	DB9 male connector J3 Pins 2 and 7
Impedance:	120 ohms or high impedance selected by jumper H18.

1.2.2.5 Input Power

DC Input:	7 to 20 VDC, 1 W
Connector:	12 Pin Pluggable Header J4 pins 3 and 2 [or 6 Pin Header J6 pins 3 and 4]
Polarity:	Positive on J4 pin 3 [or J6 pin 4]

1.2.3 *CONNECTORS*

1.2.3.1 Data Sync Port J1

Connector: DB15 male

Pinout: See Table 1-2

PIN	SIGNAL	DESCRIPTION
1	Reserved	Reserved
2	Reserved	Reserved
3	+18 kHz	RS-485 B Terminal
4	-18 kHz	RS-485 A Terminal
5	+CTCSS Signal #2	RS-485 B Terminal
6	- CTCSS Signal #2	RS-485 A Terminal
7	+CTCSS Signal #1	RS-485 B Terminal
8	- CTCSS Signal #1	RS-485 A Terminal
9	Ground	Cable Shield
10	Reserved	Reserved
11	Reserved	Reserved
12	Reserved	Reserved
13	Ground	Ground
14	Ground	Ground
15	Ground	Ground

TABLE 1-2 DATA SYNC PORT PIN ASSIGNMENTS

1.2.3.2 Data Clock Port J3

Connector: DB9 male

Pinout: See Table 1-3

PIN	SIGNAL	DESCRIPTION
1	+CTCSS Signal #4	RS-485 B Terminal
2	+18 kHz	RS-485 B Terminal
3	+CTCSS Signal #3	RS-485 B Terminal
4	Reserved	Reserved
5	Reserved	Reserved
6	-CTCSS Signal #4	RS-485 A Terminal
7	-18 kHz	RS-485 A Terminal
8	- CTCSS Signal #3	RS-485 A Terminal
9	Ground	Cable Shield

TABLE 1-3 DATA CLOCK PORT PIN ASSIGNMENTS

1.2.3.3 Transceiver Interface Port A J6

Connector: 6 Pin Header (0.156 spacing)

Pinout: See Table 1-4

PIN	SIGNAL	DESCRIPTION
1	CTCSS Output	CTCSS Output high
2	GND	GND
3	GND	GND
4	+7 to 20 volts	Positive Power Supply Voltage
5	PTT In	PTT Input
6	Delayed PTT Out +	Delayed PTT Output positive

TABLE 1-4 TRANSCEIVER INTERFACE PORT A PIN ASSIGNMENTS

1.2.3.4 Transceiver Interface Port B J5

Connector: 3 Pin Header (0.156 spacing)

Pinout: See Table 1-5

PIN	SIGNAL	DESCRIPTION
1	CTCSS Output -	CTCSS Output Low
2	Delayed PTT Out -	Delayed PTT Output Low
3	INHIBIT IN	INHIBIT Input

TABLE 1-5 TRANSCEIVER INTERFACE PORT B PIN ASSIGNMENTS

1.2.3.5 I/O connector J4

Connector: 12 pin connectable terminal block

Pinout: See Table 1-6

PIN	SIGNAL	DESCRIPTION
1	Ground	Ground
2	Ground	Ground
3	+ 7 to 20 Volts	Positive power supply voltage
4	Unused	Unused
5	PTT IN	PTT input
6	CTCSS Out +	CTCSS output high
7	CTCSS Out -	CTCSS output low
8	Unused	Unused
9	Delayed PTT Out	Delayed PTT output positive
10	Delayed PTT Out	Delayed PTT output low side
11	Inhibit in	Inhibit input
12	Unused	Unused

TABLE 1-6 I/O CONNECTOR PIN ASSIGNMENTS

1.2.4 MECHANICAL, BOARD ONLY

Dimensions: 5.0” x 3.0” (127mm x 76.2mm)

Weight: 1 lb.(2.2 kg) maximum

Shipping Weight: 2 lbs.(4.4 kg) maximum

1.2.5 ENVIRONMENTAL

Operating Temperature: -30 to +60°C

Storage Temperature: -40 to +85°C

Humidity: 95% R. H. non-condensing

Section 2 Installation Instructions

Quick Installation Instructions

Detailed Installation Instructions

Section 2 - Installation Instructions

2.1 QUICK INSTALLATION INSTRUCTIONS

INTRODUCTION:

The following quick installation instructions apply.

Unit is setup for a 1 to 1 DB 15 cable from the Spectracom 8195A or 8197 provisioned with option 14.

Connect the 1 to 1 cable from the 15-pin connector on the back of the reference clock and the other end to J1.

Connect J4 pin 6 to the ctcss input of your base station.

Connect J4 pin 5 to the PTT source (multiplexer).

Connect J4 pin 9 to the PTT input of your base station.

Connect J4 Pin 3 to a power source between 7 to 20 VDC.

DETAILS:

OUTPUT CONNECTIONS

- Connect CTCSS out on J4 pin 6 [or J6 pin 1] to base station CTCSS input. The amplitude is set at the factory to 0.5 volts rms.
- Connect Delayed PTT out on J4 Pin 9 [or J6 pin 6) to base station PTT input. The delay is set at the factory to 150 msec.

JUMPER SETTINGS

- H1 in position B if CTCSS <150Hz (factory default) or position A if CTCSS > 150Hz
- H3 in position A causes key activation upon a grounded circuit (factory default)
- H4 installed for single ended PTT output (factory default)
- H5 installed in shorted position for single ended CTCSS output (factory default)

INPUT CONNECTIONS J4

- connect PTT into J4 pin 5 from PTT line
- connect positive polarity voltage (power) to J4 pin 3
- connect ground to J4 pin 1
- connect DB15 from 8195A or 8197 to the DB15 connector on the CTCSS generator filter board

INPUT CONNECTIONS J6

- connect PTT into J6 pin 5 from PTT line
- connect positive polarity voltage (power) to J6 pin 4
- connect ground to J6 pin 3
- connect DB15 from 8195A or 8197 to the DB15 connector on the CTCSS generator filter board

2.2 DETAILED INSTALLATION INSTRUCTIONS

CTCSS OUTPUT

J4 Pin 6 [or J2 pin 1] is the CTCSS tone output. This output provides a sine wave at the CTCSS frequency. The output structure is a capacitor-coupled transformer. For a balanced output, J4 Pin 7 [or J3 pin 1] is the second connection. Remove the H4 jumper when operating in this mode. The output amplitude is adjustable using potentiometer R14. The adjustment range is 0 to 4.5 volts peak-peak, 0 to 1.6 Vrms. The output amplitude is factory set to 1.4 volts peak-to-peak, 0.5 Vrms. This adjustment can be made for the appropriate Deviation setting if required. Jumper H1's position should be set based upon the output frequency. Place H1 in position B if the CTCSS tone frequency is <150Hz (factory default) or in position A if the CTCSS tone frequency is > 150Hz.

PTT OUTPUT

J4 Pin 9 [or J2 pin 6] is the PTT output. CTCSS tones are gated by PTT; the PTT input active immediately causes the PTT Output to go active. PTT inactive will cause the PTT output to go inactive after the PTT delay. The delay is factory set to 150 milliseconds.

This output is a solid-state switch. When PTT is active, the switch will turn on. When PTT is inactive, the switch will turn off. The turn-on resistance of this output is approximately 20 ohms. Jumper H5 is used in conjunction with this output to reference one end of the switch to circuit ground. For a balanced output, J4 pin 10 [or J3 pin 2] is the second connection. Remove jumper H5 when operating in balanced output mode.

PTT INPUT

The PTT input on J4 Pin 5 [or J6 pin 5] is used to activate the Delayed PTT output. The input is comprised of an optical isolator that reacts to the flow of current. H3 is used to establish the polarity of the input signal. If H3 is in the A position, the Delayed PTT output will activate when there is current flowing at the input. In position B, the output will activate when there is no current flowing. If H3 is not installed, the Delayed PTT output will be active. Input current can be established with either a switch contact to circuit ground or with a voltage. Current will begin to flow when the input voltage is less than 4.5 volts. Voltages above 4.5 volts will cause the current to cease.

CTCSS INPUTS

There are 4 possible CTCSS inputs labeled CTCSS #1, CTCSS #2, CTCSS #3 and CTCSS #4. The different CTCSS frequencies are set on the 8195A or the 8197 driving the CTCSS filter board assembly. They are input to the CTCSS filter assembly on connector J1 or J3. J2 is a loop thru connector for connecting more CTCSS filter boards to the same 8195A or 8197 output. If the loop thru connector is used, the termination

should be set on the last CTCSS filter board in the string. The CTCSS inputs are individually selected and terminated with jumpers. Either jumper pairs H6 and H7 for CTCSS #1, H8 and H9 for CTCSS #2, H10 and H11 for CTCSS #3, or H12 and H13 for CTCSS #4 select one of the CTCSS inputs.

CTCSS signal inputs from the master oscillator are a differential signal (RS-485) that can be terminated into 120 ohms. A jumper can individually terminate each CTCSS input: jumper H14 for CTCSS #1, jumper H15 for CTCSS #2, jumper H16 for CTCSS #3 or jumper H17 for CTCSS #4.

The CTCSS input signal is a square wave that is operating at the specified CTCSS frequency. The differential signal is converted to a single ended signal then converted into a sine wave, filtered and amplitude controlled before it is output as the CTCSS tone output.

The 18 kHz Clock input on DB15 J1 pins 3 and 4 from the master oscillator is a differential signal (RS-485) that can be terminated into 120 ohms by jumper H19.

CTCSS INHIBIT INPUT

The Inhibit input on J4 Pin 11 [or J5 pin 3 of J] is used to de-activate the CTCSS tone output. The Inhibit input is comprised of an optical isolator that reacts to the flow of current. H2 is used to establish the polarity of the input signal. If H2 is in the A position, the CTCSS tone output will de-activate when there is no current flowing at the input. In position B, the output will de-activate when there is current flowing. When H2 jumper is not installed, the CTCSS tone output will be enabled. Input current can be established with either a switch contact to circuit ground or with a voltage. Current will begin to flow when the input voltage is less than 4.5 volts. Voltages above 4.5 volts will cause the current to cease.

POWER INPUT

Power input is provided on J4 Pins 3 and 2 [or J6 pins 4 and 3]. J4 Pin 3 [or J6 pin 4] is the positive supply voltage and J4 pin 2 [or J6 pin 3] is the circuit ground. The required range of voltage is 7 to 20 volts. Approximately 30ma of current is required.

JUMPER SETTINGS

H1 – Determines the cut-off frequency of the filter. Position A is for CTCSS tone frequencies greater than 150 Hz, position B is for frequencies less than 150 Hz. The default position is B

H2 – Determines the Inhibit input polarity. In position A the tone is inhibited when the input is open, in position B the tone is inhibited when the input is grounded. The default position is B.

H3 – Determines the PTT input polarity. In position A the CTCSS tone and PTT output are enabled when the input is grounded, in position B the outputs are enabled when the input is open or pulled high. The default position is A.

H4 – Grounds one side of the CTCSS tone output. When the jumper is on the CTCSS low output is grounded. The default position is on.

H5 – Grounds one side of the PTT output. When the jumper is on the PTT output low side is grounded. The default position is on.

H6 and H7 - Selects CTCSS frequency #1 input from the master oscillator. The default position for both jumpers is on

H8 and H9 - Selects CTCSS frequency #2 input from the master oscillator.

H10 and H11 - Selects CTCSS frequency #3 input from the master oscillator.

H12 and H13 – Selects CTCSS frequency #4 input from the master oscillator

H14 – terminates the CTCSS frequency #1 input into 120 ohms. The default position is on.

H15 – terminates the CTCSS frequency #2 input into 120 ohms. The default position is on.

H16 – terminates the CTCSS frequency #3 input into 120 ohms. The default position is on.

H17 – terminates the CTCSS frequency #4 input into 120 ohms. The default position is on.

H18 – terminates the 18 kHz clock input on J3 into 120 ohms. The default position is on.

H19 – terminates the 18 kHz clock input from J1 into 120 ohms. The default position is on.

H20 – Enables the legacy mode of operation or reverse burst. When this jumper is on the 180 degree inverted tone output during the delayed portion of the PTT output is disabled. The default position is off.

H21 and H22 – These jumpers select the 18 kHz applied on J2 (DB9 data clock) as the filter clock source. Default position is off.

H23 and H24 – The jumper select the 18 kHz applied on J1 (DB15 data sync) as the filter clock source. Default position is on.

Section 3 Schematics

Schematic and Location Drawing

Section 3 - Schematics

3.0 SCHEMATIC AND LOCATION DRAWING

The schematic is included as Figure 3-1 and a location drawing as Figure 3-2.

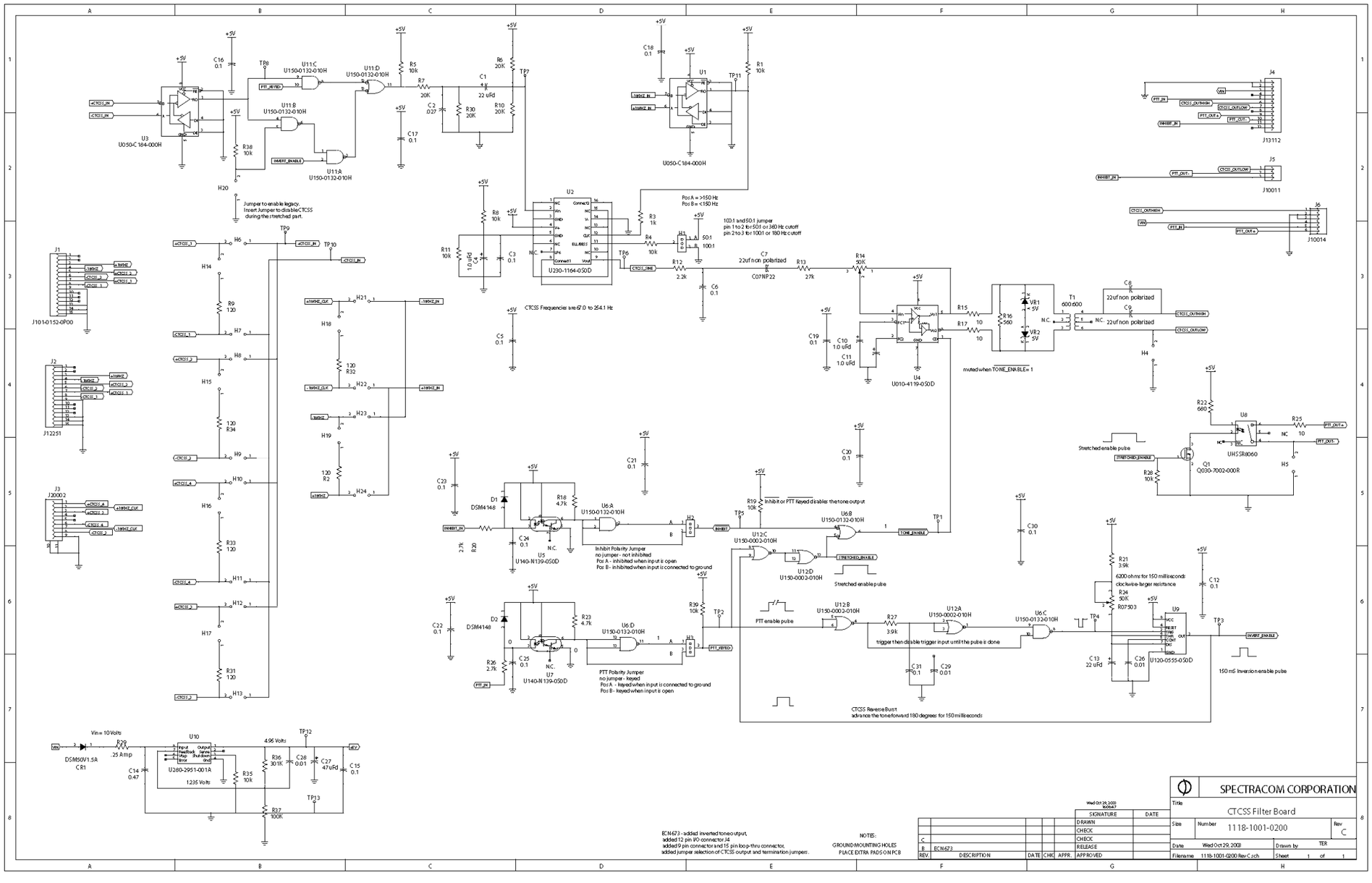

FIGURE 3-1 SCHEMATIC

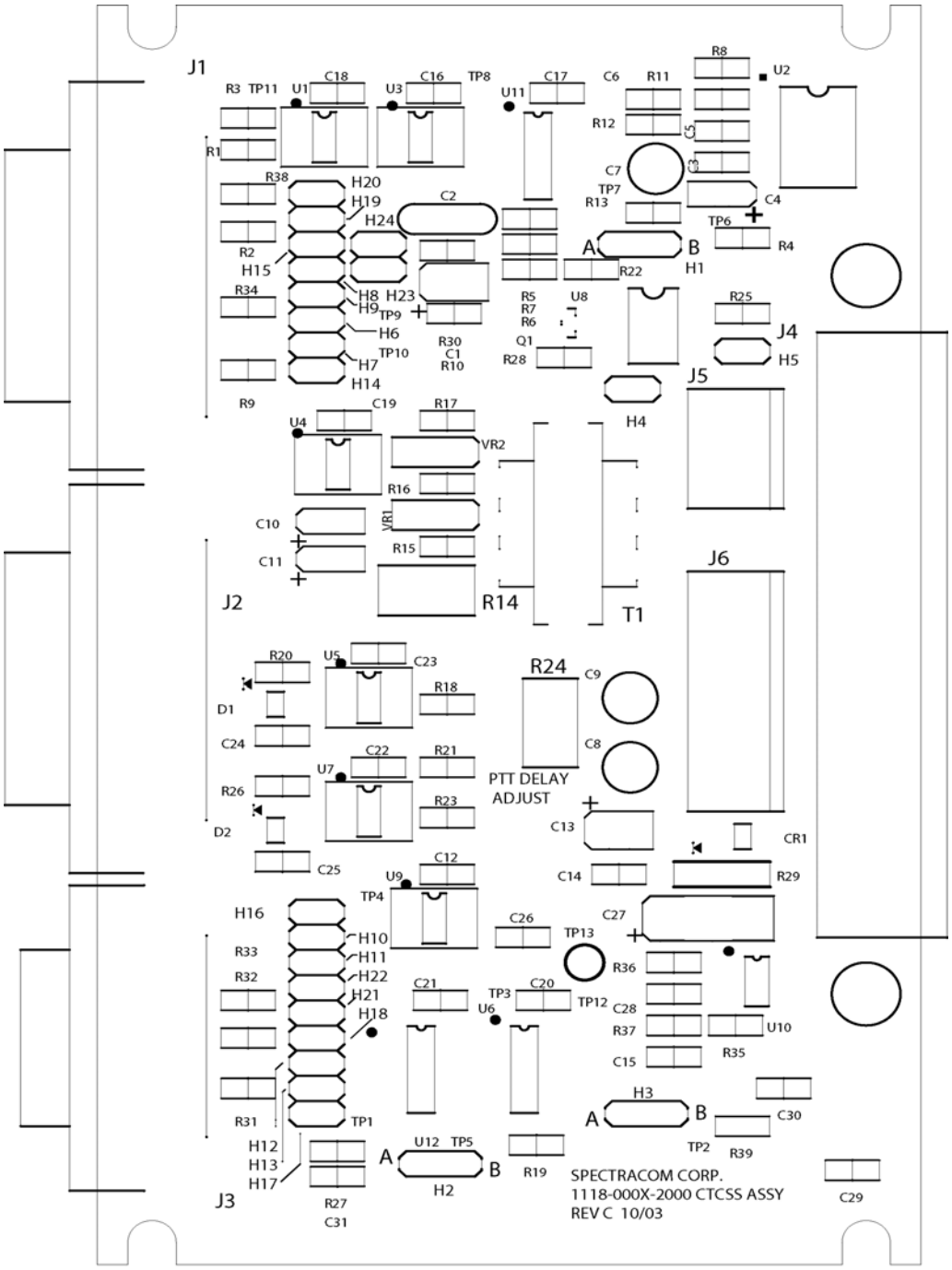

FIGURE 3-2 LOCATION DRAWING