

PRAXSYM

*PST*

CW Test Transmitter

*User's Manual*



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## Warranty Statement

PRAXSYM warrants that all items will be free from defects in material and workmanship under use as specified in this guide for a period of one year from date of delivery. PRAXSYM further agrees to repair or replace, at its discretion, any failure which upon PRAXSYM's inspection appears to be a result of workmanship or material defect. In no case, shall PRAXSYM's liability for breach of warranty exceed the purchase price of the items in question. PRAXSYM's liability on any claim of any kind, for any loss connected with, or resulting from the use of, performance or breach thereof, installation, inspection, operation or use of any equipment furnished by PRAXSYM, shall in no case exceed the purchase price of the goods which give rise to the claim.



[www.praxsym.com](http://www.praxsym.com)

Praxsym, Inc.  
120 S. Third Street  
Fisher, IL 61843  
Phone (217) 897-1744  
Fax (217) 897-6388

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## 1.0 Introduction

### 1.1 Overview

The PST is a portable CW test source capable of transmitting test signals on two channels simultaneously. The output from each channel can be enabled independently. The output level can be adjusted between -10 dBm and +12 dBm, in 0.1 dB steps.

Each channel contains four *Setups*. *Setups* allow the user to program up to four saved output configurations (frequency, amplitude, and channel spacing) per channel. The transmitter also contains *Scan Mode* which cycles through the *Setups* at an adjustable scan rate.

The transmitter frequency and output level for each channel can be set from the touch keys on the front panel or from the touchscreen display. The transmitter status can easily be monitored from the backlit LCD display. The transmitter also contains a USB interface enabling the user to control the transmitter remotely.

The transmitter can be powered using the internal 6 AA rechargeable batteries for 6 hours of continuous operation or from the AC/DC wall adapter included.

### 1.2 Functional Description

The PST will power on to a splash screen with the Praxsym Logo, and immediately proceed to the main operation screen. The previous settings from the last use will be retained. The transmitter will not power on transmitting RF energy, though it may have been powered off previously while transmitting. The PST may safely be powered off in any state using the ON/OFF button.

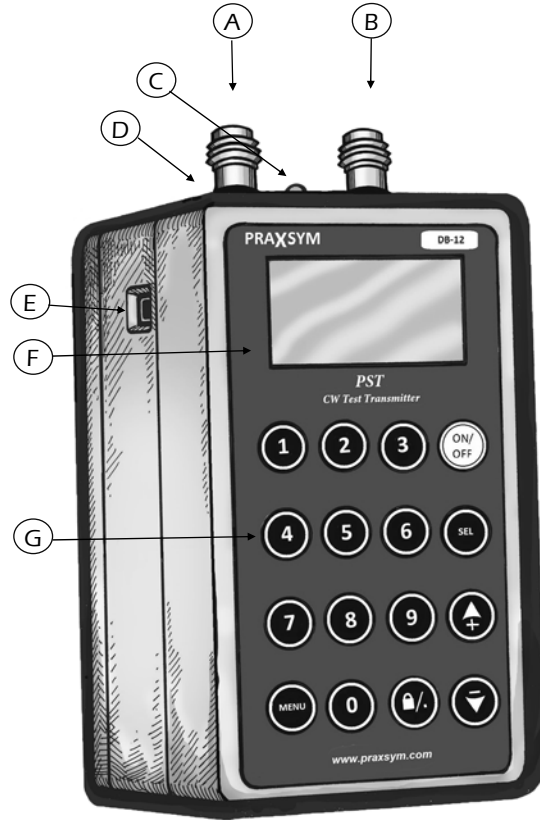
The PST is configured with channel spacing of many common wireless standards. Once the channel spacing is selected within the Channel Setup menu, the step size may be adjusted from the main operation screen. This function makes stepping across multiple channels quick and easy during testing.

### 1.3 Items Supplied



| Item | Description   |
|------|---|
| A    | PST CW Transmitter<br>With 6 Internal NiMH AA Batteries |
| B    | 12V 1.5A AC/DC Supply                                   |
| C    | Power Cord  |
| D    | USB Cable   |
| E    | Flash Drive, Users Manual, Driver Software              |

### 1.4 Looking at the PST CW Transmitter



| Item | Description                        |
|------|------------------------------------|
| A    | Channel 1 Output, N-Type Connector |
| B    | Channel 2 Output, N-Type Connector |
| C    | Battery Charger Status LED         |
| D    | Battery Charge Jack                |
| E    | USB Port                           |
| F    | LCD Touchscreen Display            |
| G    | Front Panel, Touch Keys            |

## 2.0 Operation

### 2.1 Battery Charging

The PST transmitter is fully operational while the batteries are being charged. Charging can occur whether or not the unit is powered on.

When "batt low" appears in the battery icon, the battery life is nearing its end. The transmitter will shut down soon. Connect the AC/DC adapter (12 V /1.5 A) to the unit's CHARGE jack. Plug the adapter into a wall outlet. An internal battery charger will control and terminate the charging of the 6 NiMH cells within each unit. When beginning a charge cycle with batteries which have been completely depleted, allow about two and a half hours for a full charge to be restored. A top-off charge is recommended immediately before use for maximum battery life.

A flashing red LED indicates a precharge state. Usually it will flash for a few moments and then enter a fast charge state, indicated by a solid red LED. The precharge state may last up to a few hours with drained batteries and indefinitely if one or more cells have failed. All cells must be replaced in the latter case. When the LED turns green, the batteries are nearly full and enter top-off mode. Continuing to charge after the LED turns green for approximately an hour will give maximum battery life. Following top-off mode, the charger will enter trickle mode indefinitely. Fully charged batteries will give six to eight hours of use. Also, the battery icon on the display will be completely darkened. If the AC/DC adapter is left connected to the PST, the charger will initiate a new charge cycle once the batteries have discharged. This will occur continually. Unless the transmitter is in operation, it is not recommended to leave the AC/DC adapter connected for more than 24 hours.

Though designed for many recharge cycles, the batteries are user replaceable. Replace the batteries every 2-3 years. Use only Energizer® NH15 AA NiMH rechargeable batteries, as supplied originally. The internal charge circuit will only work with NiMH rechargeable batteries. Attempting to charge other AA battery types such as Alkaline or Lithium Ion will result in damage to the transmitter.

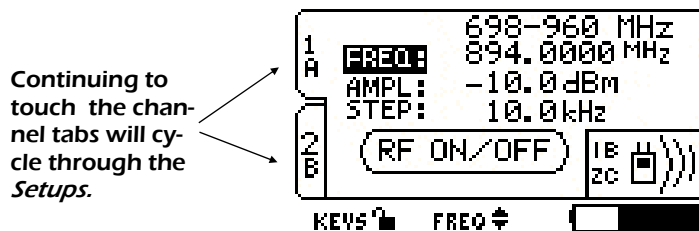
Do not store the transmitter with discharged or failed batteries. Discharged NiMH batteries can leak acid causing damage to the transmitter.

## 2.2 Using Channel Setups

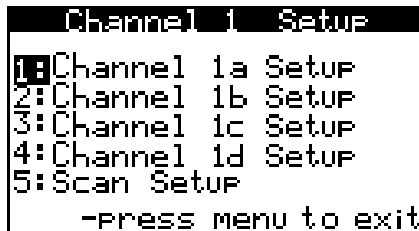
Each channel, 1 and 2, contain four *Setups*. *Setups* allow the user to program up to four saved output configurations (frequency, amplitude, and channel spacing) per channel. The *Setups* can be accessed by repeatedly touching the tabs on the left side of the display, depressing the 1 or 2 number keys, or by choosing *Channel 1 Setup* or *Channel 2 Setup* from the main menu.

When selecting the desired *Setup* from the home screen, pressing the *SEL (Select)* button toggles between frequency, amplitude, and step size. The arrow keys change the values of the selected option. On applicable transmitter models, touching the listed frequency band allows for selection of a new band. These same changes can be made from the *Channel 1 Setup* or *Channel 2 Setup* menu options in the *Main Menu*.

Touching *RF ON/OFF* or depressing the 0 key on the keypad will enable and disable the RF output for the selected *Setup*.



*Setups* for channel 1 can also be changed through the *Channel 1 Setup* Menu, likewise for channel 2.



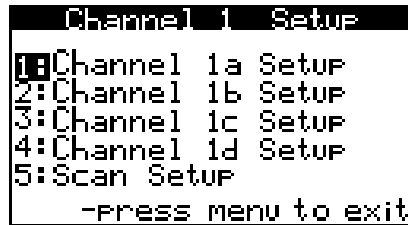


## 2.3 Scan Mode

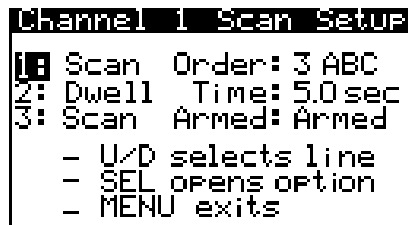
Each channel, 1 and 2, can be independently set to *Scan Mode*. In *Scan Mode*, the transmitter cycles through the *Setups* at an adjustable scan rate. The *Scan Mode* configurations are accessed through the *Channel 1 Setup* and *Channel 2 Setup* options in the *Main Menu*.

Selecting *Scan Setup* from the *Channel 1 Setup* menu portion displays the various configurations associated with *Scan Mode* on channel 1, likewise for channel 2. Using the up/down arrows and *SEL (Select)* key will modify the scan settings. Selecting *Scan Order* allows the user to choose which *Setups* will be used in the scan (AB, ABC, ABCD). Selecting *Dwell Time* allows the user to select the duration at which each *Setup* will be enabled. Selecting *Scan Armed* prepares the transmitter to begin the *Scan*. The *Scan*, RF Output, will not be enabled until *Scan ON/OFF* is pressed on the main screen. The Zero key will also start the *Scan*.

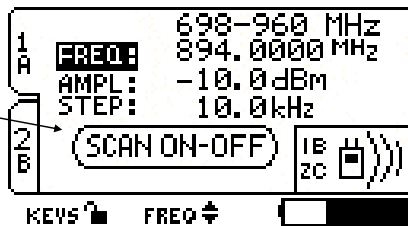
Selecting The *Scan Setup* option available in the *channel 1 Setup* menu, modifies the *Scan* settings



The *Scan Setup* configurations are available in the *Scan Setup* menu.



After the scan is armed, touching *SCAN ON-OFF* begins the scan (enables the RF output).



## 2.4 Keypad Definition

**ON/OFF:** Turns unit on or off

**Numerals 0-9:** Enter a new frequency, amplitude level or step size, select corresponding menu item choice where applicable

**Numerals 1&2:** From the main screen, pressing 1 or 2 will toggle the LCD between channel 1 and channel 2 set up screens. Pressing 1 while on the channel 1 will cycle between the four channel *setups*. Likewise for channel 2.

**Numeral 0:** From the main screen, pressing 0 will toggle the RF on and off or turn the SCAN on and off when the SCAN is armed.

**SEL: Select.** Toggles between frequency, amplitude and step size on the main screen or chooses highlighted menu option in applicable screens. Also the same as the "OK" touch screen button.

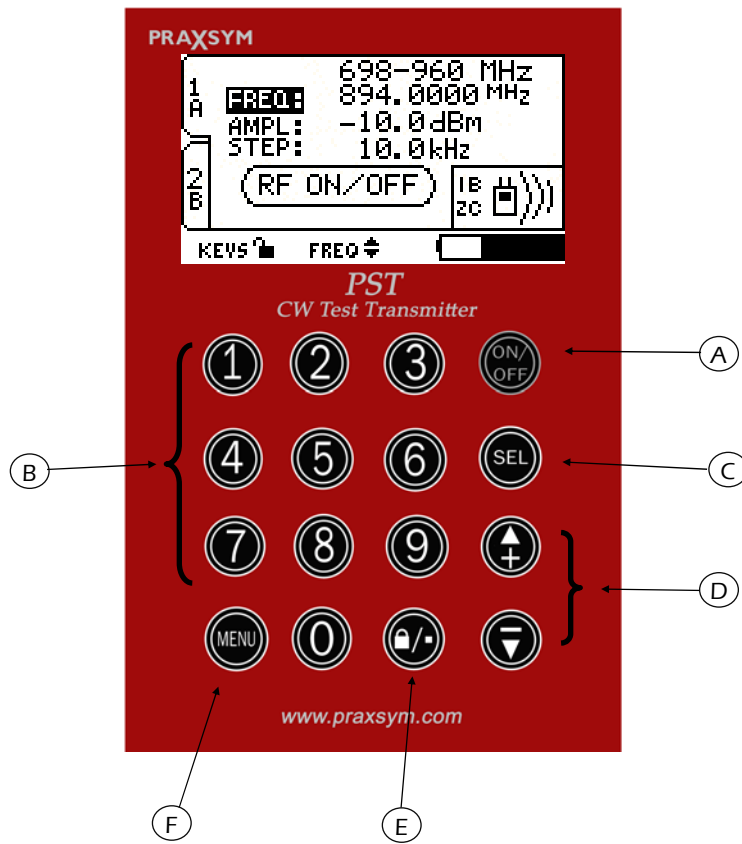
**UP/DOWN ARROWS:** Adjust frequency, amplitude or step size of highlighted channel in the main screen using the arrows. Adjustments to frequency are made in the set step size. In applicable sub-menus, the arrows control selection of menu options.

**PLUS/MINUS SIGNS:** Change to a positive or negative amplitude value.

**LOCK/DECIMAL POINT:** Locks the keypad from any unintentional changes. Indication of lock status is on the display when on the main screen only. The keypad may be locked and unlocked from the main operation screen only. The Decimal Point is for use when numerically entering a new frequency, amplitude or step size.

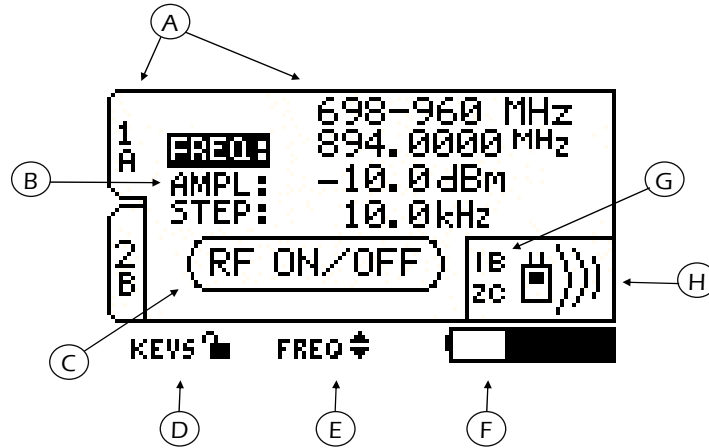
**MENU:** This brings up the Main Menu screen from the main operation screen, returns to main screen from Main Menu and backtracks through menus within sub-menu screens.

## 2.4 Keypad Definition (Continued)



| Item | Description                      |
|------|----------------------------------|
| A    | On/Off                           |
| B    | Numerals 0-9                     |
| C    | Select                           |
| D    | Up/Down Arrows, Plus/Minus Signs |
| E    | Lock/Decimal                     |
| F    | Menu                             |

## 2.5 Display Definition



| Item | Description   |
|------|---|
| A    | Toggle between active channel screens by touching the tabs on the left side of the screen, the active channel band is noted at the top. Continuing to touch the tabs will cycle through the channel <i>Setups</i> . |
| B    | Frequency, Amplitude, and Step size for both channels may be controlled using the SEL key to change between the three, while the arrow keys make adjustments to the values  |
| C    | Touch screen control of RF transmission   |
| D    | Lock status of the keypad is indicated by the padlock icon  |
| E    | Indicates setting which may be adjusted using the arrow keys  |
| F    | Battery level indicator   |
| G    | Numbers present indicate the channel and <i>Setup</i> which is transmitting   |
| H    | Animation will run when either or both channels are transmitting  |

To ensure proper care is taken of the touchscreen; avoid leaving the screen exposed to direct sunlight for long periods of time, clean with non-abrasive cloths (microfiber cloth), do not store in temperatures lower than -20°C and higher than 70°C, avoid touching the glass touchscreen with sharp or hard objects.

## 2.6 Menu Navigation

Pressing the *MENU* button from the main operation screen brings up the *Main Menu*. All transmitter settings are available from this menu. Pressing *MENU* again from this screen returns to the main operation screen.

Using the arrow keys will change the highlighted menu option. *SEL* chooses the highlighted menu option. Pressing the corresponding menu option on the keypad will also select menu options directly.

The *Channel Setup* options allow for setting of Frequency, Amplitude and Step Size. Within the *Channel Setup* options, *Setups* and *Scan Mode* are also configured.

*Display Settings* contains user-selectable parameters for the duration of Backlight Timeout and also Backlight Level brightness.

*System Settings* contains options to change Baud Rate or Disable/Enable Transmitting when the Frequency is changed. If Disable On New RF is 'ON', the PST will not transmit when a new frequency is entered. If a new step size does not require change of frequency, the PST will continue transmitting.

Pressing the *MENU* button while in any menu screen will backtrack through the menu hierarchy.

## 2.7 Controlling the PST Remotely

The PST can be controlled by a PC or embedded controller via the USB interface. Procedures in this section also describe control with terminal emulation software on a PC or laptop computer.

Install the supplied cable between a USB port on the PC/laptop and the USB port on the transmitter.

Start the terminal emulation software and setup with the following parameters.

Baud rate 9600, 38400, or 115200 (user selectable)  
Data bits 8  
Stop bits 1  
Parity none  
Com port assigned by PC operating system  
Local echo ON  
Select line feed (LF) after carriage return (CR) when receiving

The settings may be found in various places depending on the terminal emulation software used. Generally, check the Serial Port and Terminal configuration menus.

Power up the Transmitter by depressing the 'ON/OFF' button. The transmitter frequency is stored in non-volatile memory. When power is applied to the transmitter, it will return to the last entered frequency.

When connecting the transmitter to your PC for the first time, you may need to install the virtual USB-Serial Driver. This driver will be installed automatically on most PCs with Windows 7, Windows 8, or Windows 10 operating systems.

## 3.0 Serial Interface Operation

### 3.1 Configuring Tera Term Pro

Open the Terminal setup window from the Setup Menu. Select CR+LF for Receive and CR for Transmit. Enable Local Echo. Also within the Setup menu, choose the Serial Port option. Ensure parameters are matched to what settings were configured within the transmitter for communication.

Tera Term must be closed and the USB cable removed before manually powering down the transmitter.

### 3.2 Commands

Commands may be sent in lower or upper case. All commands should be followed by <CR>. <CR> represents 'ENTER.'

Spaces are represented by underscores (\_).

Note: The equal (=) can be replaced with a space, and the commands will still execute.

#### SET COMMANDS

The response to successfully executed SET commands is the message OK <CR>.

FR = *XXXX.yyyy* Sets output frequency (in MHz). The inclusion of the decimal point and digits to the right of the decimal are optional.

AMP=*+/-XX.y* Sets the output amplitude for the current channel.

CH=*XX* Sets the channel you wish to configure. Valid values are 1A, 1B, 1C, 1D, 2A, 2B, 2C, and 2D. Defaults to 1A.

TX=X

Enable/Disable output command. TX=1 turns the output on for the current channel. TX=0 turns the output off for the current channel.

If current CH is scanning transmitter will report:  
*DISABLE CHANNEL BEFORE MAKING CHANGE*

If current CH is armed for scanning but not scanning, transmitter will report:  
*OK. SCAN DISARMED*

ST=X.yyyy

Sets the channel spacing (in MHz).  
Example: ST=0.0125 (12.5 kHz Channel Spacing)

*SCANSU\_X\_YYYY\_ZZ.z* Scan Setup, where X is 1 or 2 (the physical channel being set up for scanning. YYYY is either AB, ABC, or ABCD (the setups being armed for scanning). ZZ.z is a number between 0.2 and 99.9 seconds (The desired dwell time).

The addressed channel cannot be currently active.

**Example:** SCANSU 2 ABC 12.2

**Sample alerts:**

- *DWELL TIME MUST BE 0.2 TO 99.9 SECS*
- *DISABLE SCAN BEFORE CHANGING SCAN PARAMETERS*
- *SCAN ORDER NOT VALID FOR THIS CHANNEL*



SCAN\_X\_Y

Start/Stop Scan where:  
X is 1 or 2 (the physical channel being started or stopped) Y is 1 (Start Scanning) or 0 (Stop Scanning)

The addressed channel cannot be currently active, and must have been previously set up for scanning.

**Sample alerts:**

*- DISABLE CHANNEL BEFORE MAKING CHANGE*

*- SCAN NOT SET UP FOR THIS CHANNEL*

BAND\_X

Assign band to current CH where:  
X is 1 through 4, one of the internal calibrated bands. The band's parameters are loaded into the setup previously selected by the CH command. The current channel cannot be currently active. Loads default parameters each time a band is changed.

**Sample alerts:**

*- NOT A VALID BAND!*

*- DISABLE CHANNEL BEFORE MAKING CHANGE*

**Example:** to select Band 2 for Setup 1A, type this:

Ch\_1A  
Band\_2

Then, change the default parameters as required.

QUERY COMMANDS

Note: Must enter underscores ( \_ )

- FR?** Returns the current frequency setting in the form XXXX.yyyy (MHz).  
Example: 1710.0000
- MN?** Returns the lowest frequency that the currently selected channel can be set in the form XXXX.yyyy (in MHz). See "FR?" for example.
- MX?** Returns the highest frequency that the currently selected channel can be set in the form XXXX.yyyy (in MHz). See "FR?" for example.
- ST?** Returns the synthesizer step size setting in the form X.yyyy (MHz).  
Example: 0.0100
- AMP?** Returns the current output amplitude in the form +/-XX.y (dBm) for the current channel.  
Example: +5.0
- BAND?** Returns the current band for the current channel.  
Sample Response:  
*Channel 1A is set to 617-698 MHz.*
- BANDLIST** Returns the available bands for CH

**Sample Response:**

These are the available bands for Channel 1A:  
Band 1 - 617-698 MHz  
Band 2 - 698-960 MHz

**Example:** to select Band 2 for Setup 1A, type this:

Ch\_1A  
Band\_2

Then, change the default parameters as required.

|        |   |
|--------|---|
| SCANX? | Lists the scan settings for CH X, where X is 1 or 2.<br><br><b>Sample Response:</b><br><br><i>OFF DISARMED AB 5 SECS</i>              |
| AMN?   | Returns the minimum output amplitude in the form +/- XX.y (dBm) that the current channel can output. See "AMP?" for example.          |
| AMX?   | Returns the maximum output amplitude in the form +/-XX.y (dBm) that the current channel can output. See "AMP?" for example.           |
| LD?    | Returns "0" if the synthesizer for the current channel is unlocked. Returns "1" if the synthesizer for the current channel is locked. |
| VR?    | Returns software version of the receiver board in the form X.yy.<br>Example: 1.15   |
| VD?    | Returns software version of the keypad/display board in the form X.yy.<br>See 'VR?' for example.                                      |
| BV?    | Returns the battery voltage level "BV=XX.y".<br>Example: BV=07.4  |
| TX?    | Returns '1' if channel's amplifier is turned on or '0' if off, or reports "This channel is scanning."                                 |

### 3.3 Error Responses

Invalid commands will be acknowledged with an error response. An error response will consist of 4 ASCII bytes followed by a carriage return. The error code consists of the two characters ER followed by a two-character error status code.

ERIC<CR>                    Invalid command

The command was not recognized because it was not in the proper format.

ERIN<CR>                    Invalid number or range

The data included in the previous command was invalid or out-of-range.

## 4.0 Specifications

### 4.1 Electrical Specifications

#### 310-010108-014 (N-type)

##### Channel 1

|                  |                                   |
|------------------|-----------------------------------|
| Band 1 frequency | <b>617-652/663-698 MHz</b>        |
| Band 2 frequency | <b>698-960 MHz</b>                |
| channel spacing  | 10, 12.5, 30, & 200 kHz, 1.25 MHz |

##### Channel 2

|                  |                                    |
|------------------|------------------------------------|
| Band 1 frequency | <b>1710-2170 MHz</b>               |
| Band 2 frequency | <b>2305-2320/2345-2360 MHz</b>     |
| Band 3 frequency | <b>2495-2690 MHz</b>               |
| channel spacing  | 50, 60, & 100 kHz, 1 MHz, 1.25 MHz |

|              |                |
|--------------|----------------|
| Output Power | -10 to +12 dBm |
| adjustable   | 0.1 dBm        |

|           |          |
|-----------|----------|
| Harmonics | < -40dBc |
|-----------|----------|

#### 310-010108-008 (N-type) & 310-010108-010 (SMA)

##### Channel 1

|                 |                                   |
|-----------------|-----------------------------------|
| Frequency       | <b>698-960 MHz</b>                |
| Channel spacing | 10, 12.5, 30, & 200 kHz, 1.25 MHz |

##### Channel 2

|                 |                           |
|-----------------|---------------------------|
| Frequency       | <b>1710-2170 MHz</b>      |
| Channel spacing | 30 kHz, 200 kHz, 1.25 MHz |

|              |                |
|--------------|----------------|
| Output Power | -10 to +12 dBm |
| adjustable   | 0.1 dBm        |

|           |          |
|-----------|----------|
| Harmonics | < -60dBc |
|-----------|----------|

## 4.1 Electrical Specifications (Continued)

### 310-010108-011 (N-type)

|                            |                           |
|----------------------------|---------------------------|
| <b>Channel 1</b>           |                           |
| Frequency                  | <b>136-174 MHz</b>        |
| channel spacing            | 12.5 kHz, 25 kHz          |
| <b>Channel 2</b>           |                           |
| Frequency                  | <b>396-512 MHz</b>        |
| channel spacing            | 12.5 kHz, 25 kHz          |
| Output Power<br>adjustable | -10 to +12 dBm<br>0.1 dBm |
| Harmonics                  | < -50dBc                  |

## 4.2 Environmental Specifications

Temperature Range: 0-50° C

## 4.3 Mechanical Specifications

|                |   |
|----------------|---|
| RF Connectors: | SMA or N-type   |
| Display:       | Transflective 128x64 Black/White<br>White LED Backlight |
| Keypad:        | Sixteen keys – see definition on page 7                 |
| Enclosure:     | aluminum  |
| Power Source:  | 6 AA NiMH cells rechargeable                            |
| Size:          | 7" x 5" x 2.75" (excluding RF connectors)               |
| Weight:        | 4 lbs.  |

PST CW Transmitter

**Notes**

**PRAXSYM**

Version 033116  
900-000015-001 Rev-