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Spectrum Scout

USER MANUAL

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PRODUCT WARRANTY
Optoelectronics, Inc. warrants all products and accessories for one (1) year against defects in materials and workmanship to the original purchaser. Products returned for warranty service will be repaired or replaced at Optoelectronics' option.

Specifically excluded are any products returned under this warranty that upon examination, have been modified, had unauthorized repairs attempted, have suffered damage to the input circuitry from the application of an excessive input signal, have suffered damage to the charging circuitry or internal batteries from the application of excessive voltage, or show other evidence of misuse or abuse. Optoelectronics reserves sole right to make this determination.

NON-WARRANTY
Products not under warranty must be returned, transportation prepaid, to Optoelectronics' service center. Factory service will be performed on a time and materials basis at the service rate in effect at the time of repair. A repair estimate prior to commencement of service may be requested. Return shipping will be added to the service invoice and is to be paid by the customer.

RETURN POLICY
Please contact us first for assistance and to obtain a return authorization number. Service Department: (954) 642-8997. Monday - Friday 8:30 AM to 5:00 PM Eastern Time.

Antenna and Accessory Recommendations

ANTENNAS

The small dual band VHF/UHF, DB32 antenna, is a very good multi-purpose antenna capable of picking up a wide range of frequencies from 100MHz to 2GHz. The BB85 VHF/UHF rubber duck antenna is also cable of picking up a wide range of frequencies from 100MHz to 2GHz. There are other antennas available that are useful for specific frequency ranges.

RD27	26-150MHz
RD150	144-165MHz
RD440	440-480MHz
RD800	500MHz-1GHz
RD2400	2400MHz-2500MHz
TA100S	100MHz-600MHz
CELL LOCK	800MHz-2GHz

FILTERS

The N100 FM broadcast notch filter will remove the influence of local FM stations (88-108MHz), providing up to 30dB of attenuation.

SERIAL DATA INTERFACE

The Spectrum Scout incorporates an RS232 interface for the purpose of interfacing to a PC. The frequencies saved to memory may be downloaded using the Spectrum Scout download program. The Spectrum Scout may also log frequencies to the PC in real time using the Spectrum Scout datalogging program. The CBDS interface cable and software are sold separately.

CE

⚠ CAUTION

WARNING - Maximum input voltage is 12VDC. Automotive voltages may exceed 12V causing damage to internal circuitry. Damage resulting from excessive input voltage is readily apparent and will not be covered under warranty. Units returned for warranty service that have damage resulting from excessive supply voltages will incur service charges.

WARNING - Maximum antenna input signal is +15dBm (50mW). Under no circumstances should the Spectrum Scout be directly connected to an RF transmitter or be used in close proximity to a radio transmitter of more than 5 watts. Damage to the input amplifier circuitry is readily apparent and will not be covered under warranty. Units returned for warranty service that have damage to the input circuitry will incur service charges.

This manual covers connection and operating instructions for the Optoelectronics Spectrum Scout™. The Optoelectronics Spectrum Scout™ is covered under U.S. Patent Number 5,471,402 and other patents pending.

Introduction

How many times have you locked on to a frequency and wondered what that frequency was allocated to in the FCC bandplan. You no longer have to wonder because the Spectrum Scout will identify that frequency for you. The Spectrum Scout is the first nearfield device capable of displaying the FCC bandplan information with each frequency captured. With a frequency range of 10MHz-2.6GHz, over 1000 FCC records are programmed into the Spectrum Scout. The Spectrum Scout is the latest advancement in hand held test equipment by Optoelectronics, Inc.

With over 1000 records programmed into the Spectrum Scout you can use the unit as your own portable reference guide. Without having to lock on to a frequency just use the arrow buttons to move through the database in steps of 1, 5, 6.25, 10, 12.5, 25, 30, and 50KHz steps. You may also move in steps of 1, 5, and 10MHz. This allows for easy lookup of the FCC bandplan information.

A great feature of the Spectrum Scout is its ability to allow the user to upload their own frequencies for their specific location. Using simple text files and and an upload program that is supplied by Optoelectronics, you can easily load your own information for specific frequencies. For instance, you could name your local repeater that is operated by your amateur radio club, or identify your local municipality frequencies. There are many possibilities. If you don't live in the U.S. your allocation tables may be much different and you can easily upload all of the information for your city or country.

The Spectrum Scout also incorporates the feature that was patented by Optoelectronics, Inc., Reaction Tune. This unique feature allows the Spectrum Scout to automatically tune a compatible receiver to the frequency it captures, allowing the user to instantly monitor the signal captured.

The Spectrum Scout is similar to other nearfield devices in the way it locks onto RF signals. It is looking for a dominant nearfield signal that is 15dB above the background RF level. As it detects a dominant signal a frequency is displayed.

Background RF levels have a large impact on how far away the Spectrum Scout can lock onto signals. The higher the background RF levels the closer the Spectrum Scout will need to be to detect a signal. The lower the background RF the further the Spectrum Scout can be to detect a signal. For instance, when in a metropolitan area the background RF levels are much higher than in a rural area. Therefore, a 5 watt UHF radio that can be detected from around 200 feet in a normal RF environment may well need to be within 100 feet or less in a high RF environment.

High power transmitters such as FM stations, TV stations, Paging towers etc.. have an adverse influence on the way a frequency counter works. Even if the Spectrum Scout does not lock onto and display the frequency of your local radio station that does not mean that it is not influenced by the RF. Because the RF is still present the Optoelectronics N100 FM notch filter should be a consideration. The N100 provides 30dB of attenuation in the FM band. Knocking down the background RF by 30dB will allow the Spectrum Scout to see that 15dB signal from a greater distance. This is not to say it will not work in high RF areas, however it is something that should be taken into account.

Using different antennas also plays a large role in the effectiveness of the Spectrum Scout. Experiment with different antennas for different applications and you will be surprised at the varying results. See page 15 for a list of accessory antennas.

Specifications

Input Impedance:	**50 Ohm**
Frequency Range:	**10MHz - 2.6GHz**
Sensitivity:	**<3mV**
Maximum Input:	**+15dBM, 50 milliwatts**
Resolution:	**1kHz / 250.000 or 100Hz / 250.0000**
Display:	**2x16 alphanumeric LCD with EL Backlight**
Timebase:	**10MHz**
Size:	**3.5"H x 3"W x 1.5"D**
Weight:	**12 oz**
Battery:	**Internal 5 cell AA NiCads**
Charging Time:	**8-10 hours**
Operating Time:	**4-5 Hours**
Power:	**AC90 adapter supplied**
Power Connector:	**2.1 mm coax, center positive**
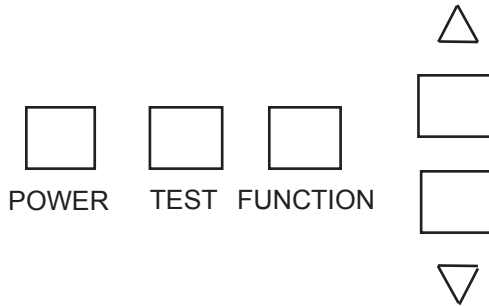
POWER: Press and hold for 3 seconds to turn the unit ON. Once on, press and hold the button for two seconds to turn the backlight ON. Press and hold the button for 4 seconds to turn the unit OFF.

TEST: Press the button when you wish to return to the frequency display when in any other mode. Press and hold the button and at the same time press either the UP/DOWN arrow button to manually store a frequency to memory.

FUNCTION: Press the button to navigate through the different modes. When in frequency display mode press and hold the button down and at the same time press the UP/DOWN arrow button to change the screen from signal strength display to FCC bandplan display.

UP/DOWN ARROW: Use these buttons when in the function mode to switch the setting for different modes.

Top Panel

ANTENNA INPUT: 50 Ohm BNC input.

CI-5 INPUT: This port is used for Reaction Tune. See Reaction Tune on pages 9&10 for more information regarding this feature and a list of receivers that are compatible with the Spectrum Scout.

9-12VDC: Power input. AC90 9-12VDC wall adapter.

RS232   This port is used for direct connection to a PC for uploading frequencies to a database, memory download and datalogging. This port is also used when interfacing to the ICOM PCR100/1000 for the purpose of Reaction Tuning.

CALIBRATION: The calibration adjustment hole is located to the left of the Optoelectronics logo on the front panel. The calibration is set at the factory and should not be altered. Altering the adjustment can result in inaccurate frequency measurements.

You may make your own database and upload to either of the two USER databases using simple text files created in Microsoft Word, Notepad or any text editor. Frequency database records consist of a START FREQUENCY in MHz, an END FREQUENCY in MHz, and a TEXT STRING, separated by commas. The TEXT STRING must be no more than 16 characters in length, and may not contain any commas.

In general, it is suggested that frequency database records be separated into two categories: BANDS and CHANNELS. BANDS are ranges of frequencies with a START FREQUENCY and a different END FREQUENCY. An example is the FM commercial broadcast band. CHANNELS are single frequencies representing a specific channel in a channelized radio service. An example is Marine VHF Channel 16. In a CHANNEL database record, the START FREQUENCY and the END FREQUENCY are the same. It is OK to have more than one database record for the same frequency or band of frequencies, and frequency bands and channels may overlap. The Spectrum Scout will display up to eight database matches for a given frequency. Each USER database can each store up to 2816 records.

The following are example BAND and CHANNEL lists.

BANDS	**CHANNELS**
87.8000,108.0000,FM Broadcast	10.0000,10.0000,NIST WWV WWVH
144.0000,148.0000,Amateur 2 Meter	99.5000,99.5000,FM Brdcst Ch 258
420.0000,450.0000,Amateur 70 cm	147.1000,147.1000,Club Repeater 2

To upload a database please visit our web site and enter the Spectrum Scout page. There you will find the upload program and instructions on how to make a database and upload that database.

Memory Download and Datalogging

Memory saved to the Spectrum Scout may be downloaded to a computer through the RS232 interface jack located on top of the Spectrum Scout. All 1000 memories and 65,000 hits may be downloaded and saved for later use. Real time datalogging is also possible through the RS232 jack. The connection to the PC is direct using the Spectrum Scout serial cable (CBDS sold separately). The Spectrum Scout download DOS software is included with the purchase of the CBDS.

1.   Plug the RS232 cable into the RS232 jack located on top of the Spectrum Scout. The interface cable has a 3.5mm stereo plug on one end and a DB9 connector on the other end. Plug the end with the DB9 connector into an available com port on your computer. If your computer only has a USB port then it may be necessary to obtain a serial to USB adapter.
2.   Install the Utility Software Disk that came with the CBDS and enter the specscout.exe program.
3..   Follow the instructions on the software for downloading and datalogging.

Turn the unit on/off

Press and hold the POWER button for 3 seconds until the unit turns on. To turn the unit off press and hold the POWER button for 4 seconds until the unit displays POWERING DOWN.

Turn the backlight on/off

After the unit has been turned on press and hold the POWER button for 2 seconds until the backlight turns on. If the backlight is on press and hold the POWER button for 2 seconds to turn it off.

Display Options

When powered on the Spectrum Scout defaults to signal strength mode. The unit can display either signal strength or FCC bandplan data. Press and hold the FUNCTION button and then press either the UP/DOWN arrow buttons to switch between the two.

Modes

Press the FUNCTION button to enter the 19 different modes of the Spectrum Scout.

Function Button

Pressing the FUNCTION button will navigate the unit through its 19 different modes.

Memory

There are 1000 unique memory locations with a possibility of 65,000 hits recorded for each frequency in memory.

Press the FUNCTION button once to select MEMORY. Press and hold the FUNCTION button and then press either of the UP/DOWN arrow buttons to switch between Frequency, Hits, Signal Strength and FCC Bandplan*. Press only the UP/DOWN arrow button to move forward and backward through the memory locations.

*The Spectrum Scout can display up to eight different records for each frequency. If there are multiple records for a particular frequency in memory the display will change every two seconds to display the different records.

Clear Memory

To clear all frequencies saved to memory press and hold the FUNCTION button and then press the the UP arrow button twice in succession.

Auto Store

The Spectrum Scout can be set to automatically store frequencies and other data to memory. Press either the UP/DOWN arrow button to switch from AUTO STORE Disabled to Enabled. If Auto Store is disabled you may also manually store a frequency to memory by pressing and holding the TEST button for two seconds. This will store what is being displayed on the Spectrum Scout at that moment.

Note: If AUTO STORE is enabled then FILTER will automatically be enabled. If AUTO STORE is disabled then FILTER may be disabled or enabled.

B. <u>AOR:</u> The Spectrum Scout can Reaction Tune the AOR AR8000 and AR8200.

C. <u>PCR1000:</u> The Spectrum Scout can Reaction Tune the ICOM PCR1000. The CBPCR Reaction Tune cable is required and it interfaces through the RS232 jack on top of the Spectrum Scout. The PCR1000 part of the cable plugs into the DB9 connector on the back of the receiver. Since the PCR1000 has no hardware volume or squelch controls the Spectrum Scout is capable of controlling these functions as well. See page 7 for details.

<u>Cables Required For Reaction Tune</u>

ICOM, OptoScan and Optoelectronics Optocom	CBCI5
Optoelectronics R11	CBRT
AOR AR8000	RT8000
AOR AR8200	RT8200
ICOM PCR1000	CBPCR

IMPORTANT:
The Spectrum Scout must send an initialization command to the receiver. Make sure the Spectrum Scout is turned off. Turn the receiver on first then turn on the Spectrum Scout.

Reaction Tune

When the Spectrum Scout is in FILTER mode it can Reaction Tune a receiver connected through the CI5 port on the top panel. Following are the procedures for Reaction Tuning the various receivers that are compatible with the Spectrum Scout.

1. Press the FUNCTION button until Filter Mode is displayed. It must display Enabled.
2. Press the FUNCTION button until Interface Type is displayed. It must display Reaction Tune.
3. Press the FUNCTION button until Receiver Type is displayed. There are three options.

> **A. <u>CI5:</u>** Following are the current CI-5 compatible receivers that the Spectrum Scout is capable of Reaction Tuning.
>> ICOM R10, R20, R7000, R7100, R8500 and R9000.
>> Radio Shack PRO 2005/2006 (with OS456/Lite installed), Radio Shack PRO 2035/2042 (with OS535 installed).
>> Optoelectronics R11 and Optocom.
>
> The ICOM R10 and R7100 require special default settings for Reaction Tuning with the Spectruml Scout.
>> ICOM R10:   Baud Rate = 9600, TRN = ON, CI-V ADDRESS = 52
>> ICOM R7100: Baud Rate = 9600, Transceive Mode = ON

Frequency Database

You may scroll through the entire database to use as a reference tool by using the UP/DOWN arrow button for FINE tune. You may also scroll by pressing and holding the FUNCTION button and pressing the UP/DOWN arrow button for COARSE tune. See next step for adjusting step sizes.

Coarse Step

There are 3 different settings for COARSE tune, 1, 5 and 10 MHz . Press either the UP/DOWN arrow button to switch between the different options. Once a step size is chosen this is the step size in which the unit will move when scrolling through the database in the previous step.

Fine Step

There are 8 different settings for FINE tune. 1, 5, 6.25, 10, 12.5, 25, 30 and 50kHz. . Press either the UP/DOWN arrow button to switch between the different options. Once a step size is chosen this is the step size in which the unit will move when scrolling through the database in the previous step.

Resolution

There are two possible resolution measurements. 1kHz 250.000 (fast) and 100Hz 250.0000 (slow). Press the UP/DOWN arrow button to switch between resolutions.

Filter Mode

You may Enable or Disable Filter mode. When Filter mode is enabled, the frequency will lock and hold on the display. This also allows frequencies to be logged to memory when Auto Store is enabled. When Filter mode is disabled the frequency detected will remain on the display as long as the signal is present. Press and hold the TEST button for two seconds to manually store the frequency to memory.

Function Button

Frequency Display
The two options for frequency display are Channel or Measured. The channel frequency will be the actual channel that the transmitter is on and a measurement may look something like this 454.1250. The Measured frequency will be the actual frequency that is coming from the transmitter and a measurement may look something like this 454.1248.

Interface Type
Switch between CI-5 Command and Reaction Tune. CI-5 is used when interfacing to a PC for memory download and datalogging. Reaction Tune is used when interfacing to compatible receivers.

Receiver Type
CI5 for ICOM, and Optoelectronics receivers, AR8000 for AOR receivers and PCR1000.

PCR1000 Volume
When interfaced to an ICOM PCR1000 in Reaction Tune mode you may control the volume of the receiver by pressing the UP/DOWN arrow buttons.

PCR1000 Squelch
When interfaced to an ICOM PCR1000 in Reaction Tune mode you may control the squelch level of the receiver by pressing the UP/DOWN arrow buttons.

Beeper
Pressing the UP/DOWN arrow buttons will Enable or Disable the beeper. Each time a signal is detected the Digital Scout will beep once.

Vibrator
Pressing the UP/DOWN arrow buttons will Enable or Disable the vibrator. Each time a signal is detected the Digital Scout will vibrate for two seconds. *Note: If both the Vibrator and the Beeper are Enabled only the Vibrator will function.*

Auto Power Off
Enabled allows the unit to automatically shut off after two minutes of inactivity. Disabled will not allow the unit to shut off unless done so with the Power button.

Default DB
The Spectrum Scout has one default database and two optional databases. The default database is loaded by Optoelectronics at the factory and may not be altered, although it may be disabled. The unit's default setting is ENABLED. To DISABLE the default database press either the UP/DOWN arrow button. **Note: If you disable the default database and the other two available databases have no data, or are not enabled if they do have data, then the Spectrum Scout will not display any FCC bandplan data when the unit locks on a signal.**

User 1 DB
To upload data to the USER DB 1 location please see page 12 and our web site for more information. You may choose to ENABLE all three databases. If so, then the DEFAULT DB will display first, the USER DB1will display second and the USER DB2 will display third. To enable USER DB

1 press either the UP/DOWN arrow button so the unit displays enabled.

User 2 DB
To upload data to the USER DB2 location please see page 12 and our web site for more information. To enable USER DB 1 press either the UP/DOWN arrow button so the unit displays enabled.