Spyder

manual version 2.5

Contents

Introduction

Berkeley Varitronics Systems' **SPYDER**® is a self-contained frequency agile signal source for "walk-about" analysis and propagation studies. Multiple transmitters can be placed in various places in a building or coverage area to be studied. The data can be collected by simply "walking-about" with a receiver such as a Fox®.

The **SPYDER** is battery powered and weighs under 1 pound. It can easily be magnetically attached or fastened by velcro to a variety of surfaces on a wall, floor or even ceiling. Transmitters can be placed in various places in a building or area desired to be studied.

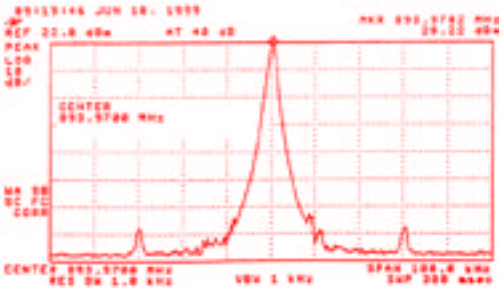
The transmitter measures only (5''L x 5''W x 1.5''H); about the approximate size of a smoke detector. Power is delivered by any standard 9 volt alkaline battery but BVS recommends that the **SPYDER** be powered by an internal 9 volt lithium 800 maH battery allowing up to 6 hours of continual use.

For even more robust battery power, BVS offers the Dragonfly® external battery system. This power source will deliver a full 8 hour's use with a single charge because of **SPYDER**'s power management circuitry, which shuts the radio frequency circuitry off when not needed reducing the current drain. The **SPYDER** may also be operated by an external 9 volt 300 mA DC wall transformer which is supplied.

The **SPYDER** has a 1 x 16 character LCD (Liquid Crystal Display) to indicate channel frequency, modulation mode, status, and is programmed with 3 touch keys. The user can select the desired modulation, channel or frequency to be used. There is a choice of both Continuous Wave (no modulation) and Frequency Modulation (modulating for EAMPS BER).

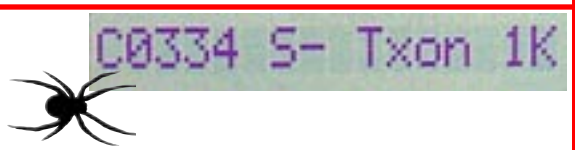
Through the **SPYDER**'s RS-232 port (9600 baud) a custom specified test routine can be uploaded. Special BER (Bit Error Rate) circuitry is built into the **SPYDER** which outputs a pseudo-random packet, or a user-authorized BER packet.

The available radio frequencies are: AMPS, ETACS, as well as custom frequencies such as ISM 900 - 932 MHz, Paging and PCS 1850 - 2400 MHz. The SPYDER 's RF power output is 100 mW (+20 dBm).



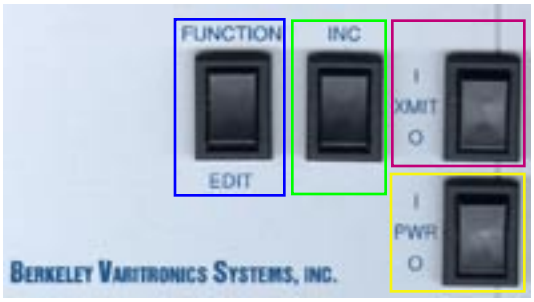
(EAMPS-ETACS modulation schemes are also available:
10 kHz FSK AMPS, ETACS, 6 kHz, SAT 0, SAT 1, SAT 2, 1004 Hz audio test tone, audio modulation, POCSAG, signaling tone,

and custom specified audio tones).



SPYDER Operation

FUNCTION/EDIT- FUNCTION is an execution key which chooses different modulations, and executes commands. EDIT is used to select the digits of the channel number desired, SAT code, or power level.



INC- Increment key is used to increase the digit value selected by cursor (EDIT) key.

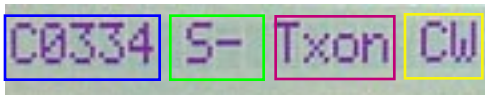
XMIT- This key turns on/off the RF carrier.

PWR- This key turns on and off power to unit. (settings reset to default when power is lost to unit)

SPYDER Display

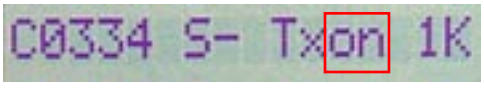
There are 4 fields displayed on the SPYDER:

Field 1: displays the channel number for AMPS (991-10232) and (1-799)
Field 2: shows (S) for SAT, code (S0) for 5970 Hz, (S1) for 6 kHz, (S2) for 6030 Hz, (S-) for no SAT
Field 3: shows the RF carriers on/off status
Field 4: displays the selected modulation schemes:



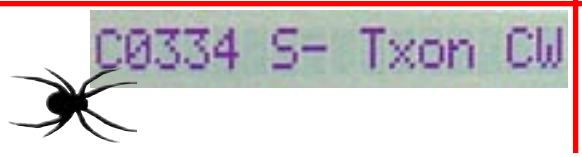
CW: continuous wave, no modulation
Au: audio modulation from the microphone jack
1K: 1004 tone modulation
DS: dotting sequence
ST: signaling tone
FC: forward control channel, control filler, and over head message
PG: page mobile

SPYDER Functions

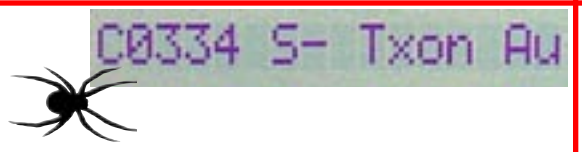


By pressing the FUNCTION key, the following selections may be chosen only when the XMIT is on:

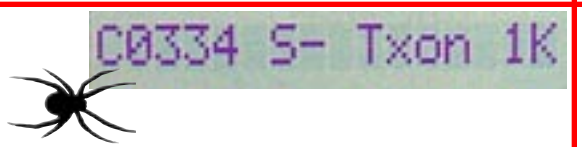
CW: Continuous Wave. No modulation at all, (this is true even if the SAT code is edited and user presses the function key.



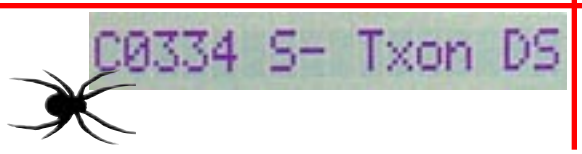
Au: Audio modulation. With a microphone plugged into the microphone jack, you are able to modulate carrier with your voice with Your voice will be heard on the CellSPAN or MSAT. A SAT can also be chosen to add to the modulation.
Audio Deviation : 8 kHz
SAT Deviation : 2 kHz



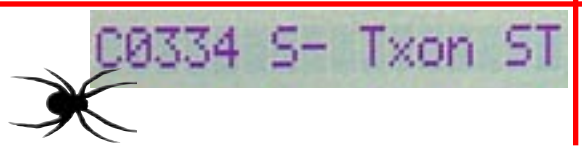
1K: 1004 Hz test tone modulation. SAT can be added onto the modulation.
Tone Deviation : 8 kHz (peak deviation)



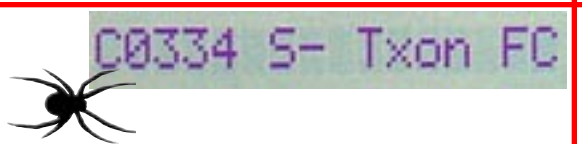
DS: Dotting sequence.



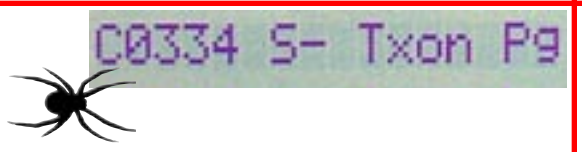
ST: Signaling tone. SAT cannot be added on the modulation deviation 8 kHz



FC: Forward control channel control filler and overhead messages:
10 kbps, deviation: 8 kHz.
No SAT can be added on the modulation.



PG: Page mobile phone. In paging mobile function mode, if no key is pressed in 3 seconds, the SPYDER will automatically enter the MIN editing mode.

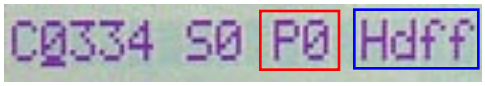


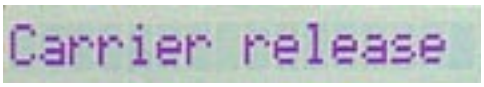
Use EDIT and INC keys to edit the MIN (Mobile Identification Number) of the mobile to be paged. Then press FUNCTION key again, the SPYDER will display "paging" message and about 8 seconds later, the mobile phone under test will ring and enter the conversation mode.

In the conversation mode, use EDIT and INC keys to edit channel number to simulate the hand off mode, new SAT or power level. Hitting the function key again, will change the hand off channel, new SAT, or power level. The P0 indicates the power level the paged mobile is on and Hdff indicates handoff occurred.

To exit the transmit mode to the phone under test, hit the FUNCTION key again, and the SPYDER will send a release command to the mobile, display "Carrier release" for 2 seconds and return to the default mode.

Note: For a direct connect to a cellular telephone, use a 50 ohm coaxial cable and at least 50 dBm attenuation pad to connect the SPYDER to the mobile phone. If you desire to page a mobile phone to air, there is no guarantee that the mobile phone will ring every time you transmit, because the phone may also get data messages on the same or different control channel at the same time from a local cellsite.

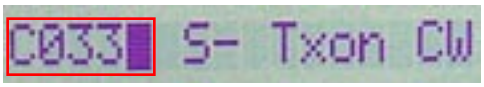




SPYDER Editing

The SPYDER does not retain settings so upon power-up, the default screen will always read the same.

Channel: 0001 (frequency = 880.02 MHz)
SAT: no (off)
Modulation: CW
Transmit On/Off depending upon the RF switch position



When the EDIT key is pressed, the left most digit of the channel number will be blinking with the cursor below the digit.

If the EDIT key is pressed again, the cursor will move to the right to the next digit. After the last possible digit at the end of the LCD, the cursor will loop back (wrap around) to the beginning at the left most digit.

When the INC key is pressed, the value of the blinking digit will increase by one step. (wraps around at the end)

Convert channel number to frequency in PCS Spyder:

example: Spyder frequency range 1930 to 1990 MHz with channel step 50 kHz

base frequency=1930
base channel=1 (channel 1=1930 MHz)
step=50 kHz (.05 MHz)
example:chan=90

frequency=base frequency+(channel-base channel) * step

frequency=1930+(90-1) * .05

frequency=1934.45

Convert frequency to channel number in PCS Spyder:

example:frequency=1960 MHz

channel=((frequency-base frequency) / step)+1

channel=((1960-1930) / .05)+1

channel=601

Convert channel number to frequency:

example: Spyder frequency range 928 to 941 MHz with channel step 12.5 kHz

base frequency=928
base channel=1 (channel 1=928 MHz)
step=12.5 kHz (.0125 MHz)
example:chan=90

frequency=base frequency+(channel-base channel) * step

frequency=928+(90-1) * .0125

frequency=929.1125

Convert frequency to channel number:

example:frequency=933 MHz

channel=((frequency-base frequency) / step)+1

channel=((933-928) / .0125)+1

channel=401

Glossary of Acronyms

AC	**Alternating Current**
A/D or ADC	**Analog to Digital Converter**
AGC	**Automatic Gain Control**
BER	**Bit Error Rate**
BPSK	**Binary Phase Shift Keying**
BW	**Band Width**
CDMA	**Code Division Multiple Access - a spread spectrum modulation**
DC	**Direct Current**
D/A	**Digital to Analog**
dB	**deciBel**
dBm	**deciBels referenced to 1 milliwatt**
DOS	**Digital Operating System**
DSP	**Digital Signal Processing**
FIR	**Finite Impulse Response**
GHZ	**GigaHertz**
GPS	**Global Positioning System (satellite based)**
GPS diff.	**GPS error correction signal which enhances GPS accuracy**
IF	**Intermediate Frequency**
I and Q	**In phase and Quadrature**
kHz	**kiloHertz**
LCD	**Liquid Crystal Display**
LO	**Local Oscillator**
Mbits	**Megabits**
MHz	**MegaHertz**
modem	**acronym for modulator/demodulator**
PCMCIA	**Personal Computer Memory Card International Association**
PC	**Personal Computer**
PCS	**Personal Communications Service (1.8 to 2.1 GHz)**
PN	**Pseudo Noise**
QPSK	**Quaternary Phase Shift Keying, 4-level PSK**
RF	**Radio Frequency**
RSSI	**Receiver Signal Strength Indicator**
UTC	**Universal Time Code**
VAC	**Volts Alternating Current**
VGA	**Video Graphics Array**
VSWR	**Voltage Standing Wave Ratio**
X	**horizontal axis**
Y	**vertical axis**

IMPORTANT SAFETY INSTRUCTIONS

When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

1)Read and understand all instructions.

2)Follow all warnings and instructions marked on the product.

3)Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

4)Do not use this product near water, for example, near a bath tub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool.

5)Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.

6)Slots and openings in the cabinet and the back or bottom are provided for ventilation, to protect it from overheating these openings must not be blocked or covered The openings should never be blocked by placing the product on the bed, sofa, rug or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.

7) This product should be operated only from the type of power source indicated on the appliance. If you are not sure of the type of power supply to your home, consult your dealer or local power company.

8)Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.

9)Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.

10)Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock. Never spill liquid of any kind on the product.

11) To reduce the risk of electric shock, do not disassemble this product, but take it to a qualified service facil4 when some service or repair work is required. Opening or removing covers may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electric shock when the appliance is subsequently used.

12)Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

A) When the power supply cord or plug is damaged or frayed. B) If liquid has been spilled into the product.

C)If the product has been exposed to rain or water.

D) If the product does not operate normally by following the operating instructions. Adjust only those controls, that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.

E) If the product has been dropped or the cabinet has been damaged. F) If the product exhibits a distinct change in performance.

13)Avoid using the product during an electrical storm. There may be a remote risk of electric shock from lightning.

14)Do not use the telephone to report a gas leak in the vicinity of the leak.

INSTALLATION INSTRUCTIONS

1. Never install telephone wiring during a lightning storm.

2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

4. Use caution when installing or modifying telephone lines.

INSTRUCTION FOR BATTERIES

CAUTION: To Reduce the Risk of Fire or Injury to Persons, Read and Follow these Instructions:

1. Use only the type and size of batteries mentioned in owner's manual.

2. Do not dispose of the batteries in a fire. The cells may explode. Check with local codes for possible special disposal instructions.

3. Do not open or mutilate the batteries. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.

4. Exercise care in handling batteries in order not to short the battery with conducting materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.

5. Do not attempt to recharge the batteries provided with or identified for use with this product. The batteries may leak corrosive electrolyte or explode.

6. Do not attempt to rejuvenate the batteries provided with or identified for use with this product by heating them. Sudden release of the battery electrolyte may occur causing burns or irritation to eyes or skin.

7. When replacing batteries, all batteries should be replaced at the same time. Mixing fresh and discharged batteries could increase internal cell pressure and rupture the discharged batteries. (Applies to products employing more than one separately replaceable primary battery.)

8. When inserting batteries into this product, the proper polarity or direction must be observed. Reverse insertion of batteries can cause charging, and that may result in leakage or explosion. (Applies to product employing more than one separately replaceable primary battery.)

9. Remove the batteries from this product if the product will not be used for a long period of time (several months or more) since during this time the battery could leak in the product.

10. Discard "dead" batteries as soon as possible since "dead" batteries are more likely to leak in a product.

11. Do not store this product, or the batteries provided with or identified for use with this product, in high-temperature areas. Batteries that are stored in a freezer or refrigerator for the purpose of extending shelf life should be protected from condensation during storage and defrosting. Batteries should be stabilized at room temperature prior to use after cold storage.

Spyder

BATTERY POWERED STICK-UP TRANSMITTER

The Spyder is a self-contained frequency agile signal source for “walk-about” analysis and propagation studies.

Multiple transmitters can be placed in various places in a building or coverage area to be studied.

Data is collected by simply “walking-about” with a receiver, such as Champ*.

The Spyder is packed with the following features:

- Compact size: weighs only one pound, measures 5" x 5" x 1.5"
- Can be surface mounted magnetically or fastened with Velcro
- Powered by a lithium 9 volt, 1200 maH battery or external, optional Dragonfly Battery Pack
- External 12 volt 500mA DC wall transformer included
- 1 x 16 character LCD (Liquid Crystal Display) indicated channel frequency, modulation mode and status
- Programmable with three touch keys
- Select desired modulation, channel or frequency to be used. Choose:
  1) CW = Continuous Wave (no modulation)
  2) FM = Frequency Modulation (modulation for BER)**

**Optional modulation schemes are also available: 10kHz FSK, AMPS*, ETACS*, SAT 0, SAT 1, SAT 2, 1004 Hz audio test tone, audio modulation POCSAG, signaling tone, and other custom specified audio tones.

*The CHAMP receiver is a hand-held field strength meter that runs on a 12 volt DC Ni-CAD battery allowing up to eight hours of continual use.

The Spyder is just one of many exceptional design solutions from Berkeley Varitronics. Call us today for more information:

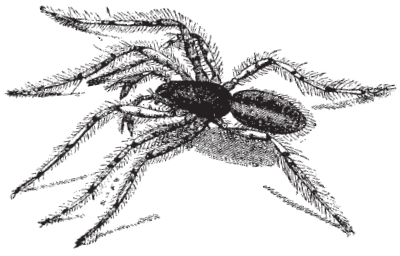
(732) 548-3737 / Fax: (732) 548-3404
Internet: www.bvsystems.com
E-mail: info@bvsystems.com

BERKELEY VARITRONICS SYSTEMS

Spyder Battery Powered Stick-Up Transmitter Specifications

FREQUENCY RANGE	(PCS Band) Pre-programmed frequencies in the following bands: 145-165, 450-565, 805-825, 850-870, 900-932 MHz and 1.4-1.5, 1.8-1.89, 1.93-1.99, 2.4-2.6 GHz or up to 10% band in the range 1-2.5 GHz Custom Bands to 2.5 GHz (to 10% bandwidth)
POWER OUT	100 mW (+20 dBm ±1 dB) @ Vs=12 volts typical, +18 dbm minimum <2.0 GHz (@ +12V) 20 mW (+13 dBm) @ Vs=5 volts
CURRENT CONSUMPTION	180 mA typical (225 typical above 1 GHz models)
BATTERY LIFE	8 hours typical with lithium battery (1200 mA hr) 30 minutes minimum with optional rechargeable battery 1½ hours with alkaline battery
ANTENNA	TNC 50 Ω whip (supplied)
VSWR SURVIVAL	Will survive infinite VSWR with no permanent damage
MODULATION	CW, FM with 10 KHz, and 1004 Hz tones below 1 GHz
SIZE	Approximately 5 x 5 x 1.5 inches not including antenna
WEIGHT	9 oz. with battery and antenna installed
OPERATING TEMPERATURE	0-50° C
EXTERNAL AC SUPPLY SUPPLIES	+12VDC @ 500mA max or customer-supplied 12V/300mA supply
OPTIONS	Optional Dragonfly Battery Pack extends operating time to >8 hours

Custom frequencies available upon request.



Berkeley Varitronics Systems, Liberty Corporate Park, 255 Liberty Street, Metuchen, NJ 08840
Phone 732-548-3737 • Fax 732-548-3404 • Internet: http://www.bvsystems.com • E-mail: info@bvsystems.com