Model 8140VT
VERSATAP™
INSTALLATION AND
OPERATION MANUAL

SPECTRACOM

SPECTRACOM LIMITED WARRANTY

LIMITED WARRANTY

Spectracom warrants each new product manufactured and sold by it to be free from defects in software, material, workmanship, and construction, except for batteries, fuses, or other material normally consumed in operation that may be contained therein AND AS NOTED BELOW, for five years after shipment to the original purchaser (which period is referred to as the "warranty period"). This warranty shall not apply if the product is used contrary to the instructions in its manual or is otherwise subjected to misuse, abnormal operations, accident, lightning or transient surge, repairs or modifications not performed by Spectracom.

The GPS receiver is warranted for one year from date of shipment and subject to the exceptions listed above. The power adaptor, if supplied, is warranted for one year from date of shipment and subject to the exceptions listed above.

THE ANALOG CLOCKS ARE WARRANTED FOR ONE YEAR FROM DATE OF SHIPMENT AND SUBJECT TO THE EXCEPTIONS LISTED ABOVE.

THE TIMECODE READER/GENERATORS ARE WARRANTED FOR ONE YEAR FROM DATE OF SHIPMENT AND SUBJECT TO THE EXCEPTIONS LISTED ABOVE.

The Rubidium oscillator, if supplied, is warranted for two years from date of shipment and subject to the exceptions listed above.

All other items and pieces of equipment not specified above, including the antenna unit, antenna surge suppressor and antenna pre-amplifier are warranted for 5 years, subject to the exceptions listed above.

WARRANTY CLAIMS

Spectracom's obligation under this warranty is limited to in-factory service and repair, at Spectracom's option, of the product or the component thereof, which is found to be defective. If in Spectracom's judgment the defective condition in a Spectracom product is for a cause listed above for which Spectracom is not responsible, Spectracom will make the repairs or replacement of components and charge its then current price, which buyer agrees to pay.

Spectracom shall not have any warranty obligations if the procedure for warranty claims is not followed. Users must notify Spectracom of the claim with full information as to the claimed defect. Spectracom products shall not be returned unless a return authorization number is issued by Spectracom.

Spectracom products must be returned with the description of the claimed defect and identification of the individual to be contacted if additional information is needed. Spectracom products must be returned properly packed with transportation charges prepaid.

Shipping expense: Expenses incurred for shipping Spectracom products to and from Spectracom (including international customs fees) shall be paid for by the customer, with the following exception. For customers located within the United States, any product repaired by Spectracom under a "warranty repair" will be shipped back to the customer at Spectracom's expense unless special/faster delivery is requested by customer.

Spectracom highly recommends that prior to returning equipment for service work, our technical support department be contacted to provide trouble shooting assistance while the equipment is still installed. If equipment is returned without first contacting the support department and "no problems are found" during the repair work, an evaluation fee may be charged.

EXCEPT FOR THE LIMITED WARRANTY STATED ABOVE, SPECTRACOM DISCLAIMS ALL WARRANTIES OF ANY KIND WITH REGARD TO SPECTRACOM PRODUCTS OR OTHER MATERIALS PROVIDED BY SPECTRACOM, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

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EXTENDED WARRANTY COVERAGE

Extended warranties can be purchased for additional periods beyond the standard five-year warranty. Contact Spectracom no later than the last year of the standard five-year warranty for extended coverage.

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1 Introduction

The Spectracom Model 8140VT VersaTap™ is a special-frequency line tap in the Spectracom Frequency Distribution Amplifier System. The VersaTap contains a crystal oscillator that is phase locked to an incoming 10 MHz reference. There are two configurations available, 10-62 (DS1 output), and 10-66 (E1 output).

1.1 Features

The standard VersaTap has two output connectors.

An LED indicator labeled OSC LOCK lights when the crystal oscillator is phase locked to the incoming reference. The indicator blinks if the input DC voltage is less than 8 VDC.

The 10 MHz reference may originate from any of the following Spectracom units:

Model 8140   Frequency Distribution Amplifier with separate 10 MHz frequency source

Model 8195B Ageless™ Oscillator with Option 03, Built-in Distribution Amplifier

Model 8197   Ageless™ Master Oscillator with Option 03, Built-in Distribution Amplifier

9200 / 9300 NetClock Series NTP Server

SecureSync Time and Frequency Appliance

NOTE: Option 40 is required when using 8140VT with 9200 / 9300 NetClock Series, SecureSync, or Models 8195A/B, or 8197 without Option 3 installed.

1.2 Specifications

Specifications for the Model 8140VT VersaTap include those for unit inputs, outputs, the OSC LOCK LED, and physical specifications.

1.2.1 Reference Input

Signal: 10.0 MHz sinewave. Alternate input frequencies are available on a special order basis.

Level: 100 mV to 5.5V peak to peak

Impedance: High impedance. To avoid reflections, the VersaTap must be properly terminated.

Connector: BNC "T"

NOTE: The 10 MHz reference has a signal level between 100 millivolts and 5.5 volts peak-to-peak on a DC voltage of 8 to 12 VDC. The DC current requirement is 165 milliamps at +12 VDC with a 50 ohm load on Output A and Output B.

1.2.2 Power

VersaTaps with serial numbers 8140VT-1225 and above, or those shipped after 3/12/91, have a switching power connector. This connector allows the VersaTap to be powered from a distribution line or external power supply.

Distribution
Loading: Typically consumes 150 milliamps from distribution line. Equivalent to three (3) line tap loads.

External Power: Provided with Option 40; otherwise, select AC adapter with specifications listed herein.

Output Voltage: 9-12 Volts DC
Minimum Current: 300 mA
Connector: Coaxial "Barrel-Type" Plug
Polarity: Barrell – Negative; Tip – Positive
Plug Size: 5.5 mm OD, 2.1 mm ID

1.2.3 Outputs

The VersaTap has two outputs, designated Output A and Output B.

Refer to Section 6-3 for specifications.

1.2.4 Indicators

The OSC LOCK LED will light when the VersaTap is locked to the incoming 10 MHz reference. The LED blinks if the DC input is low, which may cause a malfunction. The LED is off when the VersaTap is not locked to the incoming 10 MHz reference.

1.2.5 Physical

Size:	9.5L x 4.25W x 1.75H inches
	240L x 110W x 45 H mm
Mounting pattern:	8.8 x 2.8 inches (225 x 70 mm)
Weight:	2 lbs (0.91 kg)
Temperature:	0 - 50°C
Label:	Serial number tag lists unit serial number, options, and input/output frequencies when applicable.

2 Installation

Install and test your Spectracom equipment as described herein. In all cases, if any problems occur during installation and configuration, please contact Spectracom Technical Support at US +1 585.321.5800.

	CAUTION:
	Electronic equipment is sensitive to Electrostatic Discharge (ESD). Observe all ESD precautions and safeguards when handling Spectracom equipment.

NOTE: If equipment is returned to Spectracom, it must be shipped in its original packing material. Save all packaging material for this purpose.

2.1 Inventory

Before installing this equipment, please verify that all material ordered has been received. If there is a discrepancy, please contact Spectracom Customer Service at US 585.321.5800.

2.2 Inspection

Unpack the equipment and inspect it for damage. If any equipment has been damaged in transit, please contact Spectracom Customer Service at US 585.321.5800.

2.3 Physical Installation

Spectracom recommends that the VersaTap be mounted to a bench or nearby wall, using the mounting holes in the base of the unit.

A BNC tee connector is provided on the INPUT connector. Connect an RG-58/U coaxial cable from the distribution amplifier to the tee connector. Connect a second RG-58/U cable from the other side of the tee connector and continue on to the next unit.

NOTE: The last unit must be terminated with a 50 ohm DC isolated terminator.

Terminators are furnished with the base unit (Model 8140). Additional terminators may be ordered from Spectracom. Contact Customer Service at US +1.585.321.5800 for more information.

After the VersaTap is connected to a 10.0 MHz reference, the OSC LOCK LED will light. This should take less than 30 seconds to occur. If the OSC LOCK LED does not light, refer to *Performance Tests* for the appropriate testing procedure(s).

2.3.1 Stand-Alone Installation

The VersaTap may be powered from an external source. This allows the VersaTap to be used with frequency sources other than the Spectracom distribution outputs. Available DC options include Option 40 – 115 VDC to 9 VDC AC Adapter (refer to the Options section of this manual for additional information).

The VersaTap has high input impedance. To avoid reflections, the cable from the frequency source must be terminated at the VersaTap input connector. Terminate the cable with a 50-ohm BNC terminator. Figure 3-1 illustrates a typical stand-alone installation.
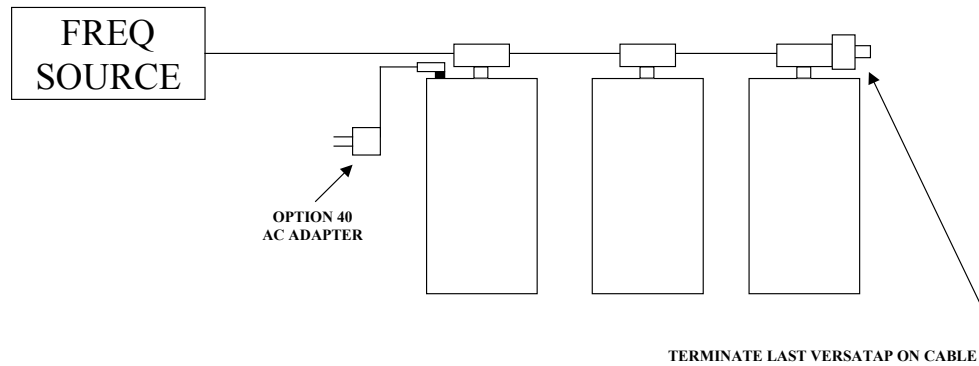

Figure 2-1: Stand-Alone Installation

3 Configuration

A typical system configuration is depicted in Figure 3-1. A standard frequency of 1, 5, or 10 MHz is provided to Distribution Amplifier. The Distribution Amplifier sends a 10 MHz standard frequency, riding on +12 VDC from four output ports. Line Taps or VersaTaps are located at remote locations.
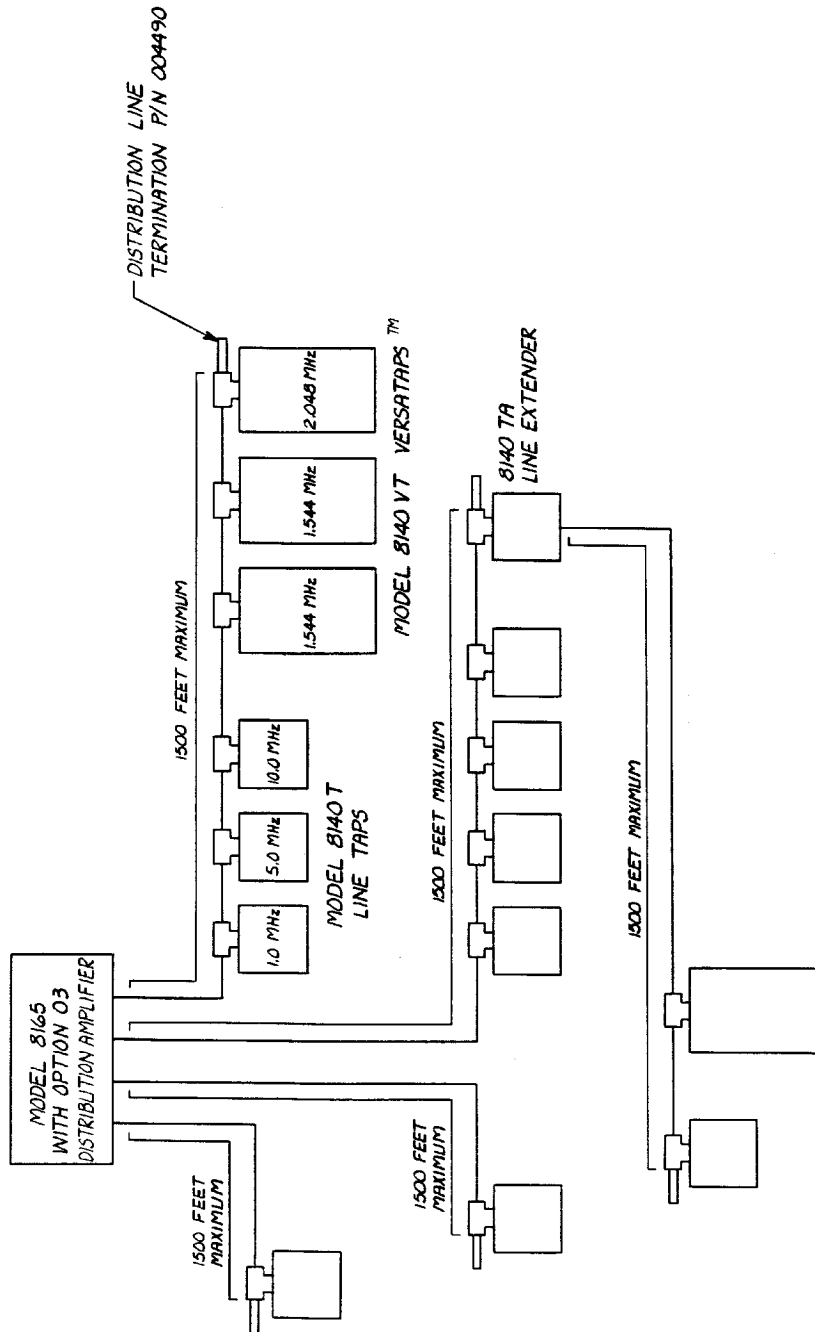
Figure 3-1: Typical System Configuration

Using RG-58/U coaxial cable, one VersaTap may be located a maximum distance of 1500 feet from the distribution amplifier. This distance is limited by the attenuation characteristics of the cable (1.4 dB per 100 feet). For applications requiring connection distances of greater than 1500 feet, larger cable (such as RG-8) or a Model 8140TA Distribution Line Amplifier may be required.

The maximum number of Line Taps and VersaTaps that may be used with a distribution amplifier is constrained by the capacity of the power supply. A distribution amplifier will drive 25 standard Line Tap loads. The maximum number of standard VersaTaps recommended on a distribution amplifier is 8. The maximum number of VersaTaps with Option 45 recommended on a distribution amplifier is 5.

The average distance from a distribution amplifier at which taps can be located is limited by the voltage drop in the coaxial cable. Eight standard VersaTaps may be located an average distance of 200 feet from a distribution amplifier. Five VersaTaps with Option 45, RS-422 output, may be located an average distance of 250 feet from a distribution amplifier. Additional VersaTaps may be added by using Option 40, External DC Input.

A BNC tee connector is provided on the INPUT connector. Connect an RG-58/U coaxial cable from the distribution amplifier to the tee connector. Connect a second RG-58/U cable from the other side of the tee connector and continue on to the next unit. TERMINATE THE LAST UNIT WITH A 50-OHM DC ISOLATED TERMINATOR.

Terminators are furnished with the base unit, i.e. Model 8140. Additional terminators may be ordered from Spectracom. The terminator part number is 004490.

A maximum of 25 line tap loads may be driven from one distribution amplifier. More than 25 loads is not permitted because of power supply limitations and impedance matching. Table 4-1 lists the equivalent number of loads and current each distribution device consumes. The distribution amplifier provides up to 1.2 amps total to the distribution network.

DEVICE	LOADS	CURRENT (mA)
8140T All Versions	1	45
8140TA	1	45
8140MT	3	150
8140VT Standard	3	150
8140VT w/Option 62	5	250
8140VT w/Option 66	5	250

Table 3-1: Line Tap Loads

If the desired distribution loading figure exceeds 25 line tap loads, Option 40, External DC input, may be added to the VersaTap. Option 40 powers the VersaTap, reducing the equivalent line tap load to 1.

Using RG-58/U coaxial cable, one VersaTap may be located a maximum distance of 1500 feet from the distribution amplifier. This is limited by the attenuation characteristics of the cable (1.4 dB per 100 feet). For applications longer than 1500 feet, larger cable such as RG-8 or a Model 8140TA Distribution Line Amplifier may be used.

The average distance that taps can be located from a distribution amplifier is limited by the voltage drop in the coaxial cable. Eight standard VersaTaps may be located an average distance of 200 feet from a distribution amplifier. Five VersaTaps with Option 45, RS-422 output, may be located an average distance of 250 feet from a distribution amplifier.

3.1 Internal Jumpers

The Model 8140VT has two internal jumpers.

Jumper W5/W6:   The jumper is normally located in position W6. Output B then provides a TTL output signal of the same frequency as Output A. If the jumper is moved to location W5, Output B provides a LOCK/UNLOCK TTL level signal.

Jumper W9/W10:   The normal operating position is W9. During calibration, the jumper is moved from location W9 to location W10.

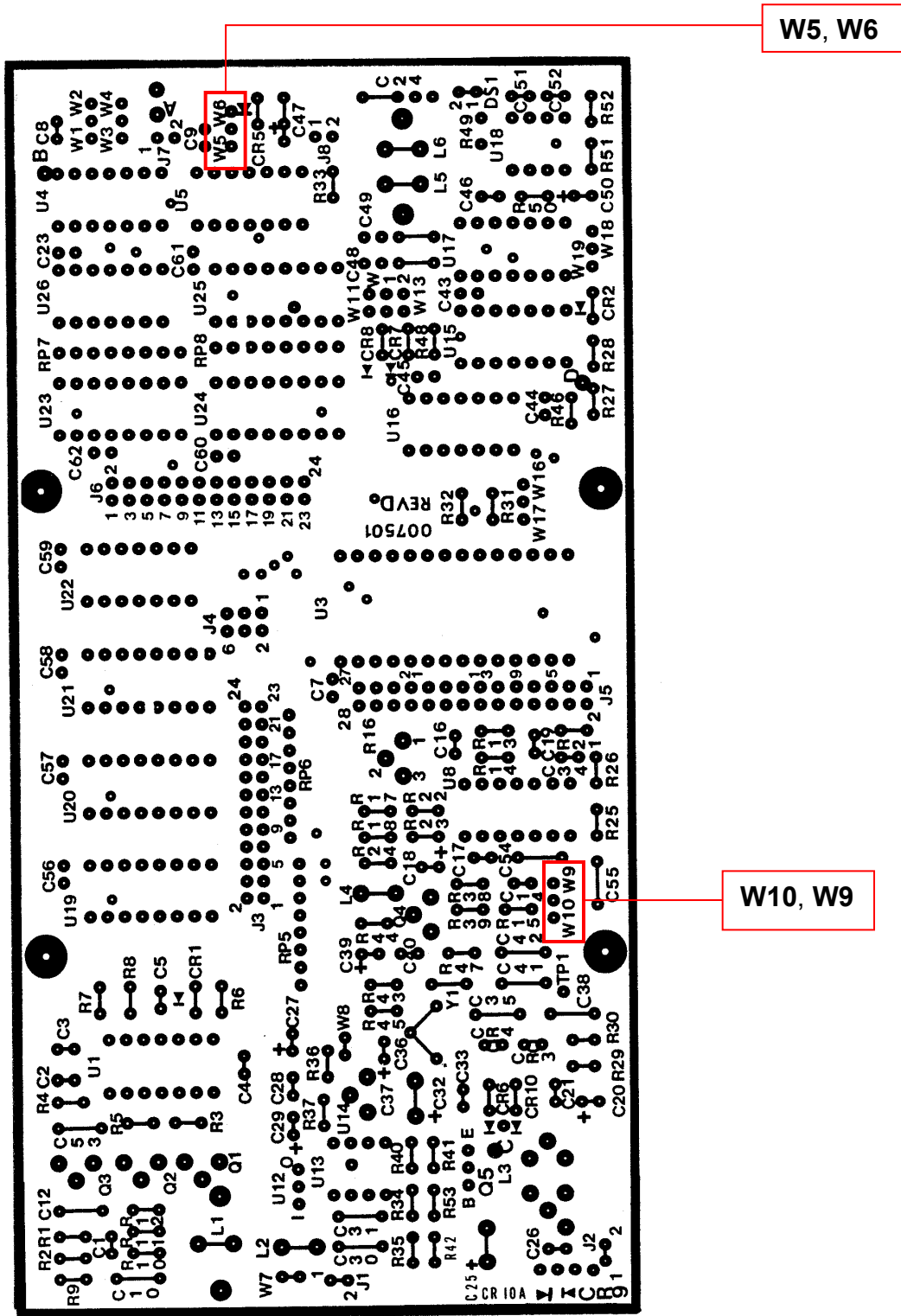Refer to the following figure for additional information.

W5, W6

W10, W9

Figure 3-2: Jumper Locations

3.2 Adjustments

The crystal oscillator and lock detector levels may be adjusted.

3.2.1 Crystal Oscillator Adjustment

As the crystal ages, the control voltage to the VCXO will change to compensate for the aging process. To calibrate the VCXO, move the W9 jumper to location W10. Connect a counter to U16 Pin 12. Adjust trimmer capacitor C36 until the counter reads the frequency of the crystal, ± 10 Hz. Return the jumper from W10 to location W9 after the adjustment is complete.

3.2.2 Lock Detector Level Adjustment

Adjust potentiometer R16 for 4.35 ± 0.05 VDC at U8 Pin 2.

4 Performance Tests

The performance tests described in this manual are suitable for initial inspection, troubleshooting, and preventive maintenance. The tests are designed to verify that the Model 8140VT is performing to specifications. Perform the tests in the order they are listed in this manual.

Equipment	Recommended Model
Signal Generator	Marconi 2022
Power Supply, Variable, 0 to 12 VDC	Kikusui Model PWC 0620
Oscilloscope	Tektronix Model 455 or Model 2215
Multimeter	Fluke 75
50 ohm Terminator	
100 uh Choke	
0.1 uf Capacitor	

Table 4-1: Recommended VersaTap Test Equipment
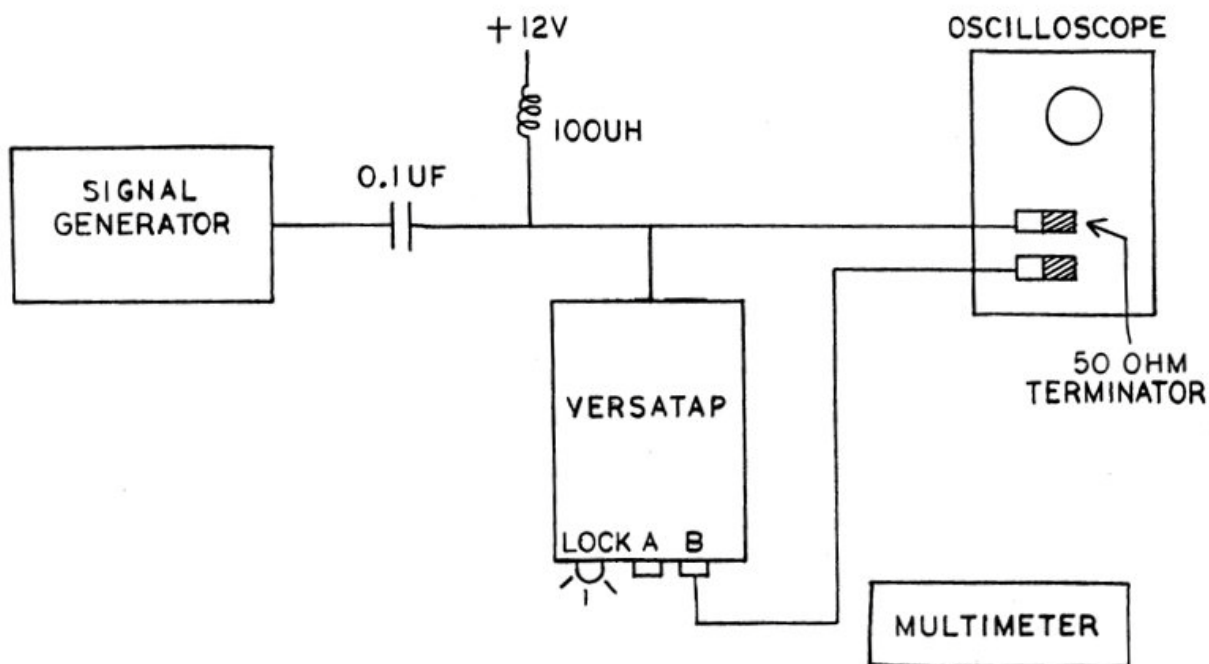
Configure the test(s) as shown in Figure 4-1.

Figure 4-1: VersaTap Test Setup

4.1 Test 1 – DC Voltages

Measure the supply voltages at the following locations:

- U3 Pin 3: +5 volts (±0.25)
- U8 Pin 4: +12 volts (±0.5)

4.2 Test 2 – VCXO Alignment

Move jumper W9 to location W10.   Using the oscilloscope, measure the signal at U16 Pin 12.

- U16 Pin 12: LOW (<1.0 volt)
- U16 Pin 12: HIGH (>4.0 volts)

Connect a counter to U16 Pin 12 and adjust trimmer C36 to the desired frequency.

- Crystal Oscillator Frequency (±10 Hz)

Move the jumper from location W10 back to location W9 when testing is complete.

4.3 Test 3 – Lock Threshold

Measure the DC voltage at U8 Pin 2. Adjust R16 until the voltage is 4.35 ±0.05 volts.

- U8 Pin 2 Threshold Voltage (4.35 ±0.05 volts)

4.4 Test 4 – Input Sensitivity

Adjust the output of the signal generator until the input signal is 10.0 MHz, 100 millivolts peak-to-peak. The OSC LOCK LED should light.

- OSC LOCK LED Illuminated

4.5 Test 5 – Output Levels

Terminate Output A in 50 ohms. Output A is a sine wave, the amplitude of which is nominally 1.7 volts peak-to-peak for frequencies from 100 kHz to 20 MHz. For frequencies below 100 kHz, the output is a TTL signal.

- Output A (1.7 volts peak-to-peak)
- Output A, TTL LOW (< 0.8 volts)
- Output A, TTL HIGH (> 2.0 volts)

Terminate Output B in 50 ohms. The output is a TTL signal.

- Output B, TTL LOW (< 0.8 volts)
- OUTPUT B, TTL HIGH (> 2.0 volts)

5 Options

Several options are available for the Model 8140VT VersaTap.

5.1 Option 40 – External DC Input

This option makes it possible to use the VersaTap with any reference frequency or Spectracom products not equipped with Option 03, Built-in Distribution Amplifier. The external DC input option may also be used to increase the number of VersaTaps allowed per distribution amplifier. Power supply limitations of the distribution amplifier permit a maximum of eight standard VersaTaps. Units added above the maximum allowable number must be equipped with Option 40, External DC Input. Option 40 AC couples the input circuitry and therefore draws a negligible amount of current from the distribution line. The external DC power is supplied from a 9 volt AC adapter. The DC power jack is located on the input side of the VersaTap.

	CAUTION:
	A modified, commercially supplied AC adapter is the supplied power source. The cord has been spliced and reversed at the transformer end. The polarity of the plug has been changed; the barrel is negative and the tip is positive. If it is necessary to replace the adapter, Spectracom recommends replacing it only with an adapter conforming to the specifications listed.

ADAPTER SPECIFICATIONS
Output Voltage: 9-12 VDC
Minimum Output Current: 300 mA
Connector: Coaxial "Barrel-Type" Plug
Polarity: Barrel – Negative; Tip – Positive
Size: 5.5 mm O.D., 2.1 mm I.D.

5.2 Option 62 – Dual Framed All Ones Output Locked to 10 MHz Input

This option provides two DS1 framed all ones signals phase locked to a 10 MHz reference signal.
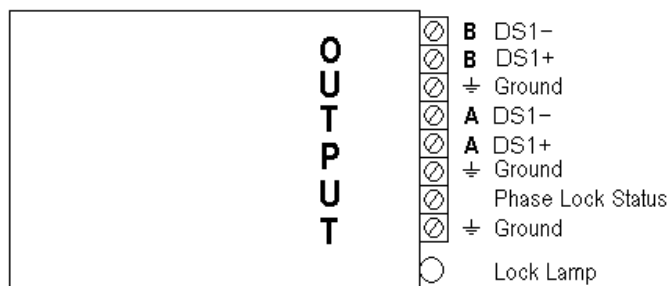

Figure 5-1: DS1 Framed All Ones Connector

SPECIFICATIONS

Outputs

Signal: Two DS1 framed all ones

Level: 3 volts base to peak

Impedance: 100 ohms

Jumpers: Internal jumpers are programmed at the factory to provide dual 193S outputs when phase locked to the 10 MHz input and unframed all ones when not phase locked. Removing the shorting plug at HDR5 removes the outputs when not phase locked. Moving the shorting plug at HDR3 to the upper position programs the unit to the 193E format when phase locked to the reference signal.

Indicators: LED that lights when the VersaTap is locked to the incoming reference signal. A TTL output is also provided on the terminal block for remote lock indication.

Connector: Two position terminal block

Size: 8.3 inches x 4.2 inches x 1.7 inches (211 mm x 107 mm x 43 mm)

Mounting
Hole Pattern: 8.87 inches x 2.75 inches (225 mm x 70 mm)

Refer to Figure 6-1 for the output connector pinout.

5.3 Option 66 – Dual E1 Framed All Ones Output

External power options include Option 40 - AC power adapter.

Option 66 units are equipped with a terminal block connector to provide the two E1 Framed All Ones outputs. The terminal block connector also includes a phase lock status indicator. This output shall be a TTL level high (1) whenever the VersaTap is phase locked to the applied CC reference and a TTL low (0) when not locked. Refer to Figure 5-2 for the output connector pin out.
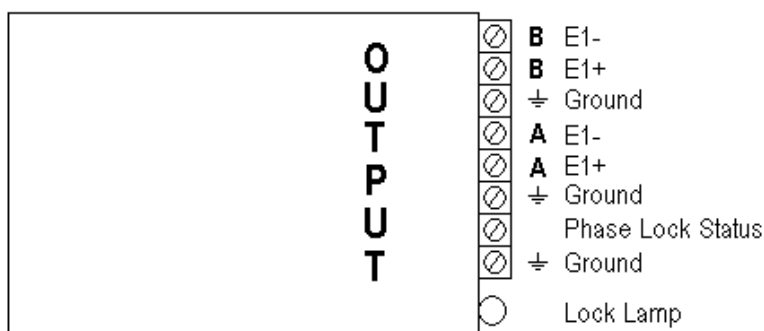

Figure 5-2: E1 Framed All Ones Connector

The E1 outputs are available with CRC4 Multiframe or CAS Multiframe. Option 66 equipped units are factory configured for CRC4 Multiframe. CAS Multiframe is enabled by moving internal shorting plugs on HDR1 of the Framed All Ones generator board as shown in Figure 5-3. Refer to Figure 5-4 for assistance in locating HDR1.
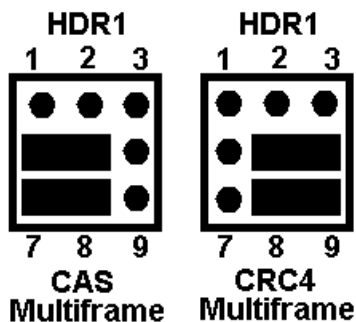

Figure 5-3: Frame Selection Jumpers

The outputs may also be programmed to provide either an Unframed All Ones or complete removal of the signal whenever the VersaTap is not phase locked to the 10 MHz input reference. The unit is factory configured to provide an Unframed All Ones when unlocked. To program the E1 outputs for complete removal when unlocked, remove the shorting plug found on HDR5.
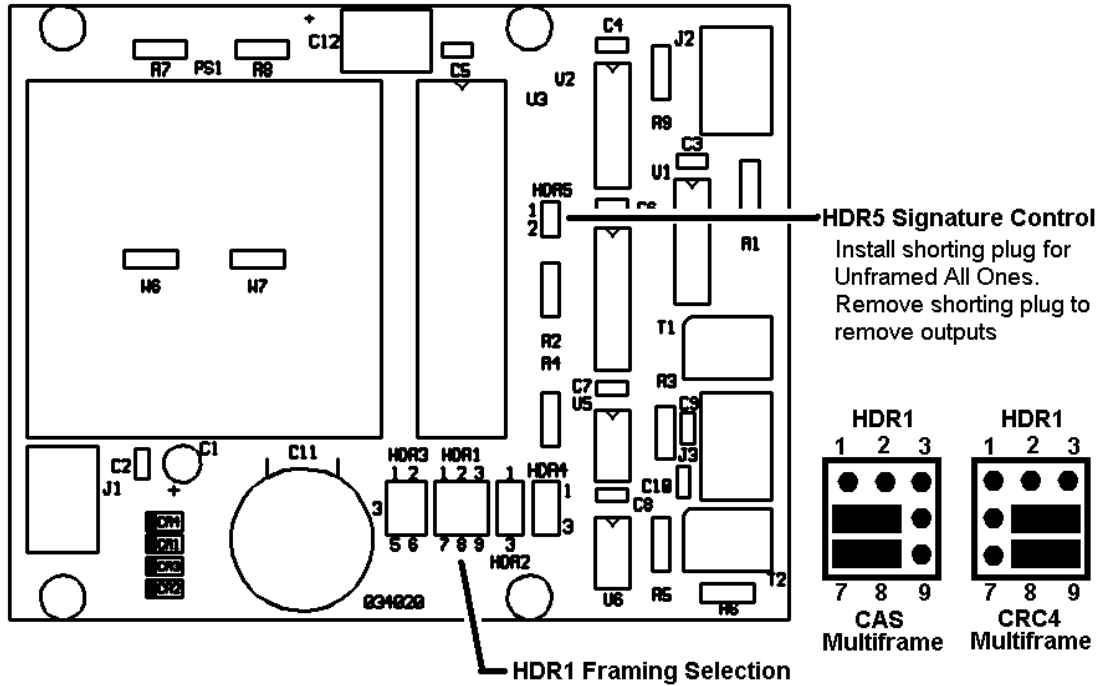
Figure 5-4: Programmable Jumper Locations

SPECIFICATIONS

Signal: Two E1 Framed All Ones (HDB3 Coded)

Framing: CAS or CRC4 Multiframe; internal jumper selection. Factory configured for CRC4.

Level: 3.0 Vpk into 100-ohms

Connector: Terminal strip

Document Revision History			
Rev	**ECN**	**Description**	**Date**
6.1 (A)	-	*Revision Level 6.1 was legacy documentation, last updated in 2002 (though the content of the manual appears to predate this). Spectracom now uses a letter code for released manual revisions, making 6.1 equivalent to Revision A of the manual. All revisions subsequent to that follow the lettering scheme.*	-
B	2044	*Revising the legacy documentation from Revision A to Revision B included style and template updates as well as a complete transcription of the old hardcopy manual. Option 66 was completely replaced with a new, updated section. Typical installation diagram was updated. Installation and Configuration materials were rearranged. Removed parts list.*	-
C	2231	*Revised specifications for Option 66 (HDB3 coded).*	-
D	2532	*Removed references to obsolete options and / or products that are no longer available, additional minor corrections and maintenance.*	January 2011