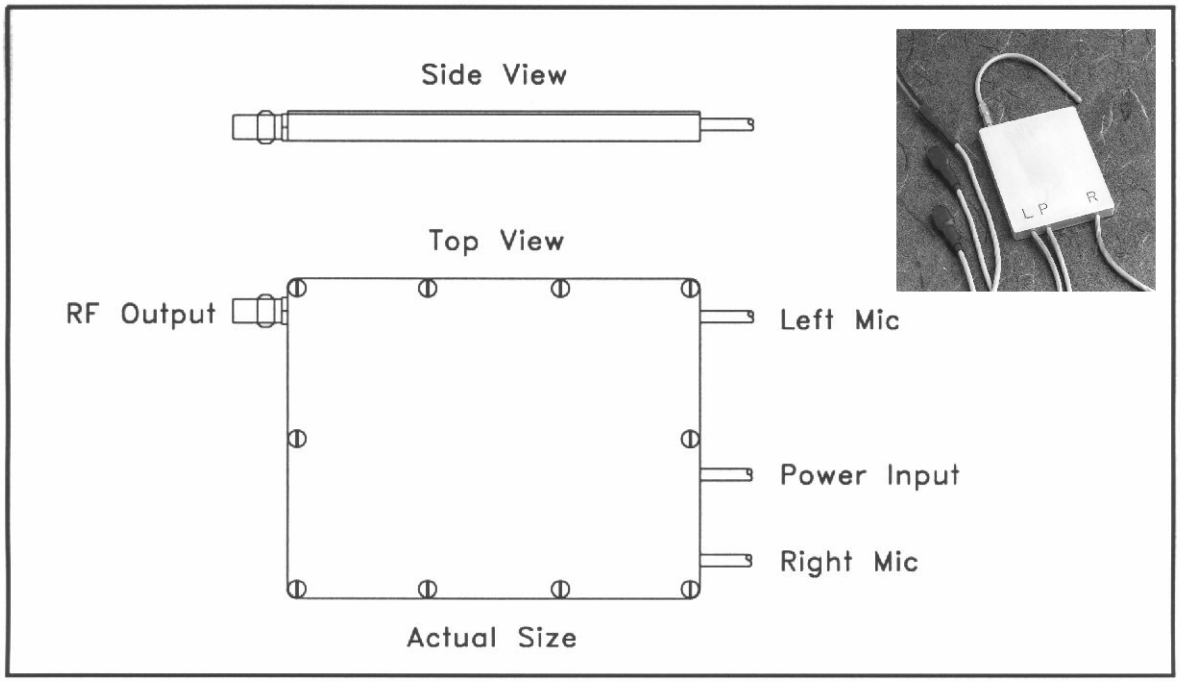
1.0 INTRODUCTION.



[1]

1.1 THE DST1000 DIGITAL STEREO TRANSMITTER.

The DST1000 is a digital wireless stereo transmitter, which offers extremely high quality audio response. It provides input for two electret microphones, and uses a stereo analog-to-digital converter and a digital RF operating at selected UHF frequencies. Because the radio transmission is truly digital in nature, a companion Tektron digital receiver (the DSR1000) delivers audio signals, which are nearly indistinguishable from a hard-wire connection to the DST1000 microphones.

The unique characteristics of this transmitter also contribute to a simple and user-friendly operating environment. These include: dual channels of information transmitted from a single antenna, two microphones cables, and a power cable. The user has flexibility to use a preferred microphone style and has considerable leeway in using a power source fitting a variety of operational requirements regarding size, type and duration

1.1.1 THE DST1000 SUMMARY OF FEATURES.

- Two 16 bit channels, 40 Hz to 16 KHz bandwidth.
- 90 dB dynamic range with 0.01% distortion, exclusive of microphones.
- Wide dynamic range obtained without AGC.
- Forward Error Correction included.
- External microphones on attached 18-inch cables.
- Power cable.
- Fully enclosed metal case.
- 1.68” x 2.12” x 0.165” overall size.
- SSMC antenna connector (flexible antenna supplied).
- 1000 mW or 500 mW output power, user select.
- Multi-channel.
- <2.5 ounces total weight.

1.1.2 TRANSMIT POWER AND CHANNEL SELECT SWITCHES.

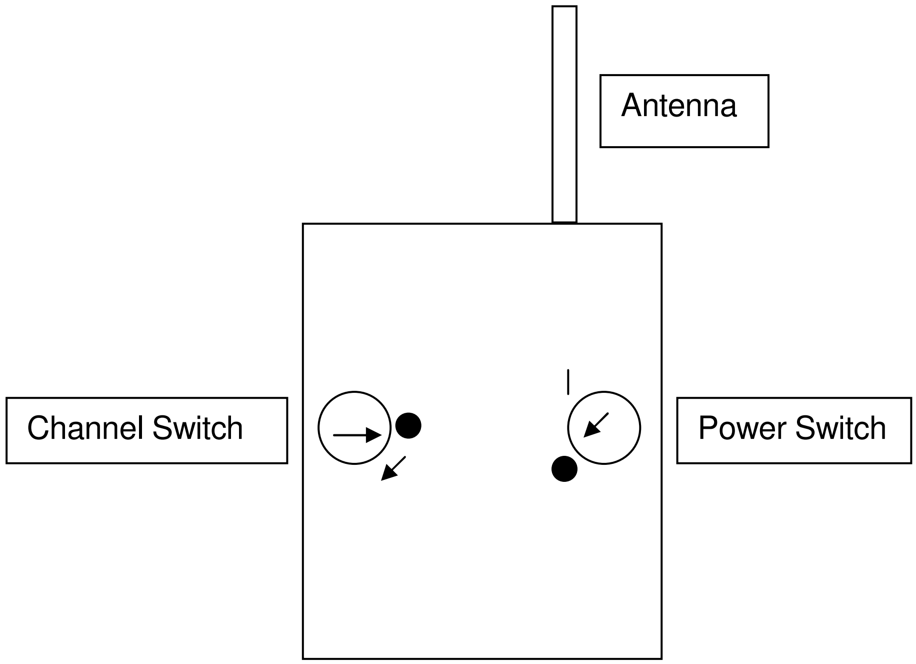


Figure 1. Location of the Channel and Power Select Switches on the DST1000 Chassis.

The black dot at the channel select switch indicates the position of the lowest channel frequency. The channel frequency is incremented by turning the switch in the clockwise direction. One end of the slot in both the channel select and the power select switch has two markers: this end is represented as the head of the arrow in Figure 1. The black dot at the power select switch indicates that the transmitter is operating at 1 Watt output power. Turning the switch to the dash line reduces the output power to 0.5 Watt.

1.2 THE DST1000 CONNECTOR NOMENCLATURE.

An SSMC male connector is used for the antenna. The AEP mating antenna connector is part no. 7002-1541-010.

AEP connectors are available from:

Applied Engineering Products
104 John W. Murphy Drive
New Haven, CT 06513
Telephone: 1-800-444-5366

1.3 DST1000 PACKING LIST.

1 each	DST1000 Digital Stereo Transmitter Serial No.
1 each	DST1000 Antenna.
1 each	DST1000 Operating Manual.

2.0 DST1000 SPECIFICATIONS.

All performance specifications are typical at +25^{0}C, unless otherwise noted.

Audio Channels	2 (left/right stereo)
Microphones	External electret required (not supplied)
Microphone Power	1.8 VDC @ 50 uA
Analog S/N Ratio	86 dB (max. input to "A" weighted noise) *
Total Harmonic Distortion	0.01% (max. input @ 1 KHz) *
Audio Frequency Response	40 Hz to 16 KHz, @ -6 dB *
	200 Hz to 15 KHz, +.5/-.5 dB *
Stereo Separation	80 dB (40 Hz to 16 KHz) *
Audio Gain	30 dB (microphone input to receiver output)*

* Exclusive of microphone, measured at Tektron digital receiver analog output.

Digitization	16 bit Linear Sigma-Delta A/D Conversion
Anti-Alias Filter	Linear Phase Digital Filter
	0.01 dB Passband Ripple, 80 dB Stopband Atten.
Sampling Rate	32 KHz
Sampling Accuracy	+/- 50 ppm, -10 to +50^0 C
Information Rate	1.024 MBit/second
Coding	Rate 1/2 Forward Error Correction
Signaling Rate	2.048 MBit/second

2.0 DST1000 SPECIFICATIONS (Continued).

Transmission Frequency	8-Channel, selectable (contact factory for frequency options). FCC certified 902-928MHz
Frequency Stability	+/- 0.05%, -10 to +50^0 C
Modulation	Minimum Shift Keying
RF Spectrum	Evenly distributed about channel center
RF Bandwidth	2 MHz @ 10 dB below peak density
Power Output	1000 mW into 50 ohm load @ 5.5-14 VDC 500 mW into 50 ohm load @ 4-14VDC
Antenna Impedance	50 ohms (less than 5:1 VSWR)
Antenna	Whip supplied
Antenna Connector	SSMC Jack (male)
External Power	4.0 to 14 VDC negative ground
DC to RF Efficiency	>50%
Operating Temperature Range	-20 to +60^0 C
Storage Temperature Range	-40 to +80^0 C
Size	1.68 x 2.12 x 0.165 inches
Weight	less than 2.5 ounces

3.0 DST1000 OPERATION.

3.1 BATTERY POWER.

Power is supplied externally through the power cable. The red and white wires are to be connected to the positive terminal of the power source, with the black and shield wires to be connected to the negative terminal. The wiring diagram for connecting power to the unit is presented in Figure 2.

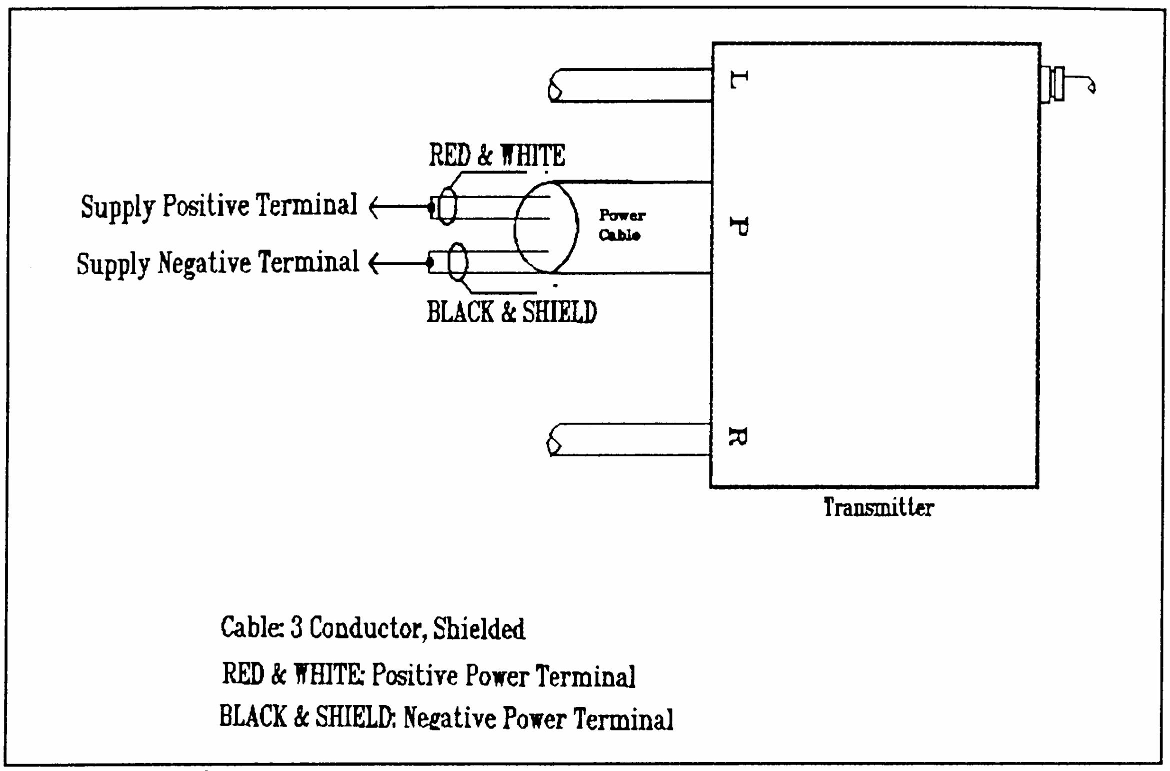
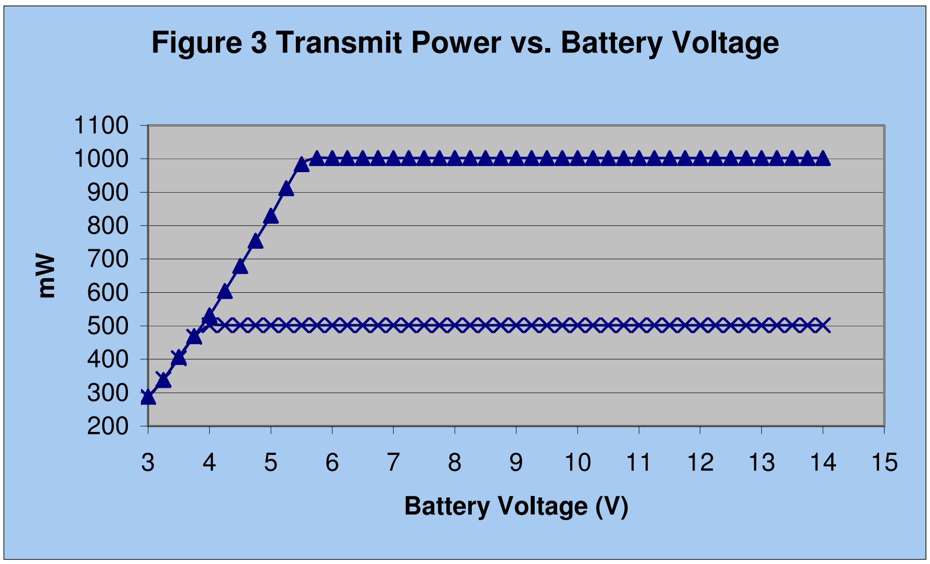


Figure 2. Power Connection Wiring Diagram.

IMPORTANT: The DST1000 uses internally attached power and microphone cables. DO NOT PULL ON THE CABLE.

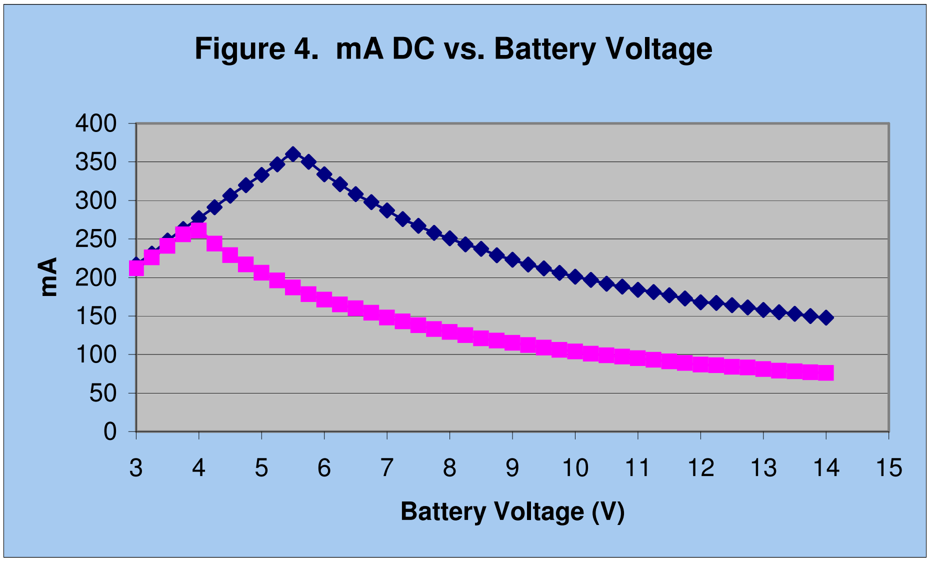
3.1.1 RF OUTPUT POWER.

The DST1000 is designed to operate over a voltage range of 4.0 – 14 VDC. The RF output power and DC current consumption will change as the DC voltage varies. Figure 3 charts the change in RF output power vs. DC voltage for both RF power settings of 1000 mW and 500 mW. The minimum voltage for 1 Watt (1000 mW) operation is 5.5V and for operation at 0.5 Watt (500 mW), 4V is required.



3.1.2 BATTERY CURRENT CONSUMPTION.

Figure 4 shows the relationship between current and voltage. The maximum current is indicative of the required minimum voltage for operation at 1 Watt and 0.5 Watt. Figure 4 shows that for operation at 1 Watt (the black graph) a minimum battery voltage of 5.5V is required and that operation at 500 mW (the gray graph) requires a minimum voltage of 4V. Note that after 5.5V is applied for 1 Watt operation the DC power consumed is constant. For example at 10Vdc the current consumption is about 200mAdc (DC Power is 2 Watts) and at 8Vdc the current consumed is 250mAdc (DC power is 2 Watts). This shows that the DC to RF efficiency is 50% and constant above 5.5VDC for 1 Watt operation.



3.2 EXTERNAL POWER INPUT.

A negative ground DC supply between 4.0 and 14 volts such as a 9V alkaline or Lithium battery is needed to operate the DST1000. Exceeding the maximum voltage limits or failure to observe voltage polarity can cause damage to the transmitter. Figures 5a to 5d show battery lifetime for different battery types. Figure 5a shows that one 9V alkaline battery will operate the transmitter for almost 1hour at 1 Watt and about 2.5hours at 0.5 Watt. Figure 5b shows that one 9V lithium battery will operate the transmitter for over 4hours at 0.5 Watts. From Figure 5c, six AA alkaline batteries will operate the transmitter for 4hours at 1 Watt. Figure 5d shows how a 6V supply from 4 AA lithium batteries is quickly drained below the 5.5V required to provide 1 Watt output power.

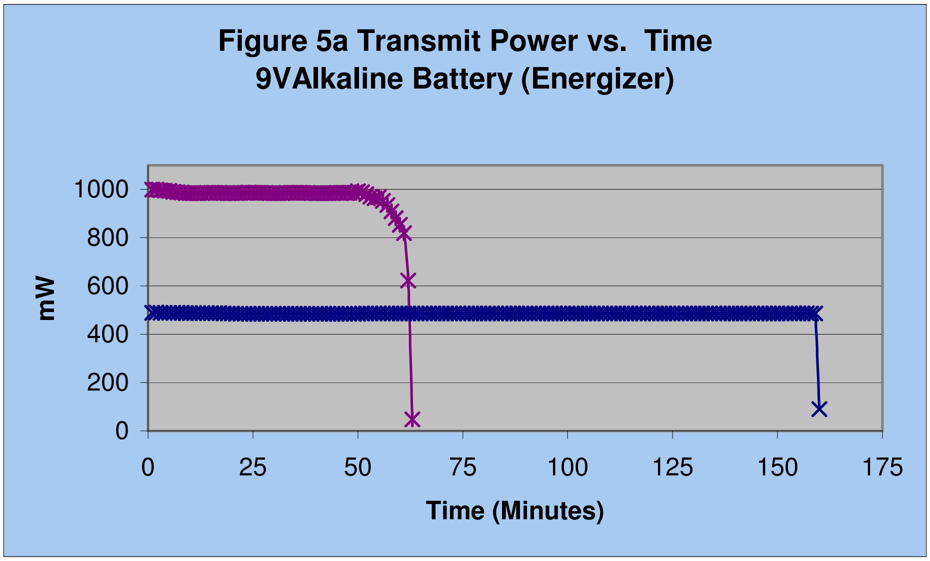


Figure 5a Transmit Power vs. Time
9VAlkaline Battery (Energizer)
mW
1000
800
600
400
200
0
0
25
50
75
100
125
150
175
Time (Minutes)

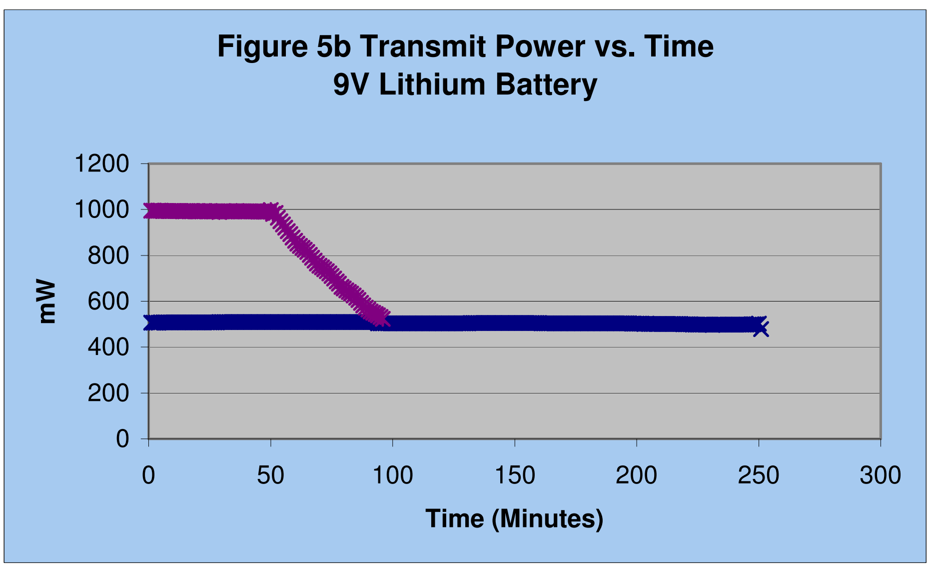


Figure 5b Transmit Power vs. Time
9V Lithium Battery
mW
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
Time (Minutes)

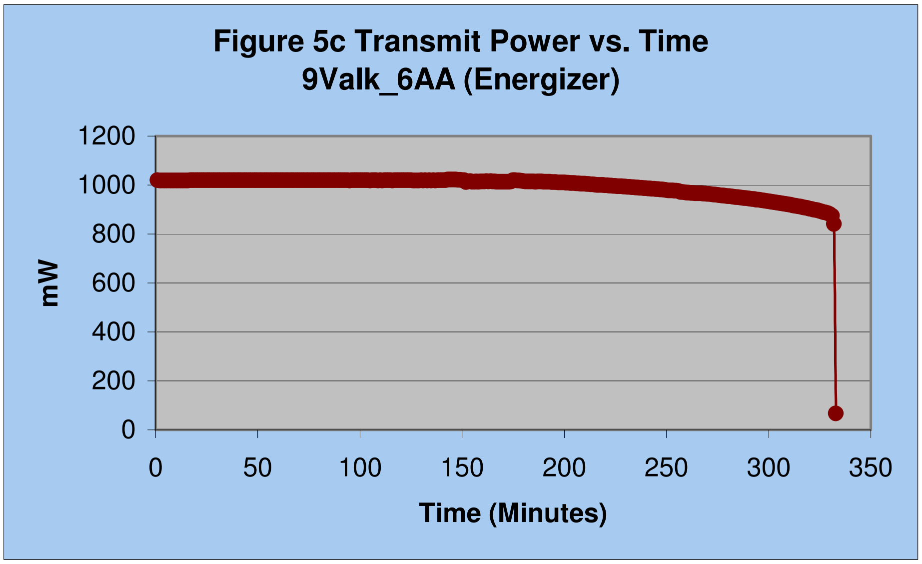


Figure 5c Transmit Power vs. Time
9Valk_6AA (Energizer)
mW
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
Time (Minutes)

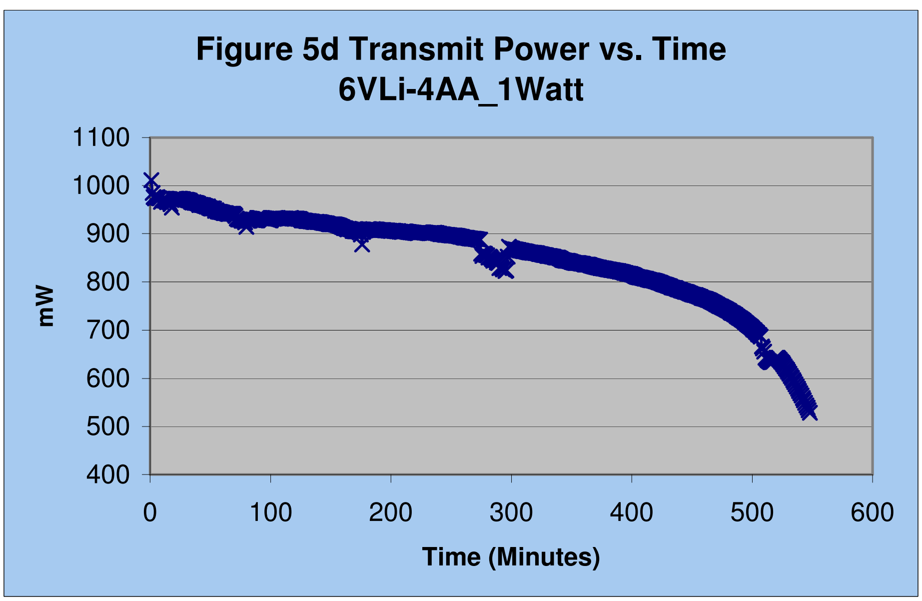


Figure 5d Transmit Power vs. Time
6VLi-4AA_1Watt
mW
1100
1000
900
800
700
600
500
400
0
100
200
300
400
500
600
Time (Minutes)

3.3 THE WHIP ANTENNA.

A properly designed antenna is important to realizing maximum power output and range for the transmitter. The transmitter antenna connection is on the top of the transmitter housing. Screwing on the antenna or cable connector to the matching transmitter connector completes the antenna connection. Connections should be finger tight, do not use wrenches or pliers to on the connector nut.

Custom antennas may be used with the DST1000. The antenna connector is a standard SSMC female jack. The DST1000 is designed for a 50 ohm antenna load with VSWR less than 5:1. No damage will result from short or open circuits on the antenna jack, but it should be realized that rated power will only be delivered into a 50 ohm load.

Antenna orientation is not critical, however, several general principles should be taken into account. When using the supplied whip antenna, standing the DST1000 vertically gives an omni-directional radiation pattern. Orienting the DST1000 horizontally will result in a “Figure-8” pattern. One situation to avoid, if possible, is pointing the antenna directly toward the intended receiver site. This results in a theoretical minimum amount of signal radiated toward the receiver. In practical situations however, there will likely be enough reflections in the environment to ensure communication with even this orientation.

For any given transmitter antenna placement, there will be some receiver antenna orientations which will be more effective than others. When using the transmitter in an operational setting it will be helpful to try a variety of different receiving antenna placement and positions.

3.4 THE MICROPHONES.

Two microphones, one for each channel, must be externally connected to the transmitter cables. The transmitter is designed to work with electret microphones and has been tested using the Knowles electret microphones, model EK-3133. The red lead is used to supply power to the microphones and is rated at 1.8 VDC @ 50 uA. The wiring details of how the cable is connected between the microphone and the transmitter are shown in Figure 6.

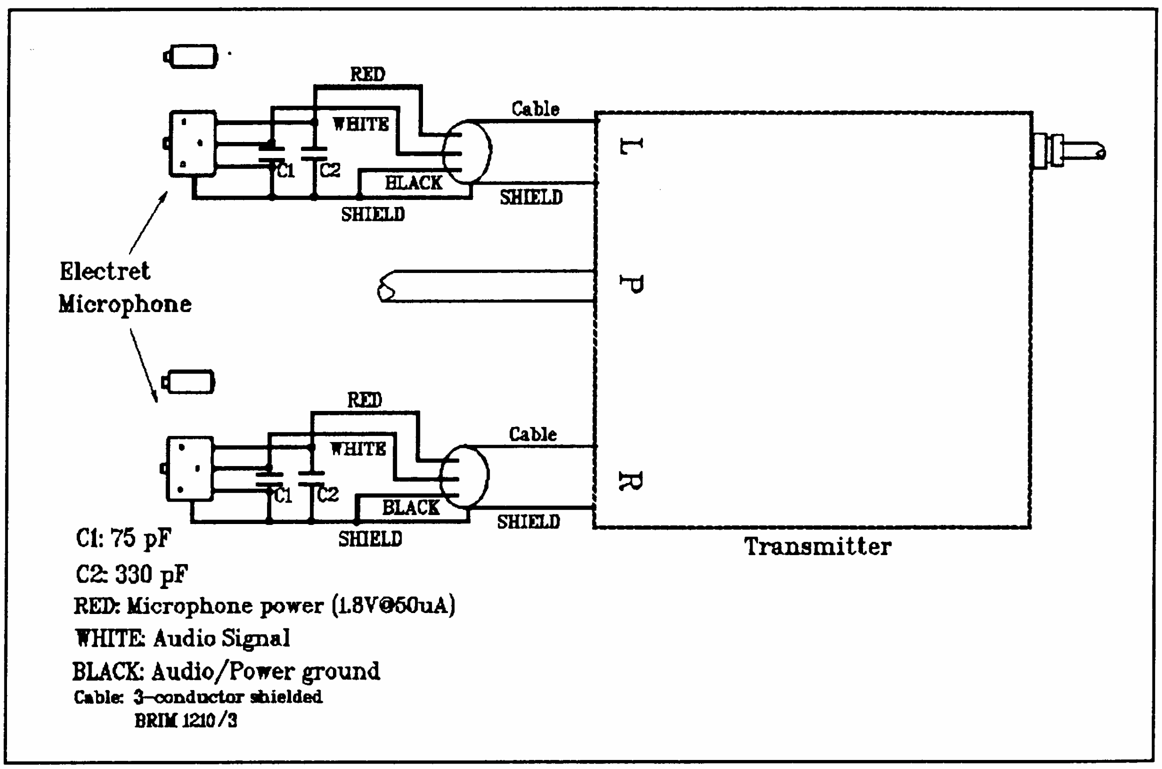


Figure 6. External Microphone Wiring Diagram.

Contact the factory for microphone connections involving two wire hook-up or microphones requiring voltage/current different from those available.

3.5 CHANNEL SELECTION.

The DST1000 can be manually set to operate on one of five channels. A slotted switch is available on the top lid of the transmitter (label side). A small jeweler's screwdriver or plastic adjustment tool can be used to select the channel. The transmitter label depicts the proper position of the slot to select the desired channel (see also Section 1.1.2).

NOTE: The switch may be turned clockwise or counter-clockwise; it is only the final position (vertical or horizontal), which determines the channel.

4.0 THE THEORY OF OPERATION.

Converting analog audio waveforms to digital data, that is, a sequence of rapid on-off decisions has become almost commonplace in modern telephony, high fidelity, and audio recording equipment. Recent advances in analog-to-digital (A/D) and digital-to-analog (D/A) converters have made available inexpensive integrated circuits, which allow miniaturization of all the essential functions. The primary benefit of a digital format is that extremely accurate transmission, recording, and reproduction becomes a reality. A secondary benefit is that the digital format lends itself to coding and encryption in systems designed for private communications.

This section describes some details of the Tektron Digital Stereo Transmitter and the nature of its wideband, "low probability of intercept" signal.

4.1 THE TRANSMITTER FUNCTIONAL BLOCKS.

Figure 7 is a simplified block diagram of a typical Tektron Digital Stereo Transmitter. It shows the three essential functions; an analog-to-digital (A/D) converter; a forward-error-correction (FEC) and synchronization generator; and lastly, an RF module consisting of the oscillator, modulator and power amplifier.

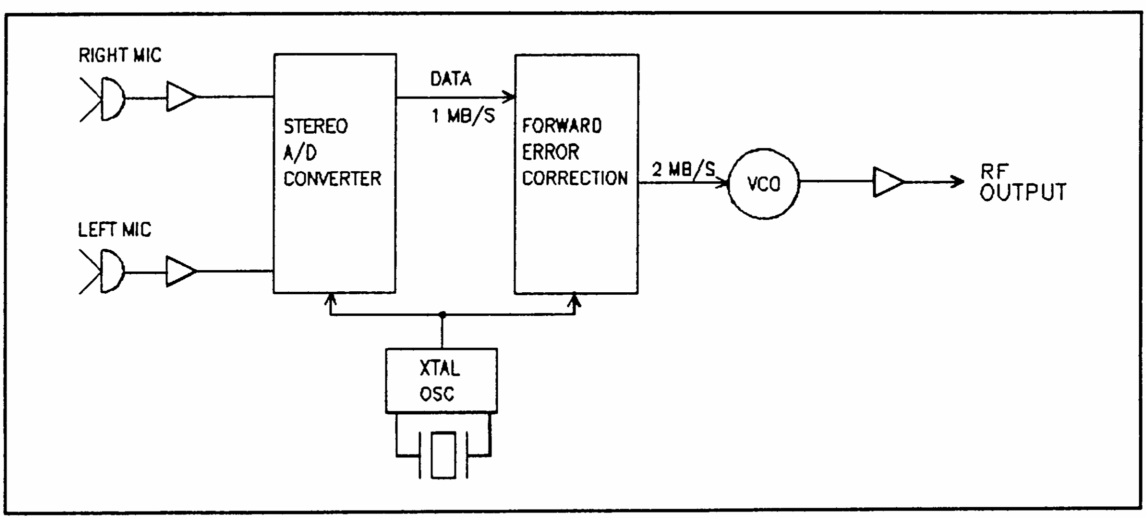


Figure 7. The Transmitter Block Diagram.

The left and right microphone signals are amplified and input to a stereo analog-to-digital (A/D) converter. The A/D converter samples each of the inputs at 32 kHz and generators two 16-bit binary “words” which represent the instantaneous input voltages at the moment of sampling. Because the 32 kHz sampling rate is very high the analog input signals do not change appreciably from one sampling instant to the next. Thus, the stream of digital output words accurately represents the input audio signals.

Engineering textbooks give a rigorous mathematical description of this process and show that audio frequencies as high as 1/2 the sampling rate may be conveyed by the sampling process without ambiguity. With 32 kHz sampling rate we may, therefore, design for an audio frequency response of 15 kHz. In fact, the A/D converter is a large-scale integrated circuit used in high-quality Compact Disk and digital audio applications. It employs an over-sampled “1-bit” conversion technique and includes a sophisticated digital filter for each channel resulting in a 16 kHz response at the 3 dB roll-off points.

Multiplying 32 kHz by 16 bits/sample by 2 channels yields the output digital date rate of 1.024 Megabits per second (MB/s). This is applied to the digital coding and synchronization section of the transmitter, which generates a 2.048 MB/s, coded data output.

The 1.024 MB/s digital audio signal is converted to a 2.048 MB/s output via a rate 1/2 forward-error-correction (FEC) code. A rate 1/2 FEC means that the output data stream has twice as many bits as the input data stream. FEC coding is a standard technique used in digital systems to reduce the signal-to-noise (S/N) ratio required at the receiver. Of course, more than a few errors per sample will overwhelm the decoding algorithm but even so the final result is that the receiver requires a lower S/N ratio with FEC coding than without.

NOTE: It should be emphasized that FEC coding is not the same as data encryption used for classified message traffic. There is no message "key" which can be changed to prevent unauthorized reception. However, FEC coding does lend a measure of privacy in the Digital Stereo Transmitter, in that an unauthorized receiver will have to discover the particular algorithm used before recovery of good data is possible. Furthermore, as described in more detail below, using both A/D conversion and FEC coding makes it impossible for a narrow band analog receiver to breakout the audio signal.

The final connection in the transmitter block diagram consists of the FEC coder output link to the RF module, which generates the carrier frequency and amplifies it to the desired power level, generally between 0.5 Watt (500 mW) and 1 Watt.

4.2 THE OUTPUT RF SPECTRUM.

The DST-series of Tektron Digital Stereo Transmitters emit a unique RF spectrum, which is fundamentally different from that of conventional audio transmitters. It has wideband, low-probability-of-detection characteristics which are identical to those in costly spread-spectrum systems. This is a consequence of the inherently high data transmission rate needed for CD quality audio combined with MSK (minimum-shift-keying) modulation, which gives a uniform spectral density within the ratio channel.

Figures 8a and 8b are Spectrum Analyzer plots of a typical DST1000 RF output, which illustrates this point nicely.

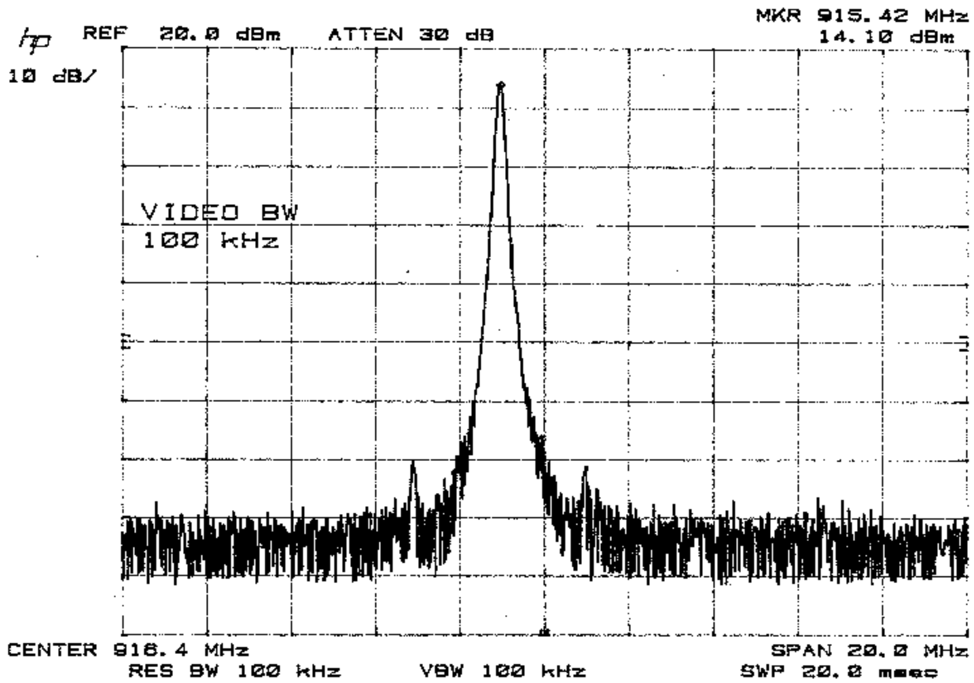


Figure 8a. RF Output Without Modulation.

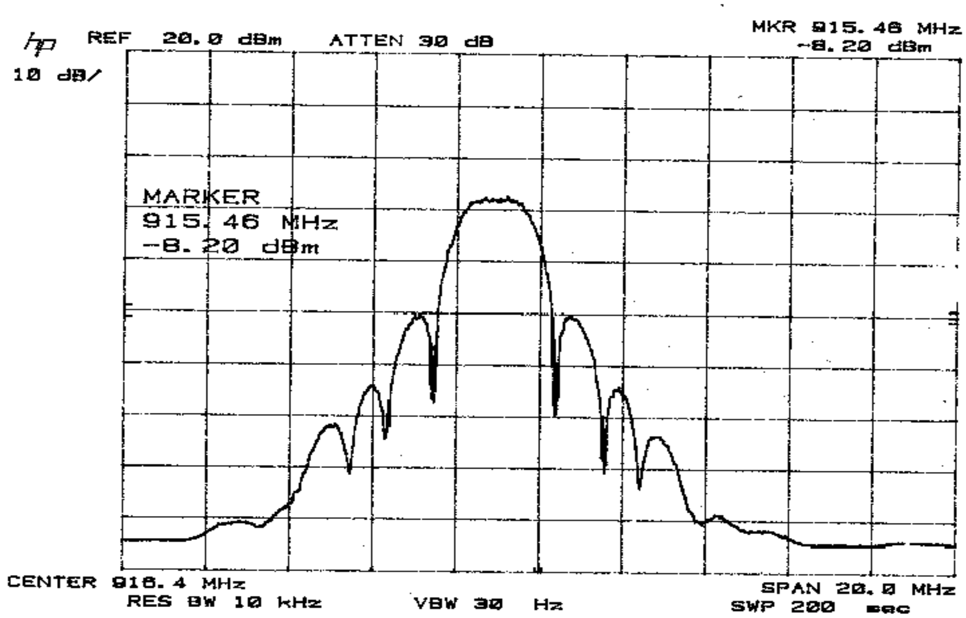


Figure 8b. RF Output With Modulation Applied.

Figure 8a shows the transmitter signal without modulation. Accounting for a 16dB attenuator being placed between the transmitter and the spectrum analyzer to prevent overdriving the analyzer, it is a steady carrier at 30.0dBm (1000 mW). Note that the analyzer shows a random noise baseline at -74 dBm when tuned off the emitted frequency. Figure 8b shows the transmitted signal with digital modulation and with the analyzer set for 10 kHz resolution bandwidth. (This bandwidth is typical of commercial audio receivers and scanners, which are intended for narrowband AM and FM reception.) Two characteristics of the DST1000 spectrum are immediately evident. First, it is a wideband signal spread out over 2.24 MHz. Second, the spectral density is about 5 mW in a 10 kHz bandwidth.

This occurs even though the total transmitted power has not changed! It is still 1000 mW. But now, due to the wideband modulation, the total power is spread over 200 "channels" of 10 kHz bandwidth each. A division by 200 is represented by a 23dB reduction in power ($10\log_{10}(200) = 23$dB). The significance of this latter point is that a 23dB reduction in the power measured at a scanner's detector has been achieved, and the likelihood of detection is correspondingly reduced. (30dBm – 23dBm = 7dBm or 5 mW). As compared with a conventional analog audio transmitter, the DST1000 appears to be a weak, noisy signal - albeit one occupying 200 adjacent 10 kHz channels!

There is yet a third remarkable feature of the Digital Stereo Transmitter's RF output spectrum. It is that the transmitted energy is quite evenly distributed throughout the RF channel, and that the statistics of that even-ness are unaffected by the strength or nature of the audio signal transmitted. There are no spectral lines which wobble and shift to reveal the underlying audio signal. Figure 9 demonstrates this fact by expanding the spectrum analyzer display and making plots at 100 kHz (top trace), 10 kHz (middle trace), and 1 kHz (lower trace) resolution bandwidth. Note that the measured spectral density tracks the analyzer bandwidth changes exactly, and that there are no line spectra evident. This means there is an extremely low probability of "breaking-out" the transmitted audio with narrowband receiving equipment.

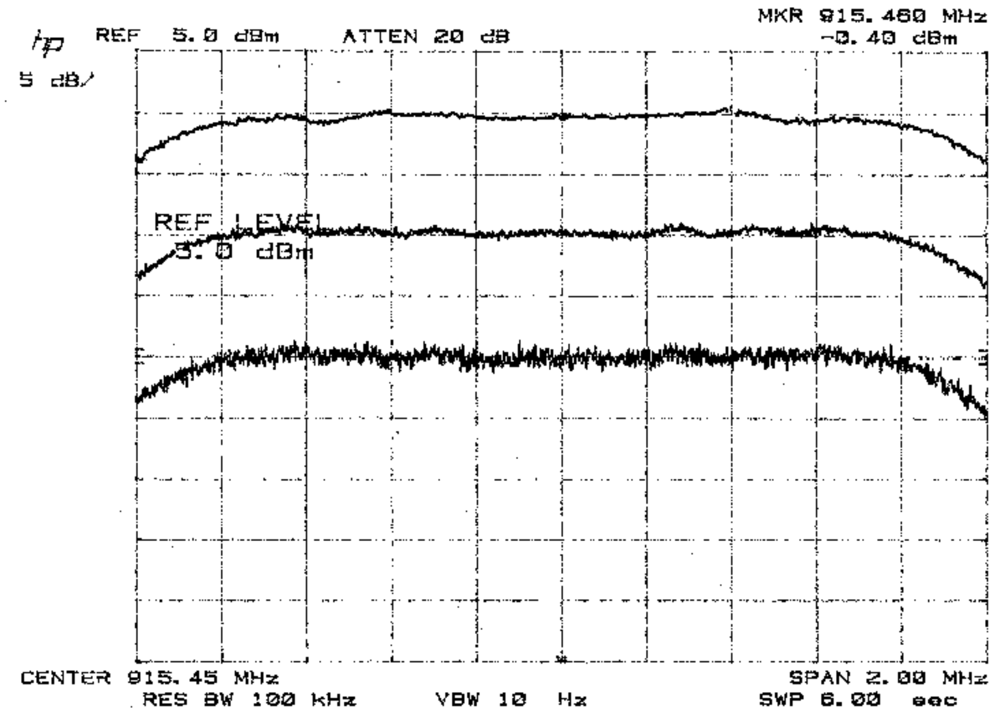


Figure 9. Spectrum Analyzer Display of RF Output with different Resolution Filter Settings.

4.3 OPERATIONAL SECURITY - LOW PROBABILITY OF DETECTION.

Operational security has become an ever-increasing problem to law enforcement investigations as commercial scanners and walkie-talkies grow more and more common. As a wideband, smooth-spectrum transmitter, the Tektron Digital Stereo Transmitter provides a significant contribution to two important security requirements; freedom to operate without detection, and privacy of message content. This section addresses the relationship between radio wave propagation, low spectral density and their effect on operational security.

4.3.1 RADIO WAVE PROPAGATION.

Any radio transmission creates an electromagnetic (E/M) field emanating from the antenna. This field can be likened to a series of expanding circles of energy, growing in diameter as they leave the point of origin.

As the distance between a radio transmitter and receiver increases, the received field strength decreases geometrically in proportion to the distance covered. In free space the field diminishes as the square of the distance. Thus, when the distance between transmitter and receiver is doubled the field strength will reduce to ¼ (2 squared) of its previous value.

Signal propagation over ground is even more severely attenuated. At the VHF and UHF frequencies (30 - 1500 MHz), a common estimate is that attenuation varies as the fourth power of distance. In that case, doubling the distance between transmitter and receiver will reduce the signal to 1/16 (2 x 2 x 2 x 2) of what it had been. The significance of these calculations is that there is a very large difference in field strength between the near vicinity of the transmitter and a point at the farthest distance at which a signal can be received. Low probability of detection comes into play, for any transmitter, when the detection device is a sufficient distance away from the transmitter to be affected by this drastic drop in signal strength. It is also true that it is very difficult to make a signal "absolutely undetectable" when close to a transmitter. In fact, if a sensitive laboratory grade spectrum analyzer is used, ANY practical signal can be detected within 50 feet of the transmitter.

4.3.2 LOW SPECTRAL DENSITY EMISSION - HIDING A SIGNAL IN NOISE.

When any radio receiver attempts to pick up signals, it must do so in competition with the random background noise, which is present in its environment, as well as the random noise generated within the receiving apparatus itself. Since the 1940s it has been recognized that spreading a signal's bandwidth beyond the required minimum will reduce its probability of detection by unauthorized receivers. The reason lies in the property of random noise energy being smoothly distributed across the spectrum. The amount of noise power a receiver picks up is directly proportional to the bandwidth employed. If the desired signal is made noise-like and spread to the point where its spectral density - its received Watts per Hertz of bandwidth- is below the random noise background, it literally will be undetectable! Of course, all this assumes the intended receiver can “de-spread” the signal and restore the proper signal/noise ratio before demodulating it in the normal fashion.

Contemporary spread-spectrum transmitters generally achieve a 10 to 20 spreading factor (called “processing gain” in the engineering literature), which means that the signal received in a scanner, or narrow-band receiver is reduced by the same factor. For example, a spread-spectrum signal will register only 1/10 or 1/20 the energy of a comparable AM or narrowband FM transmission. This is an important improvement but must be evaluated in light of the 10 billion to one ratio of signal strengths experienced between the immediate vicinity of the transmitter and the furthest practical receiving range.

A scanner will typically stop on a signal if there is enough energy centered around the frequency it is inspecting. If the signal is spread out across a wide range in the spectrum, the detection device will ‘see’ less energy than it needs to cross its alarm threshold and it will not register the presence of an RF transmitter.

An important fact when considering bandwidth is that it is the size of the band that is critical, not how the band was created. A transmitter of any design that produces a wideband signal was created. A transmitter of any design that produces a wideband signal will effectively hide from a scanner or narrow band receiver. Thus, a spread spectrum transmitter with a bandwidth of 1.5 MHz is no more effective at avoiding detection than any other design (of equal power) with a 1.5 MHz bandwidth.

Thus, if two transmitters of the same radio frequency output power are located the same distance from a scanner or narrow band receiver, the transmitter with the widest bandwidth will be the least likely to be detected, whether it is a “spread spectrum” transmitter or not.

4.3.3 MESSAGE SECURITY.

Tektron’s digital modulation also preserves message security since the transmitted signal is a binary code representation of the audio received at the microphone. The

Tektron system also adds parity bits to the binary code according to an error correction algorithm. This combination eliminates transmission intelligibility for any receiver not designed to match the Tektron transmission parameters.

The combination of these characteristics mean there is no observable correlation between audio events, such as sudden loud noise or loud single frequency tones when a spectrum analyzer is used as a detection device. Neither is there any form of recognizable audio available to a detection receiver employed as an intercept devise.

5.0 MAINTENANCE.

The DST1000 is designed to afford maximum user adaptation to operational requirements. User maintenance is limited to proper installation of power and attachment of the microphones. Because of special tools and processes required, there are no user repairable items inside the transmitter.

The DST1000 does, however, employ modular design and construction and it is possible that a damaged unit may be repaired economically at the factory. If a unit is damaged, it may be sent for an estimate of repair costs to:

Tektron Micro Electronics, Inc.
7483A Candlewood Road
Hanover, MD USA 21076-3102
Telephone: 410-850-4200
FAX: 410-850-4209

Please call for an RMA (Returned Merchandise Authorization) before sending. Tektron will provide specific shipping instructions at the time an RMA is issued.

6.0 WARRANTY INFORMATION

6.1 WARRANTY

Tektron Micro Electronics ("the Manufacturer") warrants to the first purchaser that this equipment will be free of defects in materials and workmanship for a period of one (1) year from the date of shipment to a purchaser.

6.2 LIMITATION OF WARRANTY

This warranty does not cover repairs or replacements required as a result of misuse, mishandling, improper storage, extreme weather or other Acts of God, failure to perform maintenance, alterations or repairs made other than in accordance with the Manufacturer's directions or other use inconsistent with the Manufacturer's instructions. Use in accordance with the Manufacturer's instructions is the responsibility of the user. This warranty is available only to the first purchaser of the equipment, but the exclusions and limitations herein apply to all persons and entities.

This warranty does not apply to consumable items included in the equipment, such as batteries.

6.3 EXCLUSIONS FROM WARRANTY

Manufacturer MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND SPECIFICALLY MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE.

6.4 EXCLUSIVE REMEDY

The Manufacturer will, at its option, repair or replace any equipment or parts not conforming to this warranty at its facility or other location approved by it at no charge to the user. The Manufacturer will not charge the customer for any parts or equipment furnished or services provided by or at the direction of the Manufacturer, except that customers will be responsible for all costs of shipping to the Manufacturer any item required to be returned to the Manufacturer. The equipment or part repaired or replaced by the Manufacturer's agent will be returned at the Manufacturer's cost.

To obtain warranty service, contact the Manufacturer at the address or phone number listed below to determine if return of any item is required.

Tektron Micro Electronics, Inc.
7483A Candlewood Road
Hanover, MD 21076 USA

(410) 850-4200 FAX (410) 850-4209

At the time authorization is requested, the Purchaser will be asked to identify the product serial number, a description of the problem(s) and associated symptoms, their designated point of contact and telephone number, and the shipping address for return of the repaired product. To minimize delays, please be sure to provide adequate information.

Do not return the defective parts or equipment to the Manufacturer without prior authorization from the Manufacturer.

6.5 LIMITATION OF LIABILITY

Except for the remedy above described, the Manufacturer will have no (a) other obligation with regard to any breach of warranty or other claim with respect to the equipment; (b) liability for any direct, indirect, consequential or incidental loss or damage caused by or occurring in connection with any of the equipment; (c) liability for any injury, loss of life or property caused by or occurring in connection with the use of any of the equipment.

Any warranty or other claim with respect to the equipment must be made in writing delivered to the Manufacturer within one year and 30 days after date of receipt of the equipment by the first purchaser and include evidence of the date of receipt and source of purchase. Any claim not received by the Manufacturer within such shall be deemed waived.

NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS EQUIPMENT.SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT

WARRANTY CARD

Please complete (print) the following information.

Name of Buyer____

Address____

City__________________________ State_______Zip Code____________

Country_______________Telephone Number_______________________

Model No.______________________ Serial No.______________________

Model Description____

Date Purchased____

Tektron Distributor or Agent from which purchased____________________

After completing, please detach and send to the following address:

Tektron Micro Electronics, Inc.
7483A Candlewood Road
Hanover, MD 21076 USA