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DSTS-5A/2C CHIRP Sonar Test Set

User's Manual v2.2



BBG Incorporated

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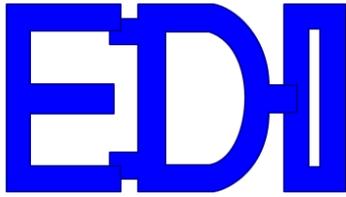


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1 PACKING LIST

- 1.1 Power transformer. A 9VDC 300mA wall plug power adapter is supplied. Nominal power requirements are 8 to 12 volts at 200 mA.
- 1.2 A CD with software for controlling, calibrating, and updating the DSTS-4A.
- 1.3 This user's manual.

2 OVERVIEW

2.1 The DSTS-5A/2C sonar test set is designed to work with chirp sonar and standard fixed frequency sonar sets.

2.1.1 HOW IT WORKS

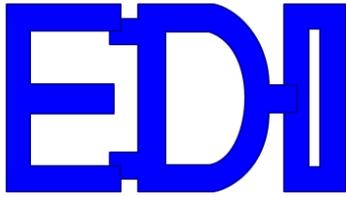
When the transmitted sonar pulse is received, it is digitized and the period of each cycle is measured and stored internally. After a delay determined by the depth setting, the reply pulse is generated from the stored data resulting in a echo that faithfully reproduces the frequency of the input pulse cycle by cycle.

2.1.2 CONTROL

All functions such as reply level, depth, and other characteristics for the fish and bottom echoes are controlled by data sent through the RS-232 port. Two programs are provided, a Windows control application , “DSTS-5A2C_APP_V103 .EXE”, and a terminal program, “DSTS_terminal.exe”.

2.2 OPERATING THE DSTS-5A/2C WITHOUT A COMPUTER

2.2.1 When powered up without the RS-232 connection, the DSTS-5A/2C will operate in the Q-mode, allowing a sonar to be evaluated based on the displayed depth. The Q-mode generates an echo amplitude based on transmitted power and depth. The depth is incremented by one foot and the reply level is decreased each time the sonar transmits a pulse. As the depth increases, a point will be reached where the echo is no longer received. The quality of the sonar can be read from the



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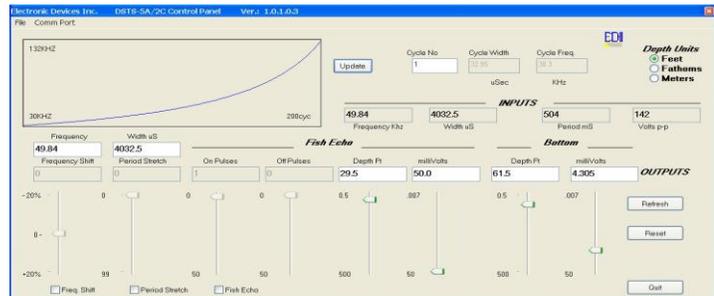
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maximum depth reading before the echo is lost. A small digital sailboat sonar might read up to 70 feet and a large fishing sonar may read over 270 feet. In actual use the small sonar will probably read bottom well in excess of 70 feet. When using Q-mode remember that the depth reading is an indication of the ratio of the sonars output power to the receiver sensitivity and not the actual depth that can be obtained.

3 CONNECTING THE DSTS-5A/2C TO A COMPUTER

3.1 We have included an Windows application for controlling the DSTS-5A/2C. The

application has controls for bottom and fish echo depth and amplitude. It also plots a graph of the pulse frequency v.s. Time. To use the supplied software, copy the file “DSTS-5A2C_APP_V103 .EXE” to a directory of your choice. To run the program, click on it and it will launch. Refer to the manual “DSTS-5A-2C Chirp Control Panel Manual.pdf” on the supplied CD for more detailed information on using this application.



3.1.1 OTHER TERMINAL SOFTWARE

If you do not want to use the supplied software, you can use any terminal program, such as Microsoft HyperTerm. The parameters should be set for **9600 Baud, 8-bit data, no parity, one stop-bit**. Flow control should be set to none. Section 5 lists the commands used with a terminal.

3.2 COMPUTER CONNECTION

Connect the DSTS-5A/2C to the computer using a standard 9-pin RS-232 cable. Connect the wall transformer power supply. Status LED 1 and 2 will light for six seconds, the three LED's will sequence one time, then status LED 3 will glow and pulse at a one-second rate indicating the DSTS-5A/2C is ready for operation.

4 CONNECTING A SONAR TO THE DSTS-5A/2C

4.1 Connect a sonar to the IN/OUT connector. If the sonar has a balanced output, one of the two balanced output wires may need to be connected to the shield and grounded. Consult the manufacturers manual to determine if one wire and the shield can be used as ground without damaging the sonar. If you are unsure of the correct connections for a balanced output, use the EDI BAL-550 accessory. The BAL-550 is a balanced-to-unbalanced transformer that has connections for the shield and two wires, and converts the balanced input to a ground referenced output. The output of the BAL-550 connects to the DSTS-5A/2C. A short BNC to BNC cable is required.

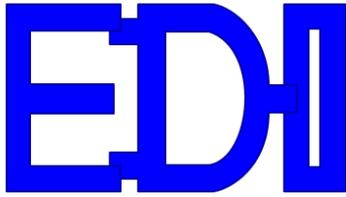


Do not connect sonar to the Trig Out connector or the DSTS-5A/2C will be damaged.

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4.1.1 APPLY POWER

Apply power to the DSTS and the sonar. It takes about 5 seconds for the DSTS-5A/2C to complete it's self tests, and status LED 3 will illuminate when the unit is operational. When the DSTS-5A/2C receives a pulse from a sonar, status LED 1 will blink and the reply echo is generated, marking bottom on the sonar.

4.1.2 RUN THE SUPPLIED CONTROL APPLICATION

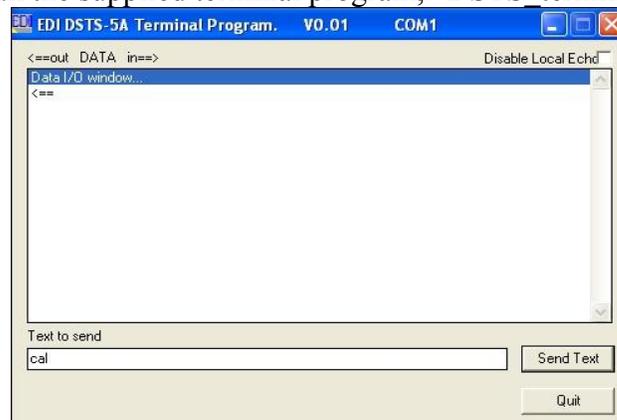
The control application, "DSTS-5A2C_APP_V103 .EXE" sets the depth to 30 feet and the echo reply amplitude to 50 mV when it is first started. The depth and amplitude can be varied using the sliders. See the "DSTS-5A-2C Chirp Control Panel Manual" for details on using this application.

5 CONTROLLING THE DSTS-5A/2C WITH A TERMINAL

5.1 Any terminal program, such as Microsoft HyperTerm can be used. The parameters should be set for 9600 Baud, 8-bit data, no parity, one stop-bit, no flow control. The supplied terminal program, `DSTS_terminal_V1dot1.exe`, is preset to the correct communication parameters.

5.1.1 TERMINAL PROGRAM

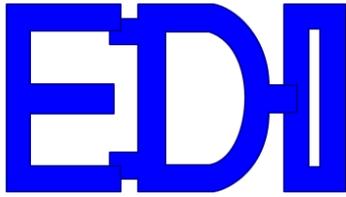
To run the supplied terminal program, "`DSTS_terminal_V1dot1.exe`", copy it to a



directory of your choice and click on it to launch the application. When the terminal program starts it will ask for the com port before it starts. Once it is running, commands may be typed in and sent to the DSTS-5A/2C.

5.2 COMMAND STRUCTURE

Most commands are a single alpha character followed by numbers. For instance, 'd250' followed by pressing the 'enter' key will set the depth to 25 feet. Some commands use two alpha characters. The frequency shift command 'fn12' will decrease the reply frequency by adding 12 sample times to each cycle in the reply pulse. The command 'cm' will change the depth calibration to meters. Commands requiring a numerical input such as the depth will be shown as 'dxxxxxx' showing that the command expects a



string of up to 6 digits to follow. These numerical inputs are integer only, no floating point is supported. Commands must end with a CR/LF.

5.2.1 Data can be requested from the DSTS-5A by following the command with a '?'. For instance, if the DSTS has been set to reply at 21.5 ft, typing 'd?' will return 215, indicating that the reply depth is 215/10 or 21.5 feet.

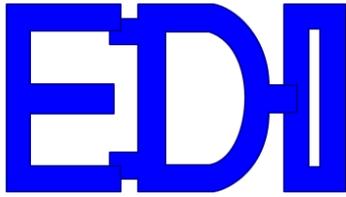
5.3 COMMAND LIST

b	Restores normal operating mode. Used to return from CW mode. Default setting, tracks frequency and pulse width.
b?	Restores normal operating mode. Used to return from CW mode. Default setting, tracks frequency and pulse width.
Bxxxx	Generates a continuous reply at the selected frequency. Example: B100000 produces an output frequency of 100KHz.
B?	Returns the manual CW frequency setting xxxxxx Hz
cf	Depth units are set in feet. This is the default setting.
cF	Depth units are set in fathoms.
cm	Depth units are set in meters.
c?	Returns depth units. 1 = feet, 2 = fathom, 3 = meters
dxxxx	Set bottom depth in tenths of a depth unit, i.e., feet, fathoms or meters. 'd12345' sets depth to 1234.5 feet, meters, or fathoms.
d?	Returns bottom depth in tenths of a depth unit.
Dxxxx	Set fish depth in tenths of a depth unit.
D?	Returns fish depth in tenths of a depth unit.
exx	Fish echo will be off for xx input pulses.
Exx	Fish echo will be on for xx input pulses.
e?	Returns echoes off.
E?	Returns echoes on
fnxxx	Adds xxx 25nS sample times to the reply period, reducing the reply frequency accordingly. New reply frequency is calculated and returned to the terminal.
fpxxx	Subtracts xxx 25nS sample times from the reply period, increasing the reply frequency accordingly. New reply frequency is calculated and returned to the terminal
f?	returns Pxxx for positive frequency shift and Nxxx for negative shift.
F	sets the reply frequency to a fixed value. 'F12000' = 12 KHz.
F0	restores the chirp mode where the reply tracks input frequency.
F?	returns 0 if in auto mode, returns frequency in Hz if manual mode.
gxx	Adds extra cycles to the echo pulse to simulate pulse stretch. 'g12' will add 12 cycles to the reply. The frequency of the added cycles is the same as the frequency of the last cycle received from the sonar. 'g0' is the default setting so echo length = input length.
g?	Returns the number of cycles added to reply pulse.
ixx	Sets the increment for the fish echo arch emulation in tenths of a depth unit.
i?	returns the increment xxx for the fish arch.
lxxx	Set the bottom echo amplitude from 0 to 255. Each number represents a 0.3dB change in level.
l?	Returns the bottom echo level xxx.
Lxxx	Set the fish echo amplitude from 0 to 255. Each number represents a 0.3dB change in level.
L?	Returns the fish echo level xxx
m	Returns input/output data and descriptors
m?	Returns input/output data. Typically used with standard sounders. The frequency reported is an average across the pulse. The period reported is the time between pulses.
P	Additional 10dB attenuator is out of circuit. Default setting.

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p	Reply level is decreased by additional 10 dB.
p?	Returns 1 for no attenuator, 0 for additional 10dB attenuator.
r	Re-initializes the frequency averaging to the frequency of the next input pulse.
R	Resets depth to 24 ft, reply level to max, and Vprop to 4800f/s.
s	Stops the auto-send mode where the data is sent to the terminal at one-second intervals.
S	Starts the auto-send mode. Input and output pulse data such as frequency, amplitude, depth will be sent to the terminal each second.
t	Enters the extended command mode. A list of additional commands will be sent to the terminal. The extended commands are used in calibrating the DSTS-5A/2C.
vxxx	Sets the velocity of propagation and stores the new value in eeprom to be loaded on power-up. The velocity of propagation should be set in ft/sec if the units are in feet, and m/sec if depth units are in meters. Default values for a new DSTS-4A/2C are preset to 4800 ft/sec and 1500 m/sec.
v?	Returns the Vprops for both the foot and metric values. The data is in the format xxxx,xxxx, where xxxx is Vprop in ft/sec and xxxx is the Vprop m/sec.
z	Outputs the number of 25nS sample intervals contained within each cycle for all cycles of the input pulse; from the first to last. This may take considerable time with a long pulse containing a large number of cycles. The data is comma delimited. To determine the period of an individual cycle, multiply the terminal value by 25nS. Take the inverse of the period to calculate frequency. Example: Frequency of a cycle = 40000/(number of 25nS periods). If 'z' gives 3900, the frequency is 40000/3900 or 10.256KHz
zxxx	Returns the number of 25nS sample intervals for the first xxxx cycles of the input pulse. The data is comma delimited. To determine the period of an individual cycle, multiply the terminal value by 25nS. Take the inverse of the period to calculate frequency. Example: Frequency of a cycle = 40000/(number of 25nS periods). If 'z' gives 3900, the frequency is 40000/3900 or 10.256KHz
Z	Returns the number of cycles in a pulse
z?	1.1.1 Returns the number of cycles contained in the input pulse.

6 TYPICAL OPERATING SCENARIOS

6.1 FISH ECHO

6.1.1 The DSTS-5A/2C is capable of generating a secondary echo between the surface and bottom. This echo can be used to simulate an echo from a fish or other object above the bottom and will be referred to as a fish echo. The depth, duration and shape of the fish echo can be set. The duration of the fish echo is set by specifying the number of echoes that the fish will generate as it passes under the transducer. A more realistic fish echo can be generated by specifying a depth increment. The depth of the fish echo is decreased for half the duration then increased for the remainder of the duration. If the increment is set to zero the fish echo will remain at a constant depth for its duration.

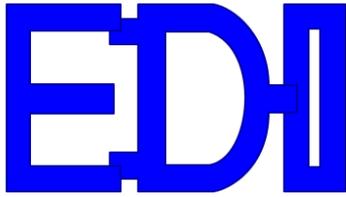
6.2 SETTING UP A TYPICAL FISH ECHO

6.2.1 Set the bottom depth to 25 feet by typing “d250 'enter’”. Set the fish depth to 23 feet by typing “D230 'enter’”. Set the fish echo off time to 20 pulses by typing “e20 'enter’”. Set the fish on time to 3 pulses by typing “E3 'enter’” and the fish echo will appear for 3 pulses every twenty pulses and repeat until disabled

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by typing “e 'enter’”. The amplitude of the fish echo can be set using the “L” command.

6.2.2 To make the fish echo stay on continuously type “E 'enter’ ”. Type “e 'enter’ ” to turn the fish echo off.

6.2.3 To generate a fish arch use the “i” command to enter an value in tenths of the selected units representing the arch height.

7 CALIBRATING THE DSTS-5A/2C

7.1 The load resistor can change if overheated by too much power. A large change in the resistance will cause the voltage and reply readings on a sonar to change. The load resistor should be checked any time abnormal readings are experienced.

7.1.1 Check the load resistance with the DSTS-5A/2C power off. Place an ohmmeter across the IN/OUT connector. The resistance for the factory-installed load should be 582 ohms +/- 10%. The resistance of a custom load at the IN/OUT connector should read 22 ohms higher than the value of the installed load resistor. If the load is out of spec, the unit should be taken apart and the load resistor replaced before any further calibration or checks are done.

7.1.2 Run the supplied terminal program, “DSTS_terminal_V1dot1.exe”.

7.1.3 VOLTMETER CALIBRATION



Caution—Do not perform this procedure without a EDI DSTS calibrator or other comparable pulse source.¹

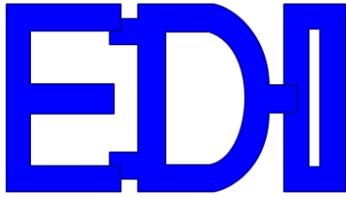
7.1.4 TERMINAL PROGRAM

To calibrate the voltmeter, the DSTS-5A/2C must be connected to a terminal. Run the supplied terminal program, DSTS_terminal.exe, or any other terminal program of your choice and make sure you can communicate with the DSTS-5A/2C.

7.1.5 METER CALIBRATION

The volt meter calibration is in the “extended menu”. Type 't' to enter the extended menu. Then type 'c' to start the voltmeter calibration routine. Connect the EDI DSTS calibrator or other comparable pulse source to the IN/OUT connector. After the indicated voltage readings have settled down, type in the

¹The EDI DSTS Calibrator produces a 400 volt p-p pulse burst with a frequency of 204.8 KHz, length of 325 uSec, and a period of 80 mSec. Droop is less than 10 percent over the pulse length.



correct input pulse voltage in volts peak-to-peak and press 'enter'. A calibration factor will be generated and stored in eeprom. Type "Yes" (case sensitive) to store the calibration factor. Press the reset button and check that the voltage reads correctly. If not, repeat the calibration.

7.1.6 FREQUENCY CHECK

Connect the DSTS-5A/2C to a frequency counter and press the reset button. Set the output to continuous frequency of 100 KHz by typing 'B100000' followed by 'enter'. Set output level to maximum by typing 'l255'. The frequency counter must read 100,000Hz +/- 10 Hz.

7.1.7 REPLY AMPLITUDE CHECK

7.1.7.1 Connect a scope (1 meg Ω input required) directly to the IN/OUT connector with a short (< 3ft) cable. Set the frequency to 100 KHz (f10000) and the level to maximum (l255). The voltage must read 112 mV p-p +/- 7 mV p-p. This is a fixed factory setting and will not change unless the DSTS-5A/2C has been damaged by a severe overload.

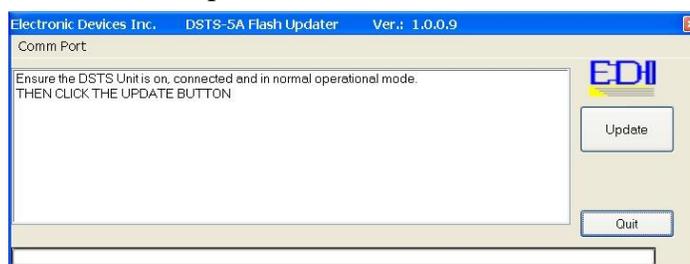
7.1.8 OPTIONAL REPLY ATTENUATOR CHECK

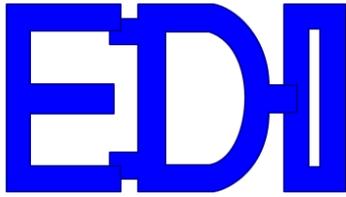
7.1.8.1 Connect the DSTS-5A/2C IN/OUT connector to a spectrum analyzer. Set various levels to make sure the attenuator tracks properly. Note that the output on the analyzer will be low because the 50 ohm input impedance of the spectrum analyzer loads down the DSTS-5A/2C output. If a high impedance ($\geq 100,000$ ohm) probe is available, the readings will be correct and a level of 255 will produce 50 mV rms. Each decrease in the level will reduce the output by 0.3 dB. The object is to verify that the attenuator is operating properly. There are no adjustments.

8 SOFTWARE UPDATES

8.1 The DSTS-5A/2C software can be updated via your RS-232 connection. As software features are added, periodic update files in hex format may be sent via email. They can be installed in the DSTS-5A/2C by using the supplied application, "flash.exe".

8.1.1 Put the flash.exe program and the updated DSTS-5A/2C hex file in the same directory. Click on the program's icon to launch it. When the application runs it will ask for the correct com port, and then the screen shown will be displayed.





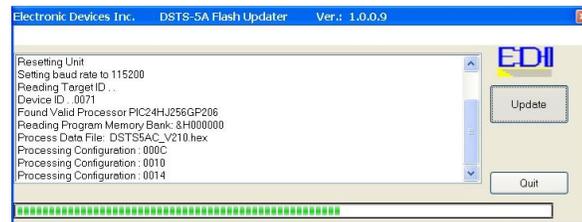
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8.1.2 Click the “Update” button on the application and the bootloader will begin the process of updating the software.

8.1.3 If the update is running successfully you will see the following screen: After the update completes the bootloader application will close and you can begin using the DSTS-5A/2C with the updated software.



9 INSTALLING A CUSTOM LOAD

Disassemble the DSTS-5A/2C by first removing the hex nut from the IN/OUT BNC connector on the front panel. Refer to illustration 1 and remove the black plastic outer bezel on the back panel (the side with the RS-232 connector) by lifting it near the center on the top and sides where the catches are located. When the bezel is off, hold the DSTS-5A/2C so the IN/OUT connector is facing upwards and slide the back panel out of the housing. Save any lock washers located on the IN/OUT BNC connector and be sure to replace them during re-assembly.

Note: Do not remove the front bezel. The front panel should not be removed, only the back panel.

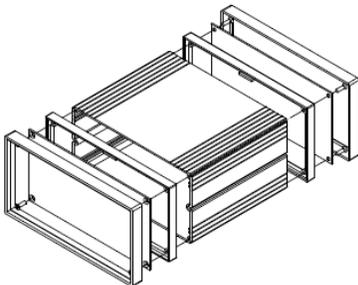


Illustration 1: Exploded view of DSTS-5A/2C housing.

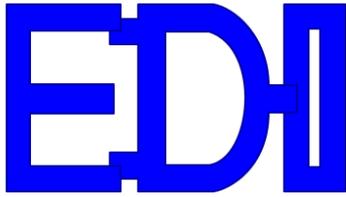
9.1 Install the new load resistor, R24 and a parallel capacitance, C31 if required. Be sure to move the jumper, J5, to the position closest to the front panel.

9.2 Re-assemble the DSTS-5A/2C making sure the lock washers are in place on the IN/OUT connector. If necessary, bend the ground contact slightly so it contacts the front panel when the unit is assembled.

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Photo 1: DSTS-5A/2C Circuit Board.

10 DSTS-5A/2C SPECIFICATIONS

<u>Parameter</u>	<u>Range</u>	<u>Resolution</u>	<u>Accuracy</u>
Sample rate	40 Mhz	n/a	±.01%
Input frequency	1.5 to 500 KHz ²	25nS	±.02% ±20 Hz ³
Input width	1100 cycles max	0.1 µs	±.02% ±2 cycles
Input period	10 to 9999 ms	1 ms	±.02% ±1 ms
Input voltage	50 to 2500 Vp-p	2 Vp-p	±10 Vp-p ±5% ⁴
Min input level	50 ⁵ Vp-p	N/A	N/A
Output frequency	1.5 to 500 KHz	25nS	±.01%
Output width	Tracks input pulse	0.1 µs	±.02%
Echo depth	1 to 100,000 ft/fm/mt 0.1 unit		±.01%
Output level	2uV to 50,000uV	0.3dB	±1.0 dB
Vprop ft, fm	4800 to 5000 f/s	1 f/s	±.01%
Vprop mtrs	1460 to 1530 m/s	1 m/s	±.01%

²Usable to > 550 KHz with reduced amplitude accuracy.

³Specified for constant frequency pulse with width greater than 100 uS.

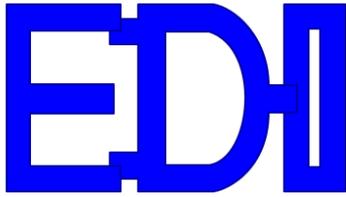
⁴Measured at 200KHz, 400Vp-p with a 325 uSec pulse width.

⁵At 50 KHz. Approximately 120 Vp-p at 500 KHz.

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Depth jitter less than 50 nSec maximum at 1 second depth delay.
Baud rate 9600, 8 bits, no parity, no handshake.

Power requirements: 9 VDC @ 200 mA.
Size and Weight: 6" W by 7"D by 3.5"H. Shipping Wt, 2.1 Lbs.

Depth jitter less than 50 nSec maximum at 1 second depth delay.
Baud rate 9600, 8 bits, no parity, no handshake.

Power requirements: 9 VDC @ 200 mA.
Size and Weight: 6" W by 7"D by 3.5"H. Shipping Wt, 2.1 Lbs.

11 WARRANTY INFORMATION

Unit will be repaired free of charge for one year from date of purchase providing there is no water damage or other evidence of improper use or handling. Purchaser must ship unit prepaid to address below. EDI will pay the return freight.

For repair, please enclose a note describing the problem and ship to:

ATTN: Service Department
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USA
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