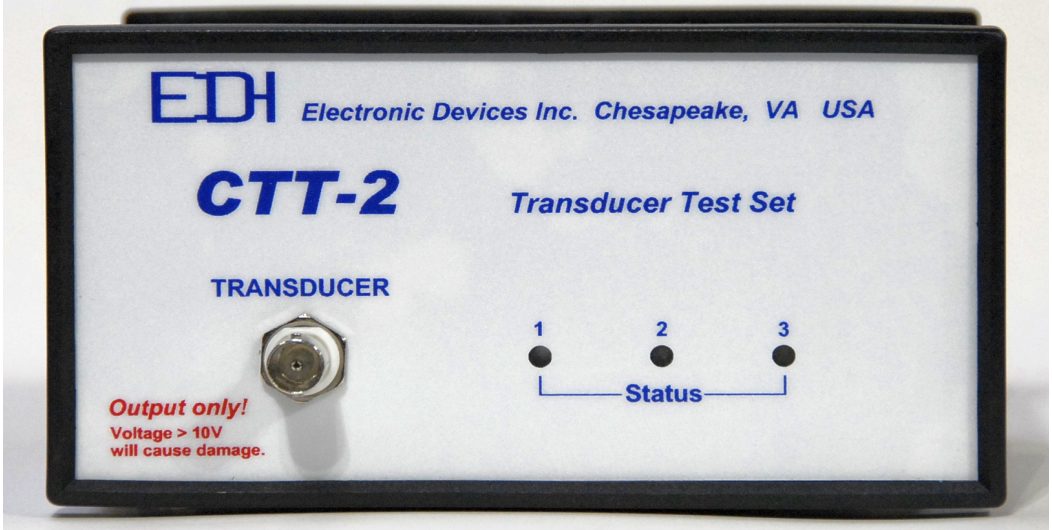
Manufactured and Distributed by BBG INCORPORATED
1708 South Park Court, Chesapeake, VA 23320•Phone (757)366-9211•Fax (757)366-9170

CTT-2 Operation Manual

V1.01 04/16/14



Contents

1 Introduction
2 Swept frequency testing
3 Spot frequency testing
4 Leakage test
5 Indicator LED's
6 Data format selection
7 Baud rates
8 Command list
9 Calibration
10 Specifications
11 Warranty

1 Introduction

The CTT-2 is a computer controlled transducer test set designed for production line testing of sonar transducers during manufacture. Swept frequency tests are quickly performed. The data returned can be impedance and relative phase for each point in the sweep, or just the minimum and maximum impedance points found over the swept frequency range. Leakage tests can also be made over a range of 100 ohms to over 10 megohms.

1.1 Preliminary setup and test

Connect a terminal to the CTT-2. Set the terminal for a Baud rate of 9600, 8 data bits, 1 stop bit, no parity, and no handshake. The supplied terminal program, DSTS_terminal.exe, is preset to these values. Connect the power supply to the CTT-2. The three front panel LED's will flash briefly, indicating the CTT-2 is ready to operate.

1.2 Read the power supply voltage

Type 'Cv' followed by the enter key. This is the command to read the power supply voltage. Note that the commands are case sensitive. The power supply voltage returned should be between 9 and 16 volts.

1.3 Impedance check

Connect a 510 ohm resistor to the TRANSDUCER connector and type 'f100000' followed by enter. The frequency and resistance will be returned. The returned value should be within 5% of the resistors value. This completes the preliminary test of the CTT-2's operation.

2 Sweep testing

For sweep testing a transducer, the frequency step and the number of steps are selected to cover the desired range of frequencies. The sweep is started by typing the sweep command and the starting frequency for the test. The type of data returned is selected by the second character of the sweep command. The quickest sweep test returns just the maximum and minimum impedance points that occurred over the frequency range. For more detail, the sweep can return the impedance at each frequency step; but this takes more time because of the large amount of data returned.

2.1 Before starting the frequency sweep, the sweep parameters must be set. There are three parameters: the frequency step, the number of steps, and the dwell at each step.

2.1.1 The frequency step is the amount the frequency will increase at each step. A value of 100Hz is a good choice between speed and accuracy for most transducers.

2.1.2 The number of steps set the range of the sweep. More steps require more time to complete. With dual frequency transducers, it is better to divide the sweep into two narrower ranges than to sweep the entire range. The reason for this is to increase the test speed by limiting the number of frequency steps.

2.1.3 The delay is the time that the frequency is held constant before the measurement is made. A short delay will speed up the sweep at the expense of accuracy. A delay of 1000uS is a good compromise between speed and accuracy.

2.2 A typical sweep test for a 200 KHz transducer would cover a range of 170 to 230 Khz using 100 Hz steps. The number of steps required will be the sweep width divided by the frequency step. In this example, the frequency sweeps from 170 to 230 Khz for a width of 60KHz. Using 100Hz steps this will require a total of 600 steps to cover the range. The recommended delay should be left at 1000uS. The 'Sf' command sets the frequency step, 'Ss' sets the number of steps, and 'Sd' sets the step delay. Typing 'S' will display the current frequency step, number of steps, and delay. For this example, type 'Ss600' to set the sweep for 600 steps.

2.3 To start the sweep, type 'sm170000' and the sweep will start at 170KHz and continue for 600 steps to 230KHz. When the sweep is finished the maximum and minimum impedances found will be displayed along with the frequency that they ocurred at. If impedance data for each frequency step is desired, use the command 'sa170000' and the impedance and relative phase will be returned for each frequency step.

3 Spot frequency tests measure the impedance at a single frequency. To check the impedance of the transducer at 197KHz, type 'f197000'. To read both impedance and the relative phase, type 'fa197000'. The 'f+' command will increment the frequency one step, and the 'f-' commad will decrement the frequency one step. The impedance and relative phase are returned.

4 Leakage testing is done with the 'l' command, and returns the resistance of the transducer. The leakage test takes 3 to 10 seconds, the longer time will read higher resistances. A minimum delay of 3000mS is required. To set a 5 second delay, type 'Ld5000'. Note that the commands are case sensitive.

5 The three indicator lights on the front panel can be turned on, off , or flashed to indicate what action is to be taken during the test. To light the left most (green) LED, type 'I1', to extinguish the LED, type 'i1'. The LED's are numbered from left to right 1, 2, and 3. The corresponding colors are green, yellow, and orange. Typing 'I2' lights the yellow LED, and 'I3' lights the orange one. To make a LED1 blink, type 'Ib1' and the green LED will begin flashing. To stop the LED from flashing type 'i1'.

6 Returned data format
Two data formats are provided, one returns descriptive data, and the other returns only comma separated (CSV) data. When first trying out the CTT232, is is easier to use the default descriptive data that returns data in the form F= 100000, Z = 257 instead of the CSV that will only return 100000,257. The 'p' command switches to CSV data. To go back to the descriptive data, type 'P'.

7 Baud rate

There are two commands for setting the Baud rate. The 'brxxxxx' command changes the rate when issued, but does not store it in eeprom. The 'bsxxxxx' command stores the new Baud rate in eeprom but does not change the rate until the next time the power is turned off and on.

8 CTT-2 Command list:

8.1 'Brxxxxx' sets baud rate. Only 9600, 19200, 38400 allowed.
8.2 'Bs' stores baud rate for power-up default.
8.3 'faxxxxxx' returns impedance and relative at xxxxxxHz.
8.4 'f+' increments frequency one step. See 'Sf' command.
8.5 'f-' decrements frequency one step.
8.6 'fxxxxxx' returns impedance only.
8.7 'Ix' turns on LED 1, 2, or 3.
8.8 'ix' turns off LED 1, 2, or 3.
8.9 'Ibx' starts LED 1, 2, or 3 flashing at a 2.5Hz rate. Use 'ix' to turn off.
8.10 'l' starts leakage test, returns ohms.
8.11 'Lxxxxx' sets the leakage test time in mS. Default is 3000mS.
8.12 'Sdxxxxx' sets dwell time in uSec. Use >1000 uS for accuracy.
8.13 'Sfxxxxxx' sets sweep frequency step in Hz.
8.14 'Ssxxxxxx' sets the number of steps used in the sweep.
8.15 'S' returns sweep frequency start, step, number of steps, and delay.
8.16 'saxxxxxx' sweeps, returns all data for each frequency point.
8.17 'smxxxxxx' sweeps for minimum, maximum Z starting at xxxxxx Hz.
8.18 'szxxxxxx' sweeps, returns only Z for each frequency point.
8.19 'Cfxxxxx' calibrates the output frequency, 1 ppm/count. Nominal is 10000.
8.20 'Cm' stores the cal data to eeprom. Reads in on power-up.
8.21 'Co' calibrates readings >5K ohms. Nominal value is 2.
8.22 'Cr' calibrates for reference resistor. Nominal value is 104.
8.23 'Cs' calibrates readings for 0 ohms. Nominal value is 2022.
8.24 'Cz' prints stored and current calibration values.
8.25 'Cv' prints power supply voltage. Range is 9 to 16 VDC.
8.26 '?' prints the firmware version and a help file.
8.27 '/' prints the firmware version.

9 Calibration

9.1 Calibration should be checked every two years or any time the readings are in doubt.
9.2 Equipment required: 5100 ohm 1% resistor, a 510 ohm 1% resistor, a 10 ohm 1% resistor, and a frequency counter capable of reading 100KHz with a 1PPM timebase.

9.3 Frequency calibration

9.3.1 Connect a frequency counter to the transducer connector. Type 'f100000' and read the counter. The frequency should be within +/- 20Hz. If it is not, the CTT-2 must be returned to the factory for repair.

9.4 Impedance calibration.

There are three calibration factors involved in calibration. They are the short circuit, the the offset, and the reference resistor factors. The values in use can be read by typing 'Cz'. The reference resistor 'Cr' value should not be changed unless the unit has been repaired. The calibration starts with a short circuit then a resistance test. The 'Cs' is adjusted for 0 ohms, and the 'Co' is adjusted for correct reading of a 5K resistor. There is interaction between the 'Cs' and 'Co' values, so the calibration may need to be repeated a few times for the best balance between short circuit and high impedance readings.

9.5 Short circuit calibration.

9.5.1 Set the offset to 1 by typing “Co1'.

9.5.2 Place a short across the transducer connector. Type 'f100000'. The returned impedance should be between 0 and 0.5 ohms. If not, the 'Cs' value, nominally 2022, must be changed. If the impedance is greater than 0, increase the value of Cs slightly and read the impedance. Keep adjusting the 'Cs' until the short reads between 0 and 0.1 ohms. If the required 'Cs' value is less than 2000 or greater than 2040 the CTT-2 may require repair.

9.6 5100 ohm calibration point

9.6.1 Connect a 5100 ohm 1% resistor to the transducer connector. Type 'f100000', the returned impedance should be 5100 +/- 250 ohms. If it is not, check the 'Co' value. Increase 'Co' to lower the reading, decrease it to increase the reading. The 'Co' value must be between 1 and 6. If a 'Co' value over 6 is required, the CTT-2 should be returned to the factory for repair.

9.6.2 Check the readings with the 10 ohm and the 510 ohm resistor and repeat steps 9.5.2 through 9.6.2 until the results are within +/- 5% tolerance of the 10 ohm and 510 ohm resistor values.

9.7 Storing the new calibration values is done by typing 'Cm1234'. If 'Cm' is entered with any other value, you will get an error message and the values will not be stored.

10 Specifications

- 10.1 Frequency range: 10KHz to 1 MHz
- 10.2 Frequency resolution: 1Hz
- 10.3 Frequency accuracy: .01% over -10 to +70 degrees C.
- 10.4 Impedance range (at resonance): 10 to 5000 ohms (to 9900 ohms with decreased accuracy).
- 10.5 Impedance accuracy 5% of reading for resonant (resistive) load.
- 10.6 Test modes: Swept and fixed frequency
- 10.7 Test voltage level 5 Vpp
- 10.8 Data returned: Impedance, +/- phase, and leakage resistance.
- 10.9 Indicators: Three panel LED's controlled by test program.
- 10.10 Size: 3 x 7 x 7 inches
- 10.11 Power: External wall-plug transformer nominal 12Vdc@ 300 mA.
- 10.12 Interface: RS-232, 9600 to 38400 Baud, standard DB9 serial port.

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 shipments within the contiguous United States.

For repair, please call to obtain an RMA number, and enclose a note describing the problem and ship to:

ATTN: EDI Service Department
BBG Incorporated
1708 South Park Court
Chesapeake, VA 23320
USA

Phone: 1-757-366-9211
1 Email: edisales@bbginc.com