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**TECHNICAL MANUAL
ULTRASONIC TEST SET
MODEL 42A12D**

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REV 00

SEACOM DIVISION

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SECTION I GENERAL INFORMATION

1.1. INTRODUCTION

1.1.1. GENERAL. This manual contains the description, operation and maintenance of the 42A12D Ultrasonic Test Set manufactured by Dukane Corporation, Seacom Division, 2900 Dukane Drive, St. Charles, Illinois 60174. See Figure 1.1.

1.1.2. SYMBOLS AND ABBREVIATIONS. All symbols and abbreviations used in this manual are in accordance with the ANSI Y14.15 and MIL-STD-12, respectively.

1.2. GENERAL DESCRIPTION

1.2.1. FUNCTION. The 42A12D is a battery operated heterodyne type receiver tunable over the ultrasonic frequency range of 30 to 45 kHz. The test set was designed primarily as a self-contained, hand-held functional tester for testing underwater acoustic beacons. Utilizing the internal microphone and loudspeaker, the Test Set can perform an operational test on a beacon without removing the beacon from its mount on the aircraft.

1.2.2. SPECIFICATIONS. The specifications for the 42A12D are given in Table 1.1.

TABLE 1.1. SPECIFICATIONS 42A12D
ULTRASONIC TEST SET

Size.....	3.0" (7.62 cm) x 4.5" (11.43 cm) x 2.25" (5.72 cm)
Weight.....	13 ounces (368 grams)
Tuning Range.....	30 to 45 kHz
Battery*.....	9V (Qty 1)
Gain.....	87 dB min. at 37.5 k Hz
Noise.....	Less than one mW across 10 ohm load
Undistorted Output.....	250 mW into 10 ohm load
Microphone Sensitivity.....	-150dB re 1uPa
Battery Life.....	30 to 40 hours
Audio Output Jack.....	Switchcraft type 43A, permits operation into headphones, oscilloscope, etc. in place of internal loudspeaker (impedance 10 ohm nominal)

* NEDA Type 1604A.

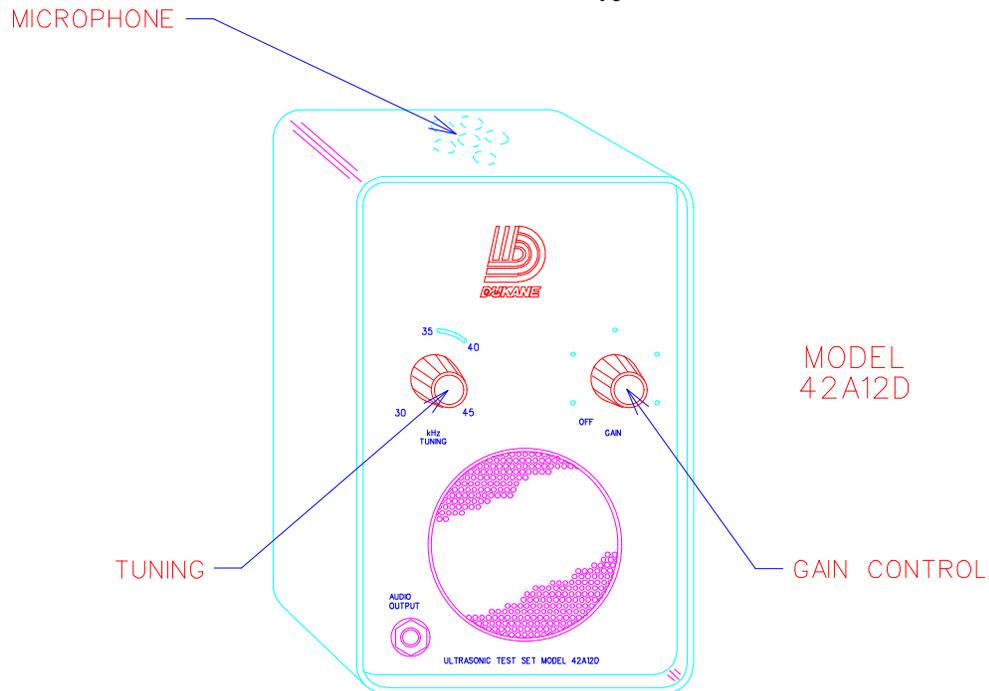


Figure 1.1. Ultrasonic Test Set Model 42A12D.

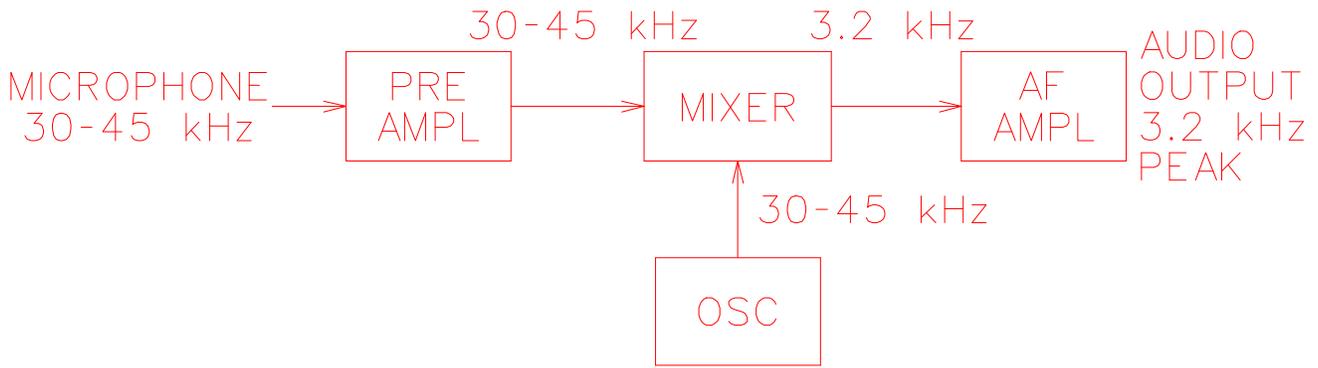


Figure 1.2. Test Set Block Diagram.

1.2.3. BLOCK DIAGRAM. Figure 1.2. is a block diagram and Figure 3.1. is the schematic diagram of the test set. The microphone detects a beacon signal which is amplified and fed into the mixer. The tunable oscillator frequency is also fed into the mixer. When tuned above or below the incoming signal, the difference frequency is the resultant output from the mixer, and will be in the audio range when the difference is within 1000 to 3000 Hz. When both frequencies are the same, the difference frequency is zero, hence no output from the mixer. The signals coming out of the mixer are amplified by the audio amplifier, where most of the gain of the test set is provided.

1.3.1 AUDIO OUTPUT.

1.3. AUXILIARY CONNECTIONS AND USES

A. The test set AUDIO OUTPUT jack circuit is designed to work into a load impedance of approximately 10 ohms which is ideal for attachment of low impedance head phones. Operation into higher impedance such as oscilloscopes, meters, chart recorders or other types of readout equipment is permissible. No DC potential is present on the AUDIO OUTPUT jack.

CAUTION

A SHORT ACROSS THE AUDIO OUTPUT JACK MAY CAUSE DAMAGE TO THE TEST SET CIRCUITRY.

CAUTION

TEST SET IS NOT WATER-PROOF OR SPLASH PROOF. SOME FORM OF PROTECTION SHOULD BE PROVIDED WHERE SPLASH CONDITIONS EXIST.

SECTION II OPERATION

2.1. OPERATION

A. Turn the GAIN control to a fully clockwise position. A pronounced background noise should be present. Lack of noise may indicate a dead battery. Should this occur, replace battery before resuming operational testing. See Maintenance Section 3.2.

B. Set the TUNING control to approximately midscale. Rubbing fingers in front of microphone should produce a rushing noise from speaker.

C. Actuate a beacon under test by immersing the water switch in tap water, or by shorting the water switch terminal to the case by means of a shorting tab. The beacon need not be removed from its mount on the aircraft to perform operational testing.

D. Set the GAIN control at a comfortable listening level.

E. Point the microphone of the Test Set towards the water switch end of the Beacon for best results. If the Beacon is mounted, position the Test Set for maximum unobstructed signal. Beacon operation will be indicated by an audible pulsing tone.

F. The tuning control permits reception of an acoustic signal operating anywhere within the 30 to 45 kHz frequency range. The audio response is peaked at about 3200 Hz; therefore, the test set should be tuned to produce an output signal of approximately this frequency to achieve greatest sensitivity.

CAUTION

TO CONSERVE BATTERY LIFE, GAIN CONTROL SHOULD BE SET TO OFF POSITION WHEN TEST SET IS NOT IN ACTUAL USE.

SECTION III MAINTENANCE

3.1. BATTERY LIFE

With intermittent usage, battery operating life will be approximately 30 to 40 hours depending on the type of and manufacturer of the battery. In any event, battery should be replaced when its load voltage has dropped to 7 volts (Test Set turned ON and GAIN control set to minimum).

3.2. BATTERY REPLACEMENT

Any 9-volt battery may be used, but longer service will be obtained by the use of premium batteries such as NEDA Type 1604A. The battery is accessible in the Test Set by removing the single screw on the bottom of the case and dropping out the chassis. A snap type connector facilitates change of battery and prevents reversal of polarity, but for additional safety, always turn GAIN control knob to OFF position before making battery change.

3.3. TEST SET TUNING

The following test equipment and procedures should be followed to tune and adjust the frequency range of the 42A12D Test Set.

3.3.1. TEST EQUIPMENT A. Test Oscillator which is accurate at 30 kHz, 37.5 kHz and 45 kHz and provides several volts output.

B. Output monitor and VTVM.

C. Regulated current limiting power supply capable of 9V and 200 mA output current.

D. Necessary interconnecting cables to connect input, output and power to test set.

D. Work surface with insulated electrostatic shield plate (see Figure 3.2.) connected to common (battery negative terminal) of equipment.

3.3.2. TUNING A. Turn the GAIN control to OFF, loosen the screw on the back of the case and remove the test set from the housing. Disconnect the battery snap and remove battery. Place test set GAIN control side up on the insulated side of test plate. Pre-set power supply to 9V DC.

B.. Connect the audio oscillator to the wiper and ground leads of the gain pot.

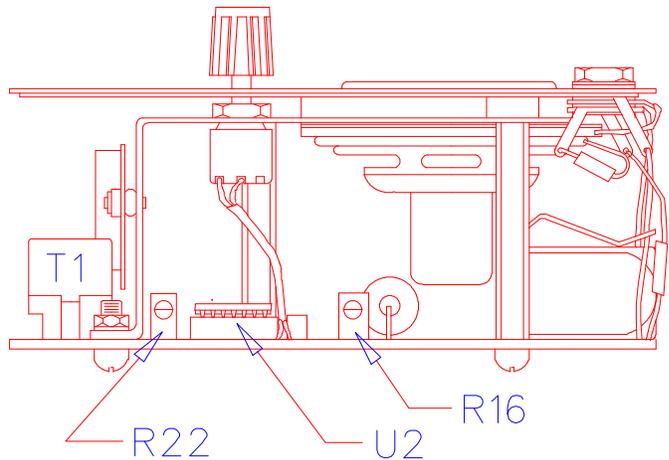


Figure 3.1. Tuning Components.

C. Set the Audio Oscillator to 37.5 kHz, with an output of 35 mvrms.

D. Monitoring the Audio Output Jack, adjust the TUNING knob for peak signal at either the upper or lower peak. With the GAIN pot at MAX, at least 1.5 Vrms should be observed

E. Tune the slug of T1 for peak signal output. The response will be very subtle. Locate adjustment T1 on Figure 3.3.

CAUTION

**USE AN INSULATED TOOL TO MAKE THIS
ADJUSTMENT**

3.3.3. ADJUSTING FREQUENCY RANGE.

A. The frequency range for the Test Set is 30 to 45 kHz. The audio output is tuned for approximately 3200 Hz.

B. Set the TUNING knob to the maximum frequency (45 kHz). Place an oscilloscope probe or frequency counter on the output of the local oscillator circuit, pin 14 of U2. See Figure 3.3.

C. Monitoring the frequency, adjust R16 for the maximum L.O., approximately 42 kHz or as high as possible.

D. Set the TUNING to the minimum frequency (30 kHz).

E. Tune R22 for the minimum L.O., approximately 27 kHz.

F. Repeat steps C through E as many times as necessary until both ends are tuned.

3.4. TEST SET SCHEMATIC DIAGRAM.

Figure 3.2. is the schematic diagram for the 42A12D Ultra-sonic Test Set.

3.5. MAINTENANCE AND REPLACEMENT PARTS.

A. Tuning or Gain

1 control knob.....P/N 809-440-0004

B. GAIN control R13.....P/N 601-315

C. TUNING control R23.....P/N 601-372

D. Battery.....NEDA Type 1604A

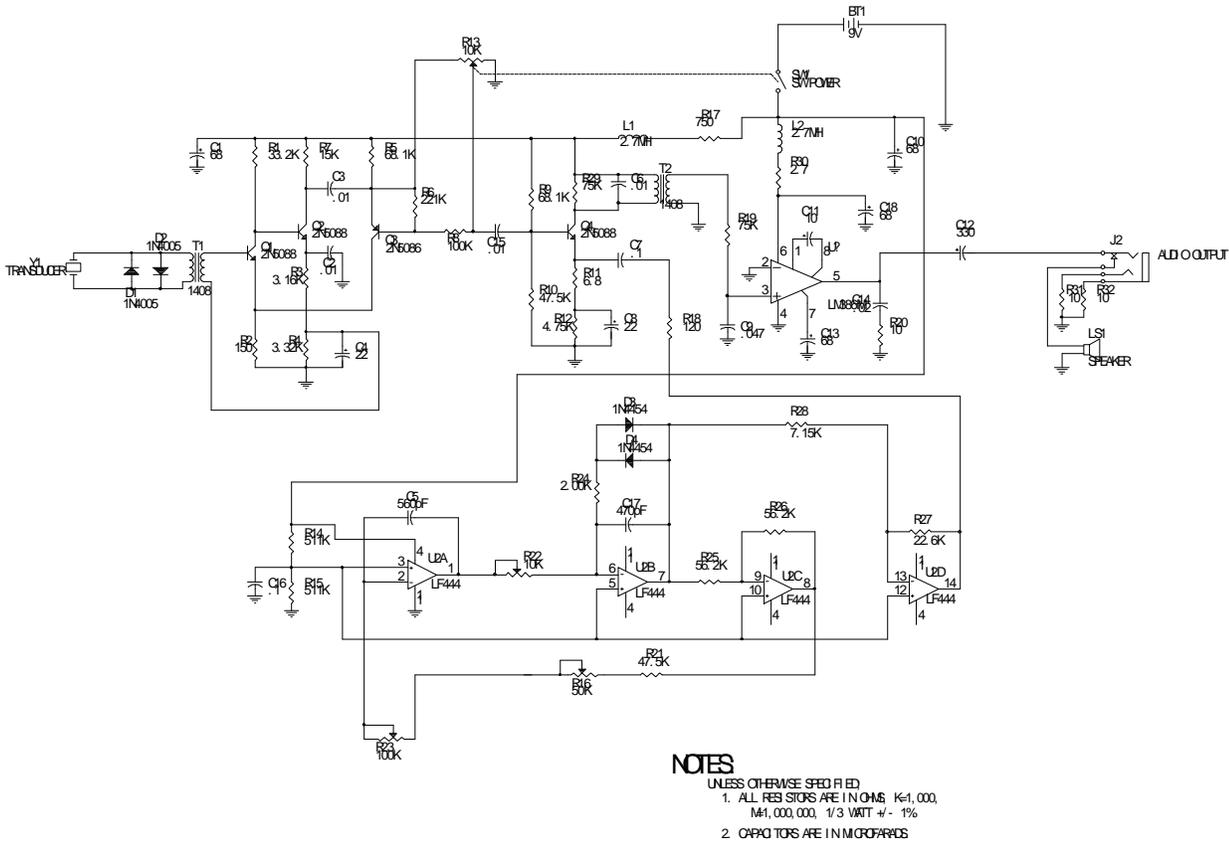


Figure 3.2 Schematic Ultrasonic Test Set Model 42A12D