**AEA**

# Advanced Electronic Applications, Inc.

**INSTRUCTION MANUAL**

**AEA BASIC MORSE TRAINER**

**Model BT-1 & BT1P**

**INSTRUCTION MANUAL**

**AEA BASIC TRAINER**

**Model BT-1 & BT-1P**


Congratulation on your decision to purchase the new AEA Basic Trainer Model BT-1 or BT-1P. You will find it a great aid in teaching or learning the Morse code.

To gain the most satisfaction and enjoyment from your unit, we recommend you first read this Manual carefully and then keep it close at hand for quick reference during the operation of your unit.
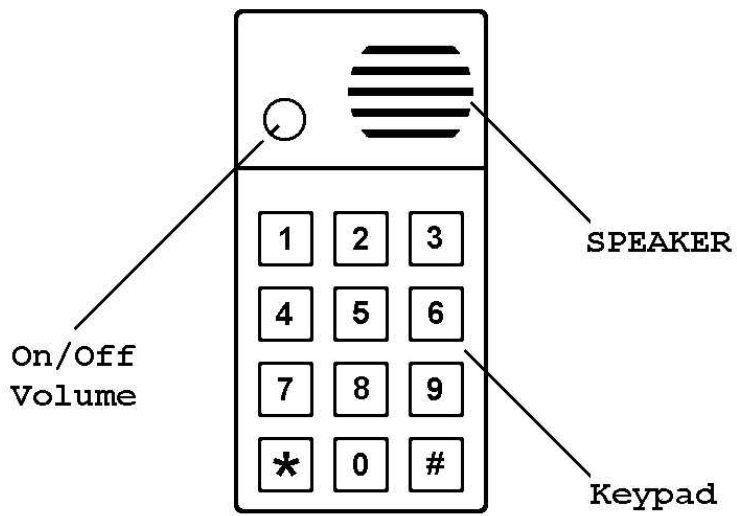
The AEA Basic Trainer can help a student achieve good copying proficiency in the shortest possible time.  By establishing two 20 to 30 minute study period each day, the average student can develop an ability to copy the Morse code at approximately 20 WPM after four weeks of study.  It is very important to maintain a well disciplined schedule with good concentration.  The rewards for good discipline are "dah didadit dit dadah dit dadit dadidit dadadah dididah dididit"!

BEST OF LUCK !

# TABLE OF CONTENTS

# TOP PANEL DESCRIPTION

SPEAKER

1 2 3
4 5 6
7 8 9
* 0 #

On/Off
Volume

Keypad

BT-1 AND BT-1P

# REAR PANEL DESCRIPTION

Earphone Jack

Morse Key
Input

Power

BT-1

Earphone Jack

Morse Key
Input
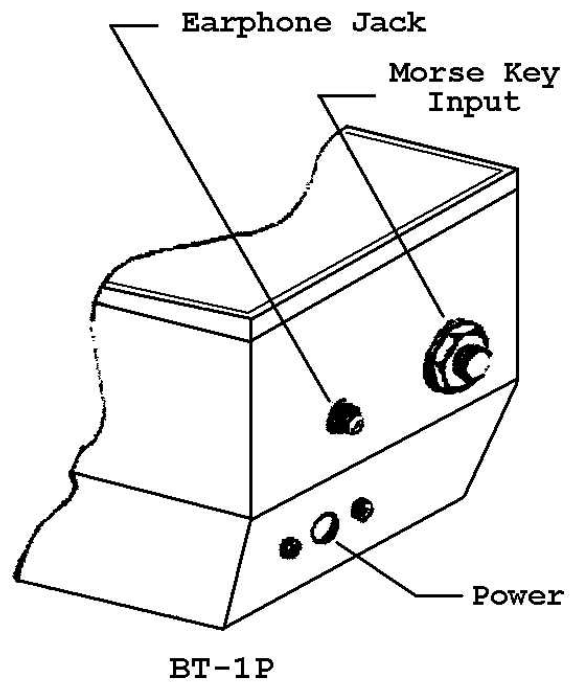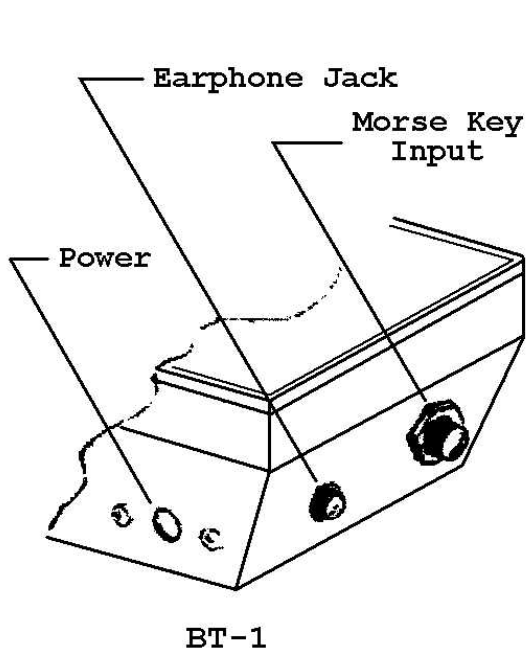
Power

BT-1P

# HOOK-UP INSTRUCTIONS

## 1.  POWER

**BT-1**       To perform the Check-Out Procedure in the following section and familiarize yourself with the BT-1, it is first necessary to apply 13 volts ± 3 volts to the power input jack on the rear panel of the BT-1.  (For the BT-1P. see next paragraph.)
This may most easily be accomplished by connecting the output cord attached to the optional AEA model AC-1 or AC-2 wall adaptor power supply to the power socket on the rear panel of the BT-1. If you are using another 12 VDC power supply or lantern battery be sure to connect the center lead of a mating power plug to + 12 volts, and the outer conductor to common.  The external power source must be reasonably well filtered and capable of supplying at least 200 mA.  The BT-1 may be used in an automobile with the optional AEA DC-1 cigarette lighter power cord.


**BT-1P**       It is very important to take proper care of your expensive NICAD battery pack which is part of your BT-1P.  The unit should arrive in a discharged condition.
IMPORTANT: USE ONLY THE CHARGER THAT COMES WITH THE BT-P1 TO CHARGE THE BT-1P.  A constant voltage supply WILL DO DAMAGE to your NICAD batteries and they WILL NOT BE COVERED UNDER WARRANTY.
Upon initial receipt of your BT-1P, plug the wall charger into a 117 VAC outlet and the output cord into the BT-1P power input connector.  With the BT-1P power switch in the OFF position, allow the batteries to charge a few minutes.  Now turn the unit on an press any button (with the volume nearly fully advanced clockwise), and note that you get some tones.  Now, turn the power switch off and allow the BT-1P to charge uninterrupted for 14 hours.  (The BT-1P is supposed to be charged with the power switch OFF but with the wall charger plugged in.)
For longest battery life, it is IMPORTANT that you exercise your batteries.  After you have fully charged the batteries, use the BT-1P without ever connecting the wall charger again until you have fully discharged the batteries.  Then you should give a full 14 hours charge before starting to use the BT-1P again. Then begin the discharge cycle all over again.

## 2.  HAND KEY

The BT-1 and BT-1P can also double as a code sending practice oscillator.  All you need to do is plug a standard 1/4 inch phone plug connected across a telegraph key into the key input jack on the rear panel.  It is not important which side of the key goes to which terminal of the 1/4 inch phone plug.
To activate the code practice oscillator tone, simply press $\boxed{*}\boxed{5}$ on the top panel keypad.

## 3.  EARPHONE

The BT-1 and BT-1P also provide a rear panel jack for earphone monitoring.  Upon insertion of the earphone plug into the jack, the internal speaker is automatically defeated for private listening.

# CHECK-OUT PROCEDURE

We recommend that your perform the following procedures to quickly acquaint yourself with the BT-1 or BT-1P and to ensure that the unit is operating properly.

## GENERAL FUNCTIONS

1. Apply power to the BT-1. In the case of the BT-1P, be sure the batteries are charged. SEE HOOK-UP INSTRUCTIONS above.
2. Turn the power switch ON and advance the volume control about 2/3 fully clockwise.
3. On the keypad, press [*] and then hold [1]. The monitor tone should step up in frequency. It will remain at the last tone you hear when you release the [1] key.
4. Now press [*] and hold [2]. The monitor tone should step down in frequency. The monitor tone will now remain at the last to you her when you release the [2] button.

## CODE SENDING PRACTICE

1. Press [*][5] and note that you now have a solid monitor tone emanating from the speaker. (Pressing # will halt the tone.)
2. Insert an earphone or headphone plug into the rear panel earphone socket and not in the speaker (for private listening).
3. if you have a telegraph hand key, plug a 1/4 inch phone plug (attached to the key) into the key input socket on the rear panel of the BT-1 or BT-1P. You will now note that the monitor tone will disappear until you press the telegraph key to form Morse code characters.

## TRAINER FUNCTIONS

1. Press [#] to clear any previous instructions to the trainer.
2. Press [0][1][#][1] and note that the unit starts sending dididadit (Morse character F), a 3 second space, dididadit, etc.
3. Press # to halt.
4. Press [*][6][5][0]. You have just entered a character speed of 50 WPM. Now repeat [0][1][#][1] and note that you still hear dididadit, but much higher rate of speed (50 WPM instead of 20 WPM). Press # to halt the trainer.
5. Press [*][7][0][3] and the [0][1][#][1]. You will now hear dididadit, only a 0.3 second space, dididadit, etc. (The [*][7][0][3] command shortened the normal 3 second space between characters to 0.3 seconds.) Press # to halt the trainer.
6. Press [*][7][6][0] and the [0][1][#][1] and note that you now have a 6 second space between characters. Press # to halt. Turn the power switch off and back on and press [0][1][#][1] and note that the spacing between characters has returned to 3 seconds.
7. Press [0][1][#][2] and note that you now hear dididadit, dididadit, space, dididadit, dididadit, space, etc. The short space between the first 2 characters is called a character space, the long space is a long word space.
8. Press [0][1][#][5] and note that 5 characters are now sent between word spaces. Press # to halt.
9. The next step will require a little more knowledge of the Morse code to verify. The odds are that if everything has been working properly so far, this step is not really necessary. You may want to come back to it after you have learned some of the characters.

Press ⎡0⎤⎡4⎤⎡#⎤⎡4⎤ and note that the letter "Q" appears approximately 50 % (percent) of the time in relation to F, K, and B that are also being sent.

Now press ⎡0⎤⎡4⎤⎡*⎤⎡4⎤ and note that the letter "Q" does not appear any more or less frequently (on the average) than the other characters, F, K, or B. Press ⎡#⎤ to halt.

This completes the check-out procedure for your BT-1 or BT-1P. If all steps have been verified as working properly, you are now ready to begin your Morse code training.

## ABOUT OUR TEACHING METHOD

The AEA Basic Trainer Models BT-1 and BT-1P are computerized Morse code instructors. Character speeds are given at 20 WPM, with a three second interval between letters or letter groups. This ideal method of learning characters at a higher speed to begin with, eliminates the learning plateau so many Morse code students encounter at 10–12 WPM. Educational Technology and Service, Inc., of St. Louis, Missouri has pioneered this teaching methodology in cooperation with research at a prominent mid-western university. The ETS system does not encourage the student to learn dot dot dash dot for F, but rather one cohesive sound of dididahdit (at the character speed of 20 WPM). As a result, a student does not have to unlearn bad habits such as counting dots and dashes in order to copy the code. When you begin learning the code at 20 WPM character speed, the sound of any given letter will not change from 0–20 WPM, thereby making it so much easier for the student to increase his (her) copying speed. To facilitate this learning technique, the minimum programmable speed on the Basic Trainer is as 18 WPM character speed.

Each character is taught separately by repetition. The student progresses only after he is confident he knows the letters being presented by the BT-1.

After the first letter (F, in this case) is learned, a student may progress to the letter K. Upon learning K, the student activates the computer to present the letter F and K in random sequence at a 20 WPM character speed. This technique continues as the student learns each subsequent letter in the alphabet.

The sequence of characters has been selected to minimize confusion with previous characters. For this reason you will find the alphabet presentation quite different from typical code training programs. When a new character is practiced along with all previous characters learned, the new character appears fifty percent of the time (50 % weighting).

## RECOMMENDED LEARNING PROCEDURE

If at all possible, devote at least two 20–30 minute sessions a day to studying with your BT-1 or BT-1P. Each time you miss a day, you will find you have suffered a noticeable setback in your learning of the (Continental) Morse code. Avoid all interruptions or outside interference so you can be assured of maximum concentration.

There are generally two ways of copying Morse code. Some students use a typewriter (mill) for copy while others use a pencil and paper for writing down the copy. The obvious advantage of a typewriter is that it allows the student to ultimately reach higher speeds because most people simply cannot write faster than 25 WPM.

When copying with a pencil and paper avoid printing as you will find that it limits your copying speed.

Write down <u>everything</u> you hear as you practice. <u>Be sure</u> to put space in their proper places so that it becomes a good copying habit for later copy of plain text code. For example, when starting with `[0][1][#][1]` your copy should be written down like this: f  f  f  f  f  .  .  .  .  . When you select `[0][1][#][2]` it should look like this: ff  ff  ff  ff  ff  .  .  .  .  . With `[0][1][#][3]` it should read: fff  fff  fff  fff  fff  .  .  .  .  . etc.

The BT-1 and BT-1P are programmed to present the code characters in a logical straight-forward manner. It is IMPERATIVE that you follow the CHARACTER SEQUENCE CHART in the EXACT sequence presented, by following the Character <sequence Chart in the same order that you would read a book (from left to right across the page and then drop down to the left side of the next line, etc.).

Each new step you take will present a new challenge, be sure to practice on the current step long enough that you feel very comfortable that you are copying correctly at that level before you proceed to the next step. The BT-1 and BT-1P are meant to be used as self-paced trainers. Do not be concerned with how others might be progressing. Each student is entirely different. Some may start out learning the first few characters quickly, but then bog down later because of insufficient practice along the way. Others may show great difficulty at first, but find that the new characters become easier and easier to learn.

We recommend that you try to spend each 20–30 minute practice session of learning and practicing one new character. You will first start by hearing the character all by itself (in groups of one) and practice writing it down until you feel totally comfortable with it. Also, you should repeat the sound of the character in your mind with dits and dahs when you are first introduced to the new character in groups of one. As an example, K should sound like dadidah and F should sound like dididadit. Then proceed to groups of two where the new character is mixed 50 percent of the time with all the previous characters you learned in a similar manner. Then progress through groups of three, four and finally groups of five. Be sure that you are essentially copying solid in groups of five before you progress to the next character. Typically a student will learn a new character each 20 minute practice session. When returning to the next practice session, start by replaying the previous practice session in groups of 5 with solid copy before you proceed to the next character.

Remember "Arbeit macht den Meister" or practice makes perfect. If you progress to a level where you are having difficulty with a previously learned character, by all means go back to that particular session number (where the character was introduced) and practice until you have it perfect.

# START LEARNING

Be sure to write down exactly what you hear as you practice.  <u>BE SURE</u> to put the spaces in their proper place so that it becomes a good habit.  Start your training in the following manner.

1.  Start with `0` `1` `#` `1`.  Your copy should look like  F  F  F  F  F . . . . .

2.  After you are comfortable with writing the letter F each time you hear dididahdit, select `0` `1` `#` `2` and write it down so that it looks like  FF  FF  FF  FF . . . . .

3.  Similarly, select `0` `1` `#` `3`, Your copy should resemble  FFF  FFF  FFF  FFF  FFF . . . . .

4.  After proceeding through `0` `1` `#` `4` and `0` `1` `#` `5` in a similar manner, you are ready for the next character.

SESSION TWO

1.  Press `0` `1` `#` `5` and confirm that you can copy solid.  Press # to halt.

2.  Press `0` `2` `#` `1` and write  K  K  K  K  K . . . . .

3.  After you are familiar with writing K each time you hear dadidah, proceed to `0` `2` `#` `2`.  Your copy should now resemble  FK  FK  KF  FF  KK . . . . .

4.  Later progressing through groups of three, four and five you are ready for a break before starting the next character to be learned in a like manner.

Note that you should be sure to follow the <u>exact</u> sequence of character presentation outlined above or you will otherwise be presented with characters not yet learned or practiced.  You will also note that each new character is weighted approximately 50 % of the time against all the previous characters you have learned.

Continue this process through the character sequence shown on page 10.  Be sure you follow the exact sequence shown.  The first 26 characters are alphabetic, the 27th through the 36th characters are numerals.  Following this, the 37th through the 46th characters are common punctuation and amateur radio ciphers.  The 48th through the 61st characters are uncommon punctuation and Spanish/German alpha characters.  For most students, the first 46 characters will fulfill their needs in Morse code operation.

# CHARACTER SEQUENCE CHART

| Session Number | Character | Character Introducion | Groups of 2 | Groups of 3 | Groups of 4 | Groups of 5 |
|---|---|---|---|---|---|---|
| 1. | F | 0 1 # 1 | 0 1 # 2 | 0 1 # 3 | 0 1 # 4 | 0 1 # 5 |
| 2. | K | 0 2 # 1 | 0 2 # 2 | 0 2 # 3 | 0 2 # 4 | 0 2 # 5 |
| 3. | B | 0 3 # 1 | 0 3 # 2 | 0 3 # 3 | 0 3 # 4 | 0 3 # 5 |
| 4. | Q | 0 4 # 1 | 0 4 # 2 | 0 4 # 3 | 0 4 # 4 | 0 4 # 5 |
| 5. | T | 0 5 # 1 | 0 5 # 2 | 0 5 # 3 | 0 5 # 4 | 0 5 # 5 |
| 6. | C | 0 6 # 1 | 0 6 # 2 | 0 6 # 3 | 0 6 # 4 | 0 6 # 5 |
| 7. | Z | 0 7 # 1 | 0 7 # 2 | 0 7 # 3 | 0 7 # 4 | 0 7 # 5 |
| 8. | N | 0 8 # 1 | 0 8 # 2 | 0 8 # 3 | 0 8 # 4 | 0 8 # 5 |
| 9. | W | 0 9 # 1 | 0 9 # 2 | 0 9 # 3 | 0 9 # 4 | 0 9 # 5 |
| 10. | X | 1 0 # 1 | 1 0 # 2 | 1 0 # 3 | 1 0 # 4 | 1 0 # 5 |
| 11. | M | 1 1 # 1 | 1 1 # 2 | 1 1 # 3 | 1 1 # 4 | 1 1 # 5 |
| 12. | D | 1 2 # 1 | 1 2 # 2 | 1 2 # 3 | 1 2 # 4 | 1 2 # 5 |
| 13. | Y | 1 3 # 1 | 1 3 # 2 | 1 3 # 3 | 1 3 # 4 | 1 3 # 5 |
| 14. | U | 1 4 # 1 | 1 4 # 2 | 1 4 # 3 | 1 4 # 4 | 1 4 # 5 |
| 15. | P | 1 5 # 1 | 1 5 # 2 | 1 5 # 3 | 1 5 # 4 | 1 5 # 5 |
| 16. | A | 1 6 # 1 | 1 6 # 2 | 1 6 # 3 | 1 6 # 4 | 1 6 # 5 |
| 17. | J | 1 7 # 1 | 1 7 # 2 | 1 7 # 3 | 1 7 # 4 | 1 7 # 5 |
| 18. | O | 1 8 # 1 | 1 8 # 2 | 1 8 # 3 | 1 8 # 4 | 1 8 # 5 |
| 19. | E | 1 9 # 1 | 1 9 # 2 | 1 9 # 3 | 1 9 # 4 | 1 9 # 5 |
| 20. | R | 2 0 # 1 | 2 0 # 2 | 2 0 # 3 | 2 0 # 4 | 2 0 # 5 |
| 21. | S | 2 1 # 1 | 2 1 # 2 | 2 1 # 3 | 2 1 # 4 | 2 1 # 5 |
| 22. | G | 2 2 # 1 | 2 2 # 2 | 2 2 # 3 | 2 2 # 4 | 2 2 # 5 |
| 23. | N | 2 3 # 1 | 2 3 # 2 | 2 3 # 3 | 2 3 # 4 | 2 3 # 5 |
| 24. | L | 2 4 # 1 | 2 4 # 2 | 2 4 # 3 | 2 4 # 4 | 2 4 # 5 |
| 25. | V | 2 5 # 1 | 2 5 # 2 | 2 5 # 3 | 2 5 # 4 | 2 5 # 5 |
| 26. | I | 2 6 # 1 | 2 6 # 2 | 2 6 # 3 | 2 6 # 4 | 2 6 # 5 |

This completes the alphabet.  Be sure you can copy these accurately and without hesitation before proceeding on the numerals.

| Session Number | Character | Character Introducion | Groups of 2 | Groups of 3 | Groups of 4 | Groups of 5 |
|---|---|---|---|---|---|---|
| 27. | 3 | 2 7 # 1 | 2 7 # 2 | 2 7 # 3 | 2 7 # 4 | 2 7 # 5 |
| 28. | 1 | 2 8 # 1 | 2 8 # 2 | 2 8 # 3 | 2 8 # 4 | 2 8 # 5 |
| 29. | 6 | 2 9 # 1 | 2 9 # 2 | 2 9 # 3 | 2 9 # 4 | 2 9 # 5 |
| 30. | 9 | 3 0 # 1 | 3 0 # 2 | 3 0 # 3 | 3 0 # 4 | 3 0 # 5 |
| 31. | 5 | 3 1 # 1 | 3 1 # 2 | 3 1 # 5 | 3 1 # 4 | 3 1 # 5 |
| 32. | 2 | 3 2 # 1 | 3 2 # 2 | 3 2 # 3 | 3 2 # 4 | 3 2 # 5 |
| 33. | Ø | 3 3 # 1 | 3 3 # 2 | 3 3 # 3 | 3 3 # 4 | 3 3 # 5 |
| 34. | 8 | 3 4 # 1 | 3 4 # 2 | 3 4 # 3 | 3 4 # 4 | 3 4 # 5 |
| 35. | 4 | 3 5 # 1 | 3 5 # 2 | 3 5 # 3 | 3 5 # 4 | 3 5 # 5 |
| 36. | 7 | 3 6 # 1 | 3 6 # 2 | 3 6 # 3 | 3 6 # 4 | 3 6 # 5 |

| # | Character | | | | | |
|---|---|---|---|---|---|---|
| 37. | . Period | 3 7 # 1 | 3 7 # 2 | 3 7 # 3 | 3 7 # 4 | 3 7 # 5 |
| 38. | , Comma | 3 8 # 1 | 3 8 # 2 | 3 8 # 3 | 3 8 # 4 | 3 8 # 5 |
| 39. | ? Question | 3 9 # 1 | 3 9 # 2 | 3 9 # 3 | 3 9 # 4 | 3 9 # 5 |
| 40. | / Slash | 4 0 # 1 | 4 0 # 2 | 4 0 # 3 | 4 0 # 4 | 4 0 # 5 |
| 41. | -- Double Dash | 4 1 # 1 | 4 1 # 2 | 4 1 # 3 | 4 1 # 4 | 4 1 # 5 |
| 42. | AS | 4 2 # 1 | 4 2 # 2 | 4 2 # 3 | 4 2 # 4 | 4 2 # 5 |
| 43. | AR | 4 3 # 1 | 4 3 # 2 | 4 3 # 3 | 4 3 # 4 | 4 3 # 5 |
| 44. | SK | 4 4 # 1 | 4 4 # 2 | 4 4 # 3 | 4 4 # 4 | 4 4 # 5 |
| 45. | BK | 4 5 # 1 | 4 5 # 2 | 4 5 # 3 | 4 5 # 4 | 4 5 # 5 |
| 46. | KN | 4 6 # 1 | 4 6 # 2 | 4 6 # 3 | 4 6 # 4 | 4 6 # 5 |

The remainder of the characters are optional.  Their usage in amateur radio is limited.

47.       - Hyphen
48.       ! Exclamation
49.       Understood
50.       ; Semicolon
51.       : Colon
52.       ( ) Parenthesis
53.       ' Apostrophe
54.       " Quotation
55.       CH/Spanish
56.       Ñ Spanish
57.       É È
58.       Ö German
59.       Ü German
60.       Ä German
61.       Á À Â  Spanish

Much ham band Morse makes use of a "code shorthand".  This is practiced by virtually all hams.  For example, the following is typical of what you might copy. "hrd ur call es gave shout - ur sigs 579 hr".  That brief copy really means "I heard you calling so I answered you.  Your signals are 5 readability, 7 strength an 9 tone here."

Morse code is like learning a foreign language.  The more you use it the more proficient you become.  If you learn the Morse code and then fail to use it, you will have to work at attaining your prior level of proficiency by practice and use.
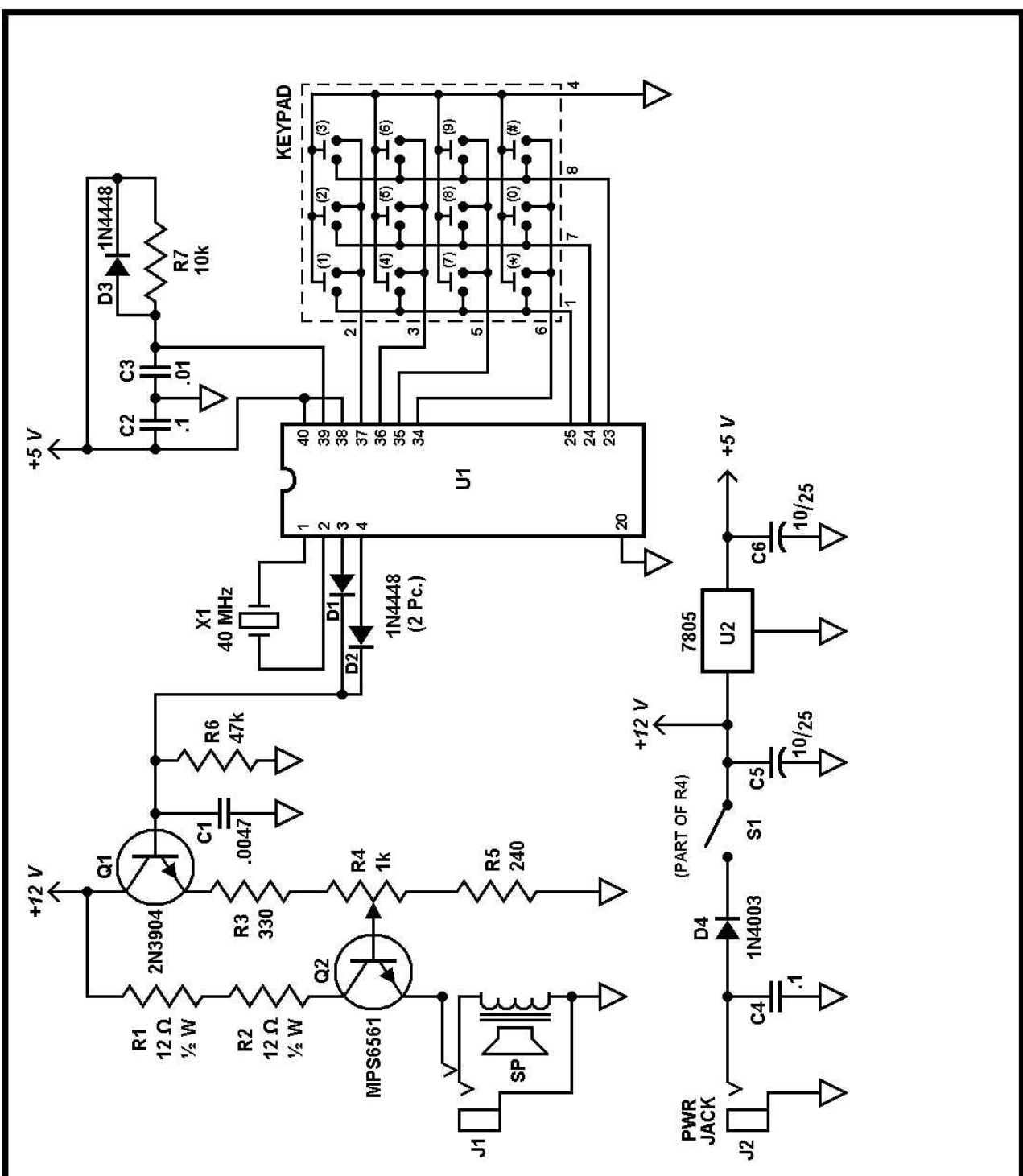
## LEARNING TO SEND MORSE CODE

No mention has been made about learning to send Morse code.  Sending is much easier to learn.  Your sending should try to duplicate the way the characters are presented by the BT-1.

The recommended means of learning how to send in the past has always started with a hand key.  However some people just cannot seem to operate a hand key proficiently no matter how hard they try.  People who have gone directly to a Morse electronic keyer and paddle set have done so well, that previous opinions about starting with a hand key are in serious question.

Regardless of the type key or keyer used, it is very important that the student develop the proper sending rhythm so that his fist is easily read by other stations on the air.  A good fist and operating practices can make more difference than an expensive transmitter and antenna system for establishing contacts and adverse conditions.

AEA is noted for manufacturing the world's most sophisticated line of self-contained computerized Morse code keyers that are simple to operate and low in cost.  We also manufacture the MBA-RO code reader that is an excellent device for correcting and improving one's fist.  Even skilled CW operators find they can improve their spacing of characters and words tremendously through the use of an MBA-RO which serves as an impartial judge in monitoring one's sending.  More information on the MBA-RO and our keyers is available in the current AEA Product Catalog.

KEYPAD

(3) (6) (9) (#)
(2) (5) (8) (0)
(1) (4) (7) (*)

1N4448
D3
R7 10k
C3 .01
C2 .1
+5 V

U1
40 39 38 37 36 35 34 25 24 23
1 2 3 4 20

X1 40 MHz
D1 D2 1N4448 (2 Pc.)

R6 47k
C1 .0047
Q1 2N3904
+12 V
R3 330
R1 12 Ω ½ W
R2 12 Ω ½ W
Q2 MPS6561
R4 1k
R5 240
SP
J1

+5 V
C6 10/25
U2 7805
+12 V
C5 10/25
S1
(PART OF R4)
D4 1N4003
C4 .1
PWR JACK
J2

dwn  HARTLEY
date  6-3-82
dwg no  012-010
sht 1  of 1
rev  NEW

ADVANCED ELECTRONIC APPLICATIONS INC.

SCHEMATIC  BT-1

# SUMMARY OF PROGRAMMING COMMANDS

| COMMAND | PRESS | WHERE NN EQUALS |
|---|---|---|
| Tone Increase | `*` `1` (hold) | |
| Tone Decrease | `*` `2` (hold) | |
| Solid Tone (For sending practice) | `*` `5` ( `#` halts) | |
| Character Speed Setting | `*` `6` `N` `N` | 18 to 99 WPM (Programmed to start at 20 WPM) |
| Delay between letters or groups | `*` `7` `N` `N` | 0.1 to 9.9 seconds (Programmed to start at 3.0 seconds.) |
| One Character Only | `N` `N` `#` `1` | Character (trial) number |
| Random number of characters in groups | `N` `N` `#` `0` | Character (trial) number |
| Specific number of characters | `N` `N` `#` `N` | NN = Character (trial) number<br>N = 2 to 9 characters in groups (student should be competent with groups of five before adding new characters) |
| New characters are weighted 50 % of the time against all previous characters learned (which are weighted equally) | `N` `N` `#` `N` | Same as above |
| Halt training session or mode | `#` | |