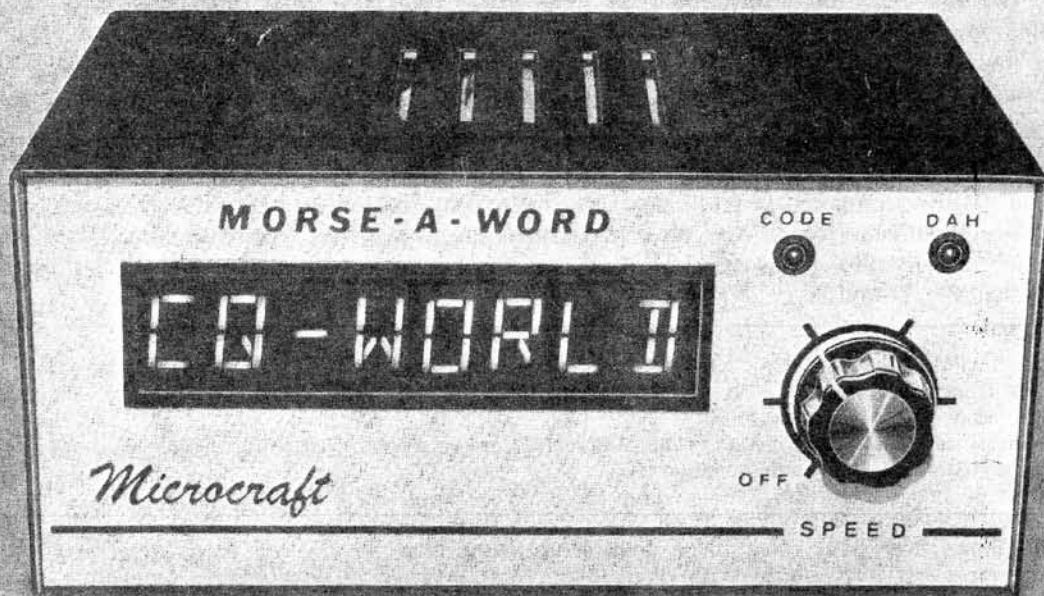# Introducing
Microcraft's New
MORSE-A-WORD II

CONVERTS DITS AND DAHS TO EIGHT CHARACTER
ALPHANUMERIC LED DISPLAY – AUTOMATICALLY!

* ALL SOLID STATE COMPONENTS

* ADVANCED SIGNAL PROCESSING

* EIGHT CHARACTER DISPLAY

* NO MECHANICAL NOISE

* BUILT–IN CODE PRACTICE OSCILLATOR

* NO EXPENSIVE CRT NEEDED

* 5 TO 35 WPM SPEED

* COMPACT SIZE . . . FITS ANYWHERE

* LOW COST

* IDEAL FOR BEGINNERS AND
  SEASONED AMATEURS

Now you can literally sit back and read messages sent in International Morse even if you do not know the code. The fabulous new MORSE–A–WORD automatically converts incoming dits and dahs from communications receivers or telegraph key into alphanumeric symbols for display on a multicharacter LED readout. The display operates in moving - character fashion to make it easy to read the messages.

With the MORSE–A–WORD, SWLs can listen in on commercial and amateur code traffic. For beginners as well as veteran radio amateurs, the MORSE–A–WORD makes an excellent operating and code practice aid.

Microcraft Corporation
P. O. Box 513, Thiensville, Wisconsin 53092
Telephone: (414) 241-8144

The reliable conversion of Morse code radio signals into alphanumeric characters is not easy. Signal fading, atmospheric and man-made noise, and human errors in sending present major difficulties. Consequently, no device can perfectly decode all received signals all of the time. The highly sophisticated MORSE—A—WORD circuit has been designed to provide a high degree of accuracy, however, and will do a very creditable decoding job in far from ideal situations.

Connecting the MORSE—A—WORD to your receiver is easy. It may be connected directly to the two wires on your receiver's loudspeaker or the headphone jack or external speaker jack. It is designed to work with any receiver although it should be noted that a good receiver and a good antenna will maximize performance.

The MORSE—A—WORD is easy to operate. The setting of the front panel speed control is the only adjustment that must be made and only a rough setting is required. The MORSE—A—WORD has a sensitive input stage and highly selective filter to reject noise. Because of the narrow filter, some care is required in tuning in a signal. With the signal properly tuned in there will be audio from the MORSE—A—WORD's internal speaker and the CODE LED will flicker in time with the incoming code. All that is required is to adjust the SPEED control until the DAH LED glows only when dahs are sent, not when dits are sent. The main LED display will now read out the incoming characters. There is a word space switch that may be used when receiving machine sent code.

For code practice sessions connect your telegraph key to the KEY input and adjust the SPEED control to the approximate sending speed. (Many electronic keyers will also work fine particularly those with a reed relay output. Specific details of connection depend on the keyer used.) The large characters can be easily read from several feet away. The MORSE—A—WORD is excellent for code practice groups and clubs. Code practice tapes or off the air CW recordings may also be played back through the MORSE—A—WORD.

SPECIFICATIONS

Speed Range: 5 WPM to 35 WPM
Speed Adjust: Front panel control
Speed Margin: 50 percent of speed setting
Morse Characters: Letters A-Z; Numbers 0-9; Question Mark; Comma; Period; Slant; $\overline{AS}$; $\overline{BT}$; $\overline{AR}$; $\overline{KN}$
Readout: Eight character, 14 segment alphanumeric
Readout Type: Dual character IEE 3785R or equivalent, 0.312 inch wide x 0.5 inch high
Receiver Input: RCA jack, 0.05 V minimum, 800 Hz center frequency, 10 K ohms
Code Practice Input: RCA jack, ground to key oscillator/internal speaker
Power Requirements: 117 VAC, 60 Hz, 20W (220 VAC, 50 Hz optional; $6.00 extra; User supplies own cord and plug.)
Dimensions: 7.375 inch wide x 5.75 inch deep x 3.375 inch high (18.732 x 14.6 x 8.57 cm.)
Weight: 4 lbs. (1.82 kg.)
Limited 90 day warranty

MODEL NO. AND DESCRIPTION		PRICE	S & H
Model MAWK-4*	MORSE-A-WORD Kit with 4 character readout	$149.95	$5.00
	(Can be expanded to eight character later by the addition of 2 dual 3785R's)		
Model MAWK-8*	MORSE-A-WORD Kit with 8 character readout	169.95	5.00
Model MAWF	MORSE-A-WORD factory wired and tested	249.95	5.00
*Kit is suggested for intermediate to advanced builders only.			

We also offer the following parts for experimenters and do-it-yourselfers.

Model EPK-M	MORSE-A-WORD essential parts kit (main and display pc boards, preprogrammed ROM, all ICs, sockets, resistors, capacitors, one dual-alphanumeric display and manual)	99.95	3.00
Model PCBK-M	MORSE-A-WORD pc board set (main, display and power)	24.00	2.00
Model M-M	MORSE-A-WORD Construction Manual	3.50	1.50
Model Prom-M	MORSE-A-WORD preprogrammed 1702A Prom	10.00	1.50
Model Cab-M	MORSE-A-WORD cabinet including hardware and bezel	17.00	2.00
Model DSP-1	IEE 3785R dual alphanumeric 14 segment LED display with data sheet	9.00	1.50
Model TR-1	Transformer; 220 volt, 50/60 Hz; secondary 12.6 VCT @ 2 amp.; used to convert MORSE-A-WORD from 110 V. to 220 V.	6.00	3.00
Model T-M1	MORSE-A-WORD practice tape	4.95	1.50

S & H — SHIPPING AND HANDLING CHARGES

For Continental United States add charges as noted. Wisconsin residents add 4% Wisconsin State Sales Tax.
We ship worldwide and will be pleased to quote charges for shipment outside of the Continental United States.

TERMS

Payment may be made with a certified check, money order, bank draft, MasterCard, VISA, and personal checks (allow extra time for personal checks).

Microcraft Corporation

Thank you for your inquiry regarding our product the
MORSE-A-WORD morse code reader, the RTTY READER radioteletype
reader and/or our latest product the affordable MORSE-A-KEYER
keyboard.

We are enclosing the MORSE-A-WORD flier for your perusal
and hope that it will answer many of the questions you might
have. For further information, you may wish to note the March
and April 1979 issues of Popular Electronics where the MORSE-
A-WORD was featured as a construction article.

A flier on the exciting, new RTTY READER is also attached.
For further information, please see the November and December
1979 issues of Popular Electronics where the RTTY READER was
also featured as a construction article.

Microcraft Corporation's affordable CW keyboard, the
MORSE-A-KEYER is now available. It features a professional
53 key keyboard, rugged steel case, monitor speaker, 16 char-
acter buffer and reed relay output. The MORSE-A-KEYER is
available as a partial kit, complete kit or factory wired and
tested at very competitive prices.

A Price List of all items available through Microcraft
Corporation is printed on the reverse side of this sheet.

Sincerely,

Dr. George R. Steber WB9LVI
President

GRS/gz
Enc.

Innovative Electronics

Microcraft Corporation

Price List
(Prices subject to change without notice.)

March 1980

MORSE CODE READER	No.	Price	S&H
1. MORSE-A-WORD kit with 4 character readout..........	MAWK-4	$149.95	$5.00
2. MORSE-A-WORD kit with 8 character readout..........	MAWK-8	169.95	5.00
3. MORSE-A-WORD factory wired and tested..............	MAWF	249.95	5.00
4. MORSE-A-WORD essential parts kit (main and display pc boards, preprogrammed ROM, all ICs, sockets, resistors, capacitors, one dual-alphanumeric display and manual)	EPK-M	99.95	3.00
5. MORSE-A-WORD pc board set (main, display and power).	PCBK-M	24.00	2.00
6. MORSE-A-WORD Construction Manual...................	M-M	3.50	1.50
7. MORSE-A-WORD preprogrammed 1702A Prom..............	Prom-M	10.00	1.50
8. MORSE-A-WORD cabinet including hardware and bezel...	Cab-M	17.00	2.00

RADIOTELETYPE READER	No.	Price	S&H
1. RTTY READER kit (complete)........................	RRK	189.95	5.00
2. RTTY READER factory wired and tested..............	RRF	269.95	5.00
3. RTTY READER pc board set (main, display and power)..	PCBK-R	24.00	2.00
4. RTTY READER preprogrammed 1702A Prom..............	Prom-R	10.00	1.50
5. RTTY READER Construction Manual...................	M-R	4.00	1.50
6. RTTY READER alignment tape........................	RT-1	7.00	1.50
7. RTTY READER cabinet including hardware and bezel....	Cab-R	17.00	2.00

MORSE KEYBOARD KEYER (available approx. May 1, 1980)	No.	Price	S&H
1. MORSE-A-KEYER kit (complete).......................	MAK-K	159.95	5.00
2. MORSE-A-KEYER factory wired and tested.............	MAKF	205.00	5.00
3. MORSE-A-KEYER essential parts kit (pc board, manual and parts--user supplies ASCII keyboard, 5V @ 120 MA power supply, case and miscellaneous hardware)......	EPK-K	69.95	3.00
4. MORSE-A-KEYER pc board and schematic...............	PCB-K	12.50	2.00
5. MORSE-A-KEYER Instruction Manual...................	M-K	3.00	1.50
6. MORSE-A-KEYER preprogrammed 1702A Prom.............	Prom-K	10.00	1.50
7. MORSE-A-KEYER cabinet.............................	Cab-K	24.95	3.00

MISCELLANEOUS	No.	Price	S&H
1. * ASCII Keyboard kit model 753 with metal mounting frame...	AK-K	69.95	3.00
2. * ASCII Keyboard metal cabinet; prepunched for ASCII Keyboard model 753.................................	Cab-AK	18.95	3.00
3. * ASCII Keyboard kit and metal cabinet combination..	AK-K&C	84.95	3.00
4. IEE 3785R dual alphanumeric 14 segment LED display with data sheet....................................	DSP-1	9.00	1.50
5. Transformer; 220 volt, 50/60 Hz; secondary 12.6 VCT @ 2 amp.; used to convert MORSE-A-WORD or RTTY READER from 110 V to 220 V.........................	TR-1	6.00	3.00
6. Morse code practice tape..........................	T-M1	4.95	1.50

* available approximately May 1, 1980.

S&H--SHIPPING AND HANDLING CHARGES

For Continental United States add charges as noted. We ship worldwide and will be pleased to quote charges for shipment outside of the Continental United States.

TERMS

Payment may be made with a certified check, money order, bank draft, Master Charge, VISA and personal checks (allow extra time for personal checks). Wisconsn residents add 4% Wisconsin State Sales Tax.

INTRODUCTION. The MORSE-A-WORD is an advanced design code reader that is ideally suited for learning Morse code. It can be used with a hand-type telegraph key and built-in sidetone oscillator, code practice tape recorder, or it can be connected to a radio receiver loudspeaker for "off the air" reception.

SPECIFICATIONS.
Speed Range: 5 WPM to 35 WPM, adjustable with front panel control
Morse Characters: Letters A-Z; Numbers 0-9; Question Mark; Comma; Period; Slant; and special characters: AS; BT; AR; KN
Readout: Eight character, 14 segment alphanumeric dual character IEE 3785R or equivalent, 0.312 inch wide x 0.5 inch high
Receiver Input: RCA jack, 0.05 V minimum, 10 K ohms, internal cw filter, 800 Hz center frequency, built-in monitor speaker.
Code Practice Input: RCA jack, ground to key oscillator/internal speaker
Power Requirements: 117 VAC, 60 Hz, 20 W (220 VAC, 50 Hz optional)
Dimensions: 7.38 in. x 5.75 in. x 3.38 in. (18.73 x 14.6 x 8.57 cm.)
Weight: 4 lbs. (1.82 kg.)
Warranty: LIMITED 90 DAY WARRANTY (see following page)

CONNECTION OF MORSE-A-WORD TO RECEIVER. In order to have the MORSE-A-WORD decode signals from a radio receiver, a connection must be made from the loudspeaker, external speaker jack or earphone jack of the receiver to the "RECEIVER" jack (RCA type) on the rear panel of the MORSE-A-WORD. In the event that your receiver does not have a jack, you may connect the MORSE-A-WORD directly to the two wires of the receiver speaker. It is recommended that you install a jack on your receiver for this purpose. The figure below shows a typical connection.
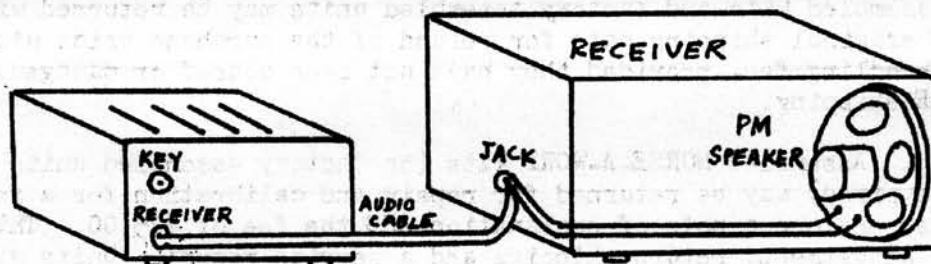
Typical connection of MORSE-A-WORD to receiver speaker.

OPERATION OF MORSE-A-WORD--TUNING STATIONS. In order for the MORSE-A-WORD to function properly, a connection to the receiver speaker must be made as noted in the previous section. The receiver should be in the CW or "SSB" mode during reception. When a CW station is heard, the receiver should be carefully tuned until the code LED on the front panel is brightest and the sound is loudest on the MORSE-A-WORD monitor speaker. The MORSE-A-WORD has a selective circuit so some care and patience is required in tuning in a CW station. After some practice, you will find it easy to tune CW stations. If the CW station drifts out of tune, you may have to re-adjust your receiver tuning occasionally. Use only a normal or lower volume setting to reduce noise pickup.

Once the signal is tuned in properly, you may have to adjust the front panel SPEED control to get correct copy. Do not expect perfect copy as many CW stations utilize abbreviations or special codes. Also, radio reception of CW is fraught with many problems due to poor sending/receiving conditions, operator errors and signal fading...so do not expect perfect copy on every station tuned in. However, you should be able to copy a large number of stations with some care and diligence.

2-21-80
4-80

CODE PRACTICE TAPES. You can practice your morse code by playing pre-recorded tapes through the MORSE-A-WORD. Connect the MORSE-A-WORD to your recorder's speaker using the external speaker jack or directly to the two wires of your recorder's speaker.

TELEGRAPH KEY INPUT--CODE PRACTICE. The MORSE-A-WORD makes a fine code practice device when used with a telegraph key or keyer. The jack on the back panel labeled "KEY" is used for this purpose. Grounding this jack should produce a tone from the MORSE-A-WORD. In other words, the "ground" corresponds to key-down and "open" corresponds to key-up.

LIMITED 90 DAY WARRANTY.
Kits: All parts used in the MORSE-A-WORD are warranted to be free from defect for a period of 90 days. Parts found to be defective within this period will be replaced promptly without charge upon receipt for inspection at the factory. DO NOT SEND entire unit. Send defective part only with a note of explanation. Microcraft Corporation cannot be held responsible for faculty workmanship during assembly or damage/harm caused by construction or installation errors. Units misused or modified are not covered by this warranty.
Factory Assembled Units: All parts and labor are warranted for a period of 90 days. Should a difficulty occur, please call or write us. Some situations are minor and can be handled by a letter or call. Should the unit have to be returned to us for servicing, pack carefully, insure and enclose a note of explanation. Microcraft Corporation will service the unit at no charge and pay for the return shipping. Units misused or modified nullify this warranty and require a $25.00 fee for service. (See Repair Service.)

REFUNDS. Unassembled kits and factory assembled units may be returned within 10 days of their original shipping date for refund of the purchase price minus the shipping and handling fee--provided they have not been abused or damaged. Contact factory BEFORE shipping.

REPAIR SERVICE. Assembled MORSE-A-WORD kits (or factory assembled units whose warranty has expired) may be returned for repair and calibration for a fee of $25.00. Please enclose a note of explanation AND the fee of $25.00. This covers minor repair, adjustment, return shipping and a service report. Units with major defects will be subject to an additional charge. Owners will be notified before additional work is performed. If repairs are minor, a refund will be issued.

Units assembled with paste flux, acid core solder, or solder guns will not be accepted. Microcraft Corporation reserves the right to refuse repair on unreasonably constructed units.

Pack all returns adequately and insure for your protection.

SHIPPING ADDRESS: For UPS: Microcraft Corporation
9957 N. River Road
Mequon, WI 53092

For US Post Office: Microcraft Corporation
P. O. Box 513
Thiensville, WI 53092.

System Analysis. Referring to the schematic, the audio output of a radio receiver is applied to an active bandpass filter whose response is centered at 800 Hz. The output of the BP filter is rectified and further processed by an RC network and decoder. This decoder generates a low voltage when the transmitter's telegraph key is down and a high voltage under key-up conditions. A low-pass filter smooths the output of the decoder.

Further signal processing is performed by a Schmitt trigger which "squares up" and inverts the signals applied to it. At the output of the Schmitt trigger, a logic 1 corresponds to a key-down condition, and a logic zero to a key-up condition. Signal processing is now complete, and clean, TTL-compatible Morse signals are available to the digital decoding circuits.

The digitized Morse is first applied to two counters. One counter, but not both, will be enabled to count, depending on whether the key is up or down. These circuits count at a rate dependent on the frequency of an adjustable code-speed clock. The clock frequency should be adjusted to match the speed of the incoming code, but this adjustment can be off by as much as $\pm$ 50% and still result in solid copy.

Whenever the key-up counter detects an element space, a condition that occurs when it counts less than eight clock pulses, it serially transfers a logic 0 or 1 to the next stage, an eight-bit serial/parallel shift register. The latter is always initialized with the binary word 00000001 so that the beginning of each Morse character will be uniquely decodable. Whether a logic 1 or 0 is transferred to the shift register in subsequent steps is determined by the condition of the key-down counter, which distinguishes between dits and dahs. If the key-down counter counts more than seven clock pulses, the code element is a dah and a logic 1 is transferred to the shift register. Otherwise, it is a dit and a logic 0 is transferred to the shift register.
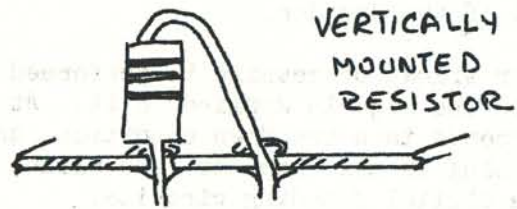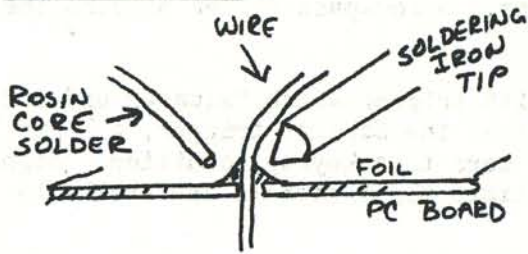
This procedure continues until the key-up counter detects a space longer than an element space (longer than seven clock periods), whereupon the circuit determines that a complete character has been sent. The unique binary code present in the shift register can now be transferred to a latch for decoding and display. However, if the key-up counter continues to count more than 15 clock pulses, this is interpreted as a space between words and a blank character is inserted in the latch after the last character is received. Because many CW stations do not send word spaces, the circuit contains a switch to defeat the word-space feature.

A 16-element RAM (in which only 8 elements are used) stores the Morse characters obtained from the latch. The RAM is synchronized to the eight-character display by an address counter and a ROM which decodes the Morse characters for display. A standard multiplexed circuit is employed for display of stored characters, which appear on IEE 3785R two-character LED displays. The circuit has been designed to provide a moving-character type of display which introduces new characters at the right-most position and moves each of the existing characters to the left, one position at a time, as characters are received. It takes just a few minutes to accustom yourself to reading this type of presentation. Once you get the hang of it, reading code is a breeze.
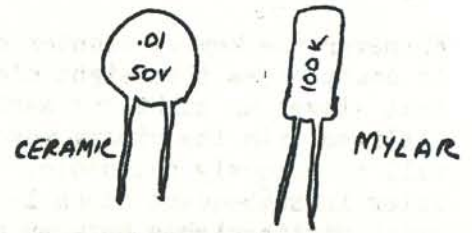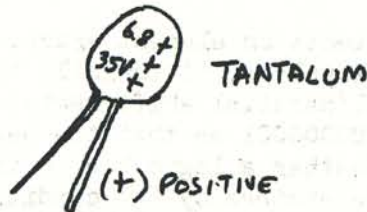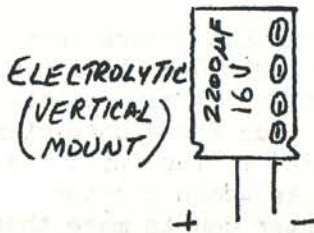
The MORSE-A-WORDs main decoder circuit power requirements are 750 mA at +5 volts and 20 mA at -8.2 volts. The display circuit also calls for 8 volts at approximately 100 mA.

CONSTRUCTION NOTES

SOLDERING

WIRE
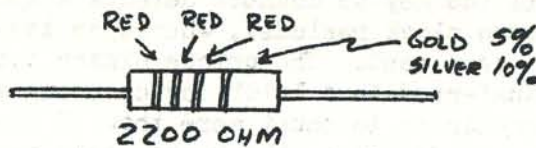SOLDERING IRON TIP
ROSIN CORE SOLDER
FOIL
PC BOARD

VERTICALLY MOUNTED RESISTOR

CAPACITORS

ELECTROLYTIC (VERTICAL MOUNT)
2200uF 16V
+ −

6.8+ 35V+
TANTALUM
(+) POSITIVE

.01 50V
CERAMIC

100K
MYLAR

NON-POLARIZED

TYPICAL VALUES
0.2 uF (204z)
0.01 uF (103K100H)
0.1 uF (1H104K)

OBSERVE PROPER POLARITY

RESISTORS

CARBON FILM

RED RED RED
GOLD 5%
SILVER 10%

2200 OHM

DIODES

LED
CATHODE
FLAT EDGE

BAND (OR BANDS)
CATHODE
ANODE
SIGNAL DIODE

IC's

PIN 1
4(OR 7,8,12 20)

8 (OR 14,16,24,40)
5 (OR 8,9,13,21)

TRANSISTORS

(BOTTOM VIEW)
SOURCE
DRAIN
GATE

2N3904 OR 2N2222

C
E B
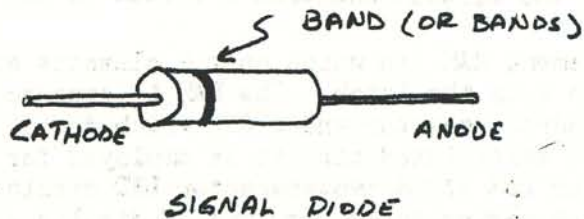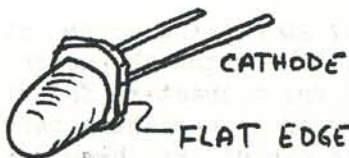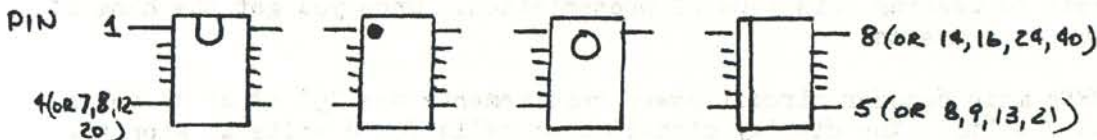
CONSTRUCTION OF THE MORSE-A-WORD II KIT

Introduction: Use a small tipped soldering iron of 30 to 50 watts for assembly. Do not use a soldering gun! Use a good grade of rosin core solder. Do not use acid core solder or any additional solder flux. Good soldering techniques are important! Each solder joint should be shiny and the solder should surround the component lead wire. Do not just dab on some solder but allow the solder to flow evenly and smoothly around the connection. However, do not use excessive heat or solder and take care not to inadvertently create solder bridges between adjacent foils.

There are three PC (printed circuit) boards in the MORSE-A-WORD—a main board, display board, and a power supply board. The main and display boards have plated through holes which eliminate the need to solder to the top of the board. This, however, makes removing a part difficult, so follow the directions closely and check your work. It is recommended that the main and display boards be held in a vertical position while being soldered to prevent solder from flowing to the top side of the board.

Special Note--PLEASE READ. The MORSE-A-WORD kit is intended for the intermediate to advanced kit builder. Its construction requires good workmanship and attention to detail. Please look over the entire construction manual before proceeding. If you feel the job is beyond your capabilities, you may wish to return the unassembled kit to Microcraft Corporation for a refund (less shipping and handling charges), as this will save us both difficulties later on. In case of minor problems, Microcraft Corporation does offer a repair service. Consult the appropriate section of this manual for details.

General Instructions. Look over the entire construction manual.before continuing. Check off each step as it is completed. The main components of the kit are the chassis, front panel, top cover, main PC board, display board and power supply board. Construction will begin with the main PC board and end up with final wiring of the switches on the chassis/front panel. Note that to conserve space some of the components on the PC boards are installed upright. Save scrap leads as some of them will be used later for jumper wires.

Main PC Board. (Main Decoding Circuit) This is a double sided board with plated through holes and only needs to be soldered on the bottom. Refer to the diagram in this manual for parts placement as well as silk screening on the board itself.

1. Install all sockets and solder. (The ICs will be installed later.)
2. Install all fixed resistors and solder.
3. Install all capacitors and solder. Make sure you distinguish between ceramic, tantalum and mylar (polyester) capacitors. Be sure to observe polarity markings on the tantalum capacitors. (See Construction Notes for examples.)
4. Install the diodes on the board and solder. Make sure the banded end (cathode) corresponds to the layout.
5. Install the transistor and solder. Observe correct orientation before soldering.
6. Install the trimmer resistors (PC trimpot) and solder. Sometimes the trimmers are hard to solder. Before installing, gently sand or file the trimmer leads to help the solder form a better (bond) connection.
7. Install all of the integrated circuits on the board in their corresponding sockets being very careful to install each in its correct position and with the correct orientation. (Note that all of the ICs except the 1702A PROM have their notches (pin 1) towards the right.)
8. Solder lengths of insulated wire to the board at appropriate locations for connection to the power supply and off board switches and LEDs. The lengths should be long enough to allow removal of the power supply, front panel, and top cover for

servicing. The lengths can be 8 to 10 inches for now and trimmed to the correct length later. The specific wires needed and a suggested color code is as follows:

a. Ground wires (3 wires) LEDs GND, RCA JACK GND, and POWER SUPPLY GND. (color green)
b. +5 volt supply wire (color red)
c. +8 volt wire (color violet)
d. -8.2 volt (-9V) supply wire (color black)
e. Speaker wires (2 wires) (color yellow)
f. LEDs (2 wires) LD and CD (color orange) *Heavy white*
g. RCA JACKS (2 wires) RCVR and KEY (color white)
h. SPEED, front panel control (R35), (2 wires), (color blue). (Note these two wires will later on be connected on the left side of potentiometer R35.)
i. Word Space switch (WS), (2 wires), (color brown).

The wires should be stripped 1/4 inch on the end inserted in the top of the board and soldered on the bottom. The opposite end of the wires should be similarly stripped for connection to the off board components later on.

9. Give the board a good final inspection. Check for possible solder bridges and poor solder connection. Trim off all excess lengths. This completes construction of the main PC board. Set it aside for now and continue with the display board.

Display PC Board. (Display circuit) This is a double sided board with plated through holes and only needs to be soldered on the bottom. Refer to the diagram in this manual for parts placement as well as silk screening on the board itself.

1. Install the 4 (four) IC sockets and solder. (The ICs will be installed later.)
2. Install the Molex Soldercons for DISP1 through DISP 4. The Soldercons should be cut into strips of 9 (nine), inserted into the plastic nest, inserted into the top of the board, and soldered on the bottom of the board. After soldering, the top connecting piece of the Soldercon may be bent and broken off. Some care should be used in lining up the Soldercons before soldering toinsure a good fit for the IEE 3785R displays.
3. Install the resistors on the board and solder. Note that they are installed in an upright position.
4. Install the ceramic capacitors on the board and solder.
5. Install solid wire jumper wires in the holes marked, H,C,P,G,D,J,K,U,V,X,Y,Z,A, B F and E. The jumpers are made from scrap leads (about 1/2") saved from components. They should be bent in the shape of an "L" and installed in the top (front) of the board and soldered on the bottom. These jumpers will mate the display board to the main board. The jumpers should extend parallel to the display board and point downward.
6. Install the integrated circuits IC1, IC2, IC3, and IC4 in their sockets in the proper orientation.
7. Carefully install the IEE3785R displays in the Molex Soldercons observing the proper orientation, making sure all of the leads are properly inserted, and seeing that there are no shorts between adjacent leads. If the leads on the 3785R displays are too long, trim them to the necessary length. Check photo of front panel for proper orientation.

8. Give the board a good visual inspection. Check for possible solder bridges and poor solder connections. Trim off all excess lead lengths. This completes construction of this PC board.

Mating the Main and Display PC Boards: The main PC board and the display PC board must be connected together. The solid wire jumpers previously soldered to the display board are for this purpose. (See photo of front panel.)

1. Insert the solid wire jumpers from the display board to the corresponding holes on the main PC board. The display board should be at right angles to the main board. With the solid wires inserted into the proper holes on the main board, push the display board down until it is in contact with the main board. Hold it in position and solder the jumper leads on the bottom of the main board. Trim off excess lead lengths.
2. This completes the mating of the main and display boards.

Power Supply PC Board: The power supply PC board is a single sided board. The components are mounted on the top and soldered on the bottom. There are extra holes in the PC board for extra components as used with another project. Ignore them for this project.
1. Install the resistors R1 and R2 and solder.
2. Install the diodes Z1 and Z2, observing the correct orientation of the banded end, and solder.
3. Install the bridge rectifier RECT1 noting the "+" sign and solder.
4. Install the fuse clips and solder.
5. Install the heat sink and Q1 with a 4-40 screw and nut. Insert the leads of Q1 into the appropriate holes and solder. Nut should be on top side of board.
6. Install the electrolytic capacitors and solder. It is extremely important to observe the correct polarity markings on these capacitors as well as correct voltage ratings. Do not mix them up.
7. Install the transformer using 2 (two) 6-32 screws. Put 2 (two) nuts on each of the screws on the bottom side of the board as these will be used for standoffs when the board is mounted in the cabinet. Trim and strip the leads on the transformer and solder in the appropriate holes.
8. Install 1 (one) 6-32 screw in the remaining hole (above Q1) and fasten with 2 (two) nuts. This will be used as the third standoff for mounting the board in the cabinet.
9. Install (solder) 2 (two) lengths of insulated stranded wire to the points marked A and S for connection to the power ON/OFF switch. The wires should be about 10 inches long and twisted together. Strip the opposite ends approximately 1/4". The color BLACK is suggested.
10. Install the fuse in the fuse clips.
11. The board is now ready for testing. A DC voltmeter is required for this test.
12. Temporarily connect the ends of the switch wires together and cover with electrical tape to prevent shock. Then temporarily solder the line cord to the board at the points marked A and A. Remember there will be 117VAC at the fuse so keep your hands away from this part of the board.
13. Connect the line cord to 117VAC, 60HZ and check the voltages of the power supply. This should be done quickly (within 5 minutes) so that the zener diodes do not overheat. The voltages will be slightly high. Typical values are: +5 volt terminal ≈ 5.3 volts; +8 volt terminal ≈ 9 volts; -8.2 volt terminal ≈ -8.2 volts.
14. Give the board a good visual inspection. Check for solder bridges and poor solder connections. Trim excess lead lengths. The power supply board is now complete and tested. Remove the line cord (unsolder) from the board and set the board aside for now.

Cabinet and Chassis: The cabinet consists of three parts—the chassis, the front panel, and the top cover.
1. Install the 4 (four) plastic PC board standoffs in the four holes in the chassis.
2. Install the loudspeaker in the top cover (on the side) using the 4-40 screws (black) provided.
3. Install the speed control R35 with associated power switch on the front panel.
4. Install the 2 (two) LEDs in the front panel for CODE and DAH functions. They

are installed by first placing the black plastic insert into the panel hole, inserting the LED, and pushing on the plastic band to secure it. Bend and connect the cathodes of the LEDs together and solder after installation. (See photo.)
5. Attach the red plastic bezel to the inside of the main cutout in the front panel. You may use 5 minute epoxy or other similar adhesive. Some people attach it with pieces of black electrical tape, taped along each of the edges--but we feel that this is not a permanent attachment. Be careful not to scratch the plastic as this will detract from the overall appearance of the MORSE_A_WORD

Final Assembly: All of the previously assembled PC boards are now ready to be assembled together as one unit. Be very careful when wiring all the components together to avoid errors.

1. Install the main PC board in the chassis on the 4 (four) previously installed standoffs. Press down on the board until it clicks into place.
2. Insert the line cord in the appropriate chassis hole and solder it to the power supply board.
3. Solder the power supply wires from the main PC board to the power supply board. This includes the +5 volt, +8 volt, -8.2 volt and ground wires. It is extremely important that these wires are correctly wired. Allow sufficient slack in the wires so the power supply can be removed for servicing.
4. Install the power supply board on the rear of the chassis (in a vertical position) by pushing the 3 (three) 6-32 screws on the board into the chassis. (Remember: There should have been 2 nuts on each of the screws on the bottom of the power supply board to act as standoffs.) Make sure there is enough clearance between the underside of the power supply PC board and the chassis to avoid short circuits. (All leads on the bottom of the PC board should be clipped short.) With the board in proper position, attach it with 3 (three) 6-32 nuts and lock washers on the rear of the chassis.
5. Push several inches of the line cord into the chassis for slack and install the strain relief.
6. Connect the appropriate wires from the main PC board to the rear panel jacks and switch and solder.
7. Attach the front panel to the chassis using the sheet metal screws.
8. Connect the power supply switch wires to the switch (PSW) on the back of R35 on the front panel. Solder.
9. Connect the appropriate wires from the main PC board to the front panel speed control R35 and the DAH and CODE LEDs and solder.
10. Connect the two remaining wires from the main PC board to the speaker.
11. The unit is now ready for final inspection and alignment. Before proceeding give the unit a good visual inspection for possible shorts, bad solder connections or loose wires.
12. Apply power to the MORSE_A_WORD. Several or all of the dual-character displays should come on. If they don't, disconnect power and go back and thoroughly check for loose wires, cold solder joints, solder bridges or incorrect wiring.

Adjustments. No alignment is required for the MORSE_A_WORD II. There are, however, two trimmer resistors on the PC board that can be adjusted to your preference.
1. Trimmer R23 is a sensitivity adjustment. Normally the wiper arm should be in the 12 o'clock position. To increase the sensitivity to weak stations, turn the trimmer counter-clockwise as viewed on the right-hand side. However, as the sensitivity is increased, your MORSE_A_WORD will become more susceptible to noise. Do not set it farther than the 11 o'clock position or you will greatly increase the bias error in the circuit.
2. Trimmer R24 controls the volume of the built-in monitor speaker. Adjust it to suit your preference.
    To complete your MORSE_A_WORD, attach the top cover with the 2 (two) black sheet metal screws provided.

Use. The MORSE-A-WORD is easy to operate. The setting of the front-anel SPEED control R35 is the only adjustement that must be made, and only a rough setting is required. Keep in mind that the MORSE-A-WORD is sensitive so don't set the receiver audio gain control higher than is necessary. When the receiver is tuned to the center of the filter passband (800 Hz), you should hear audio from the internal speaker and the CODE LED should flicker in time with the incoming code. The passband is only about 100 Hz wide, so some care is required when tuning in a signal.

With the signal properly tuned in, adjust the SPEED control so the DAH LED glows only when dahs are sent, and not dits. The alphanumeric readout LED will now display the incoming characters. If word spaces are desired, make sure the WORD SPACE switch is closed. Only a few amateur stations actually send word spaces, so don't expect perfectly spaced copy unless you are tuned to a station such as W1AW which sends machine-perfect code. Invalid Morse characters will be displayed as blanks.

For code practice sessions, connect your telegraph key to the KEY jack and adjust the SPEED control for the approximate sending speed. You can calibrate your SPEED control using the formula: Speed (WPM) = 0.15f. That is, the code speed in words per minute equals fifteen hundredths of the clock frequency as set by the SPEED control.

An excellent source of code material is amateur station W1AW, operated by the American Radio Relay League. The station transmits several code practice sessions each day, as well as ham news bulletins, propagation forecasts and OSCAR bulletins, all in Morse code, on 3.58, 7.08, 14.08, 21.08 and 28.08 MHz, as well as vhf frequencies. For a complete W1AW operating schedule, send an SASE to ARRL, 225 Main Street, Newington, CT 06111.

PARTS LIST
MAIN DECODING CIRCUIT
C1,C6,C7,C9,C19--0.01 uF Mylar (may be
  marked 103K100H)
C2,C3,C4,C8,C10,C11,C20,C22,C25--0.05 uF disc
C24--22 uF electrolytic (6v or higher)
C5-----22 uF tantalum (voltage,6 V or
  higher)
C12,C13,C18--1 uF tantalum (voltage,6 V
  or higher)
C14,C15,C16,C17--0.2 uF disc (may be marked
  204Z)
C21--27 pF disc
C23--6.8 uF tantalum (voltage,6 V or higher)
The following resistors are 1/4-watt, 5 or
  10% tolerance fixed resistors:
R1--220 ohms (red-red-brown)
R2,R6,R14--1.8 K ohms (brown-gray-red)
R3,R16,R17,R18,R19,R25--10 K ohms (brown-
  black-orange)
R4,R9--15 K ohms (brown-green-orange)
R5,R11--270 K ohms (red-violet-yellow)
R7--470 ohms (yellow-violet-brown)
R8,R13,R15--330 ohms (orange-orange-brown)
R10,R22--47K ohms (yellow-violet-orange)
R12--680 ohms (blue-gray-brown)
R20,R29,R30,R31,R32,R33,R34--1 K ohm (brown-
  black, red)
R21--82 K (gray-red-orange)
R26--1 MEG ohm (brown-black-green)
R27--47 ohm (yellow-violet-black)
R28--27 K ohm (red-violet-orange)
R23,R24--5 K trimmer resistor
R35--500 ohm linear-taper potentiometer with
  ganged SPST power switch
IC1,IC2--7495 4-bit shift register
IC3,IC6,IC14,IC16--74161 or 9316 4-bit
  counter
IC4,IC12--1458 op amp
IC5--74174 hex D flip-flop
IC7--7414 hex inverting Schmitt trigger
IC8--555 or 1455 timer
IC9,IC10--7489 64-bit RAM
IC11--74121 monostable multivibrator
IC13--1702A PROM (may not be marked)
IC15--7402 quad 2-input NOR gate
IC17--7483 4-bit binary adder
IC18--7485 4-bit magnitude comparitor
D1,D2,D3,D4,D6,D7--1N270 germanium diode
D5--1N914 silicon diode
Q1--2N3904 or 2N2222 transistor
Misc.--Printed circuit board, IC sockets,
  pc standoff insulators, control knob,
  machine hardware, hookup wire, LEDS

PARTS LIST
DISPLAY CIRCUIT
C1,C2--0.05 disc
DIS1 through DIS4--IEE 3785R or Litronix
  DL 2614 dual alphanumeric LED display
IC1,IC4--75491 or ITT 491 MOS to LED
  display driver
IC2,IC3--7445 or 74145 BCD-to-decimal
  decoder/driver
The following are 1/4 watt, 10% tolerance
  fixed resistors:
R1,R4,R5,R8,R9,R12,R13,R16--1000 ohms
R2,R3,R6,R7,R10,R11,R14,R15--47 ohms
Misc.--Printed circuit board, Molex
  Soldercons for displays, IC sockets
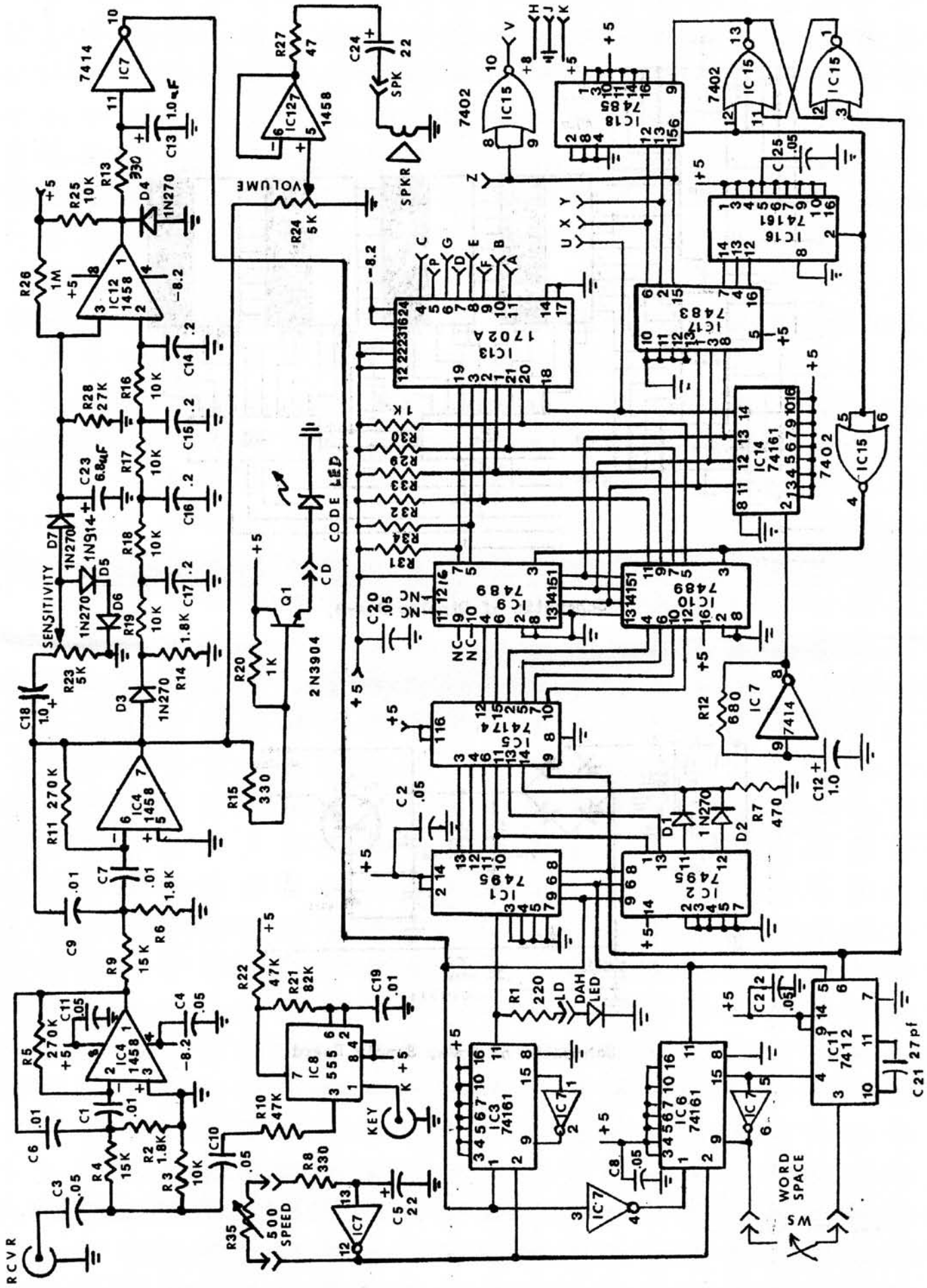 for driver ICs, red bezel for displays

PARTS LIST
POWER SUPPLY
C1,C2--2200 uF, 16 volt upright elec-
  trolytic
C3--1000 uF, 10 volt upright electro-
  lytic
C4--1000 uF, 16 volt upright electro-
  lytic
Z1--1N5232 5.6 volt zener
Z2--1N756 or 1N5237 8.2 volt zener
F1--1 ampere fast-blow fuse
Q1--TIP 31 or 31A npn tab (TO-220)
  transistor
R1--68 ohm, 1/2 watt, 10% resistor
R2--18 ohm, 1/2 watt, 10% resistor
RECT1--1 ampere, 50-PIV modular
  bridge rectifier
T1--12.6 volt, 2 ampere center-tapped
  transformer (Stancor P8130 or equi-
  valent)
Misc.--Printed circuit board, pc-
  mount heat sink for Q1, fuseholder,
  line cord and strain relief, hookup
  wire, machine hardware.

CABINET/CHASSIS/MISC.
CH-1--Chassis
FP-1--Front panel
CV-1--Cover
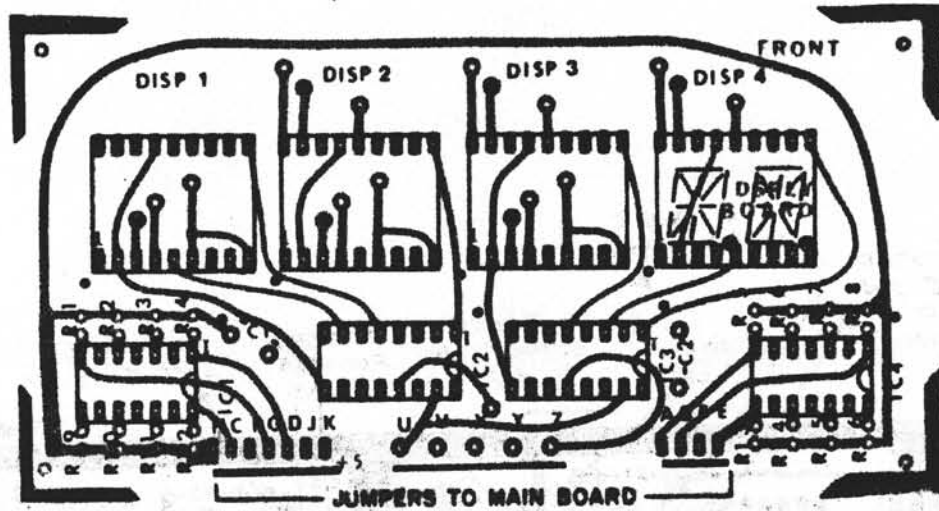J1,J2--Phono jacks
SPKR--8 ohm or higher speaker
S1--SPST switch

Schematic of Morse-A-Word II main PC Board

Schematic of Display Board.

Schematic of Power Supply Board.

Display PC Board

Power Supply PC Board

TO WORD SPACE SW (REAR PANEL)

TO POWER SUPPLY GROUND

TO DAH LED

TO POWER SUPPLY +5

TO "SPEED" POT R35

TO POWER SUPPLY −8.2V

TO J1 (RCVR JACK)

TO J1 AND J2 GND

TO J2 (KEY JACK)

TO SPEAKER

TO POWER SUPPLY +8V

MICROCRAFT CORP.

MORSE·A·WORD™

© 1979 TOP

DISPLAY BOARD JUMPERS

TO CODE LED ANODE

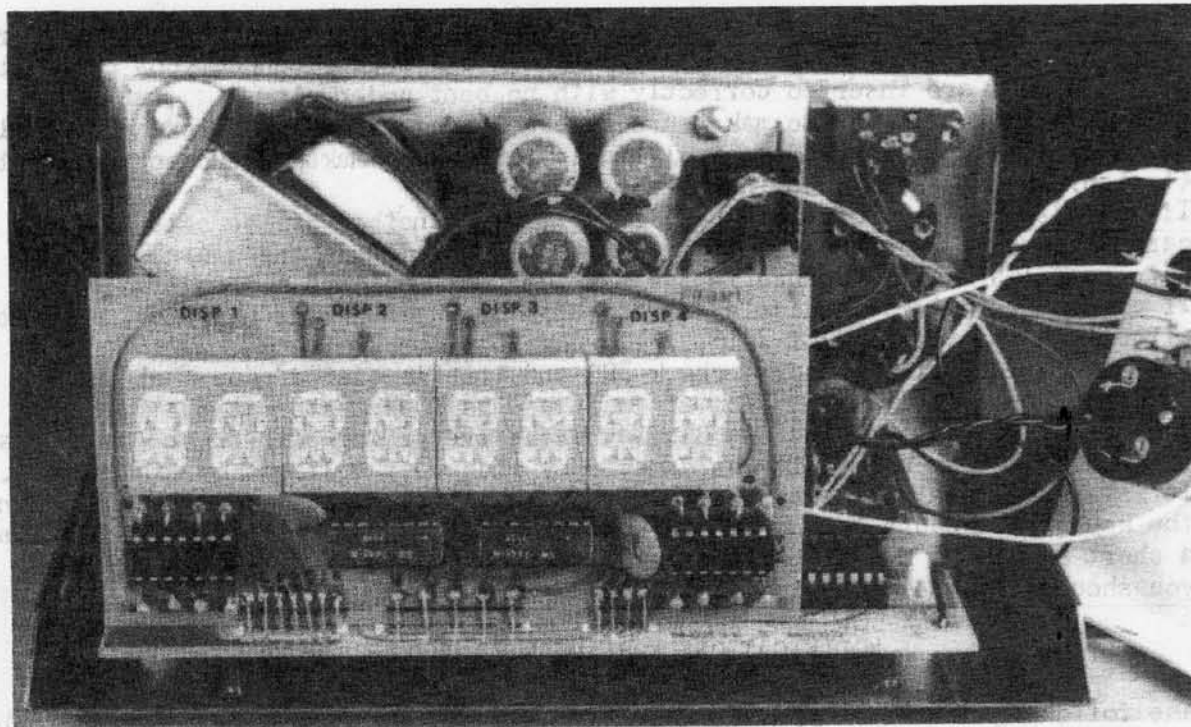TO DAH AND CODE LEDS CATHODES
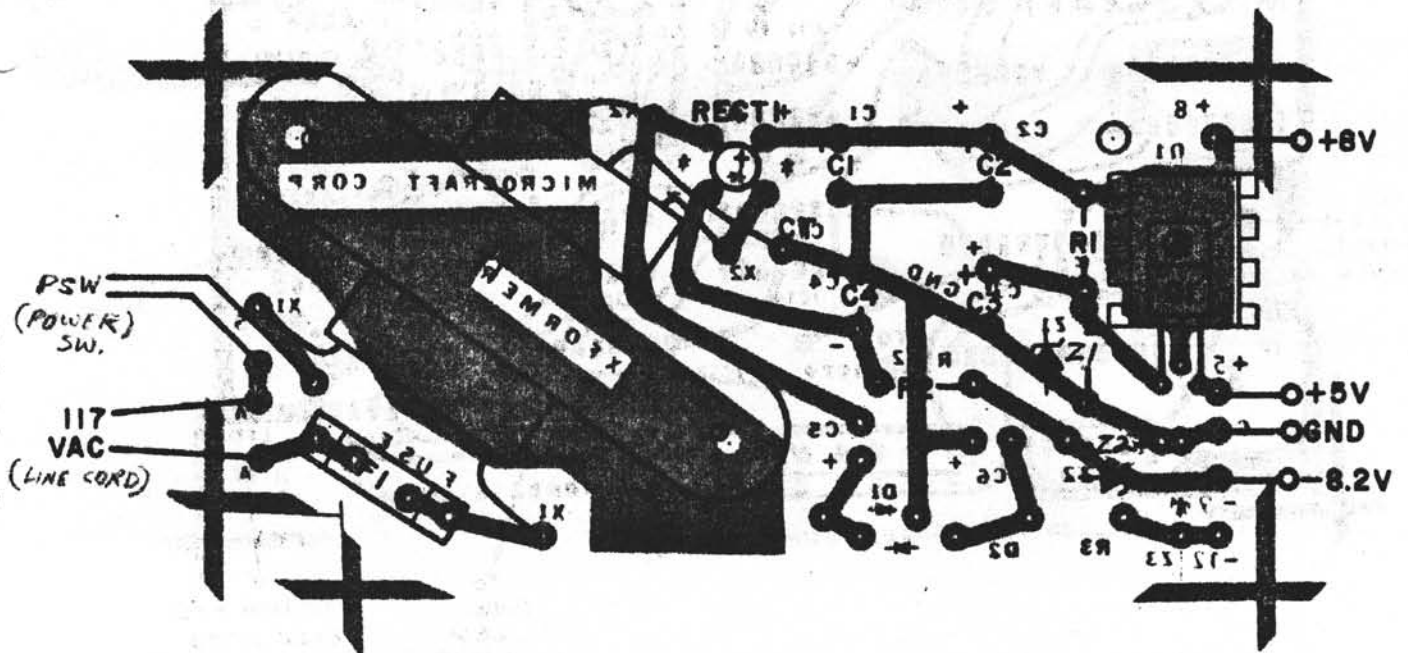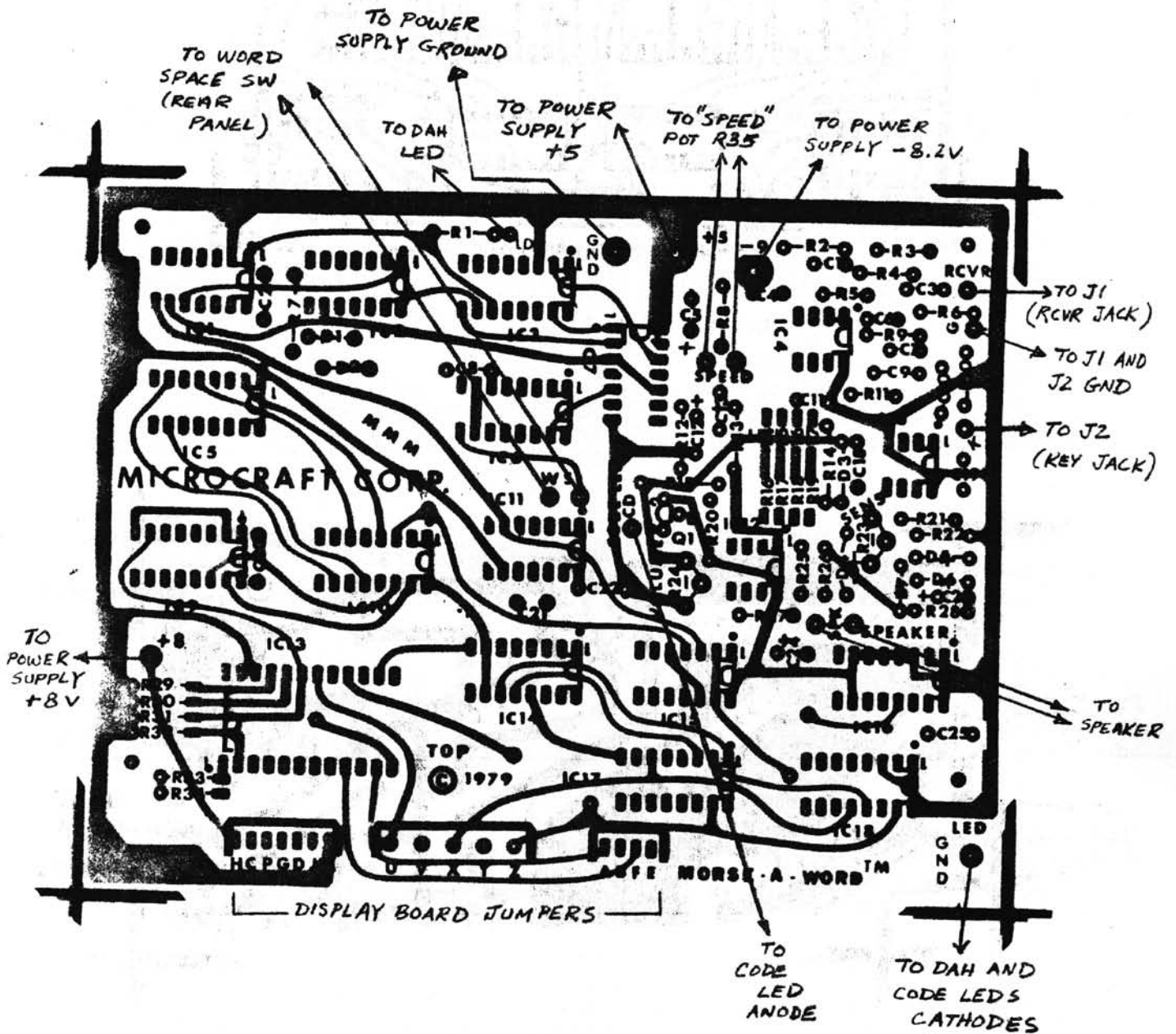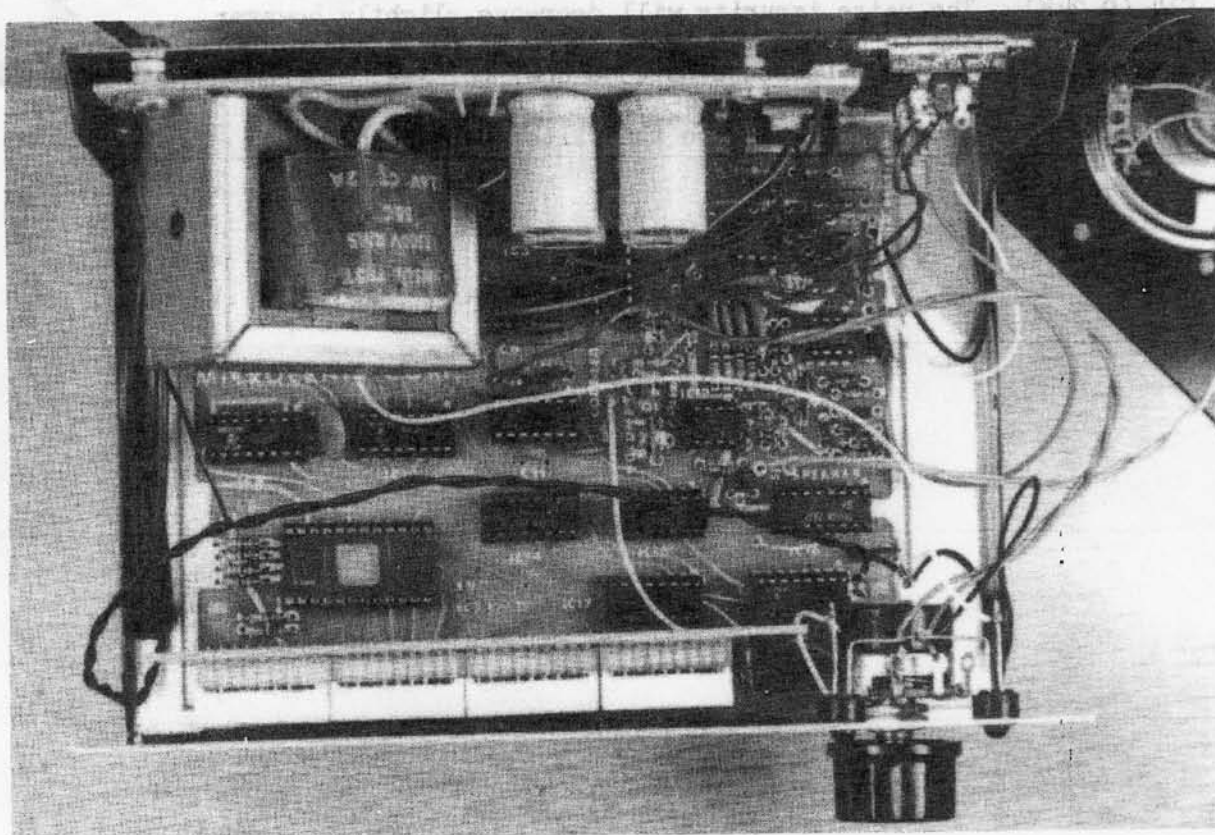
Main PC Board Wiring

MORSE-A-WORD II—Front view; front panel and cover removed.

MORSE-A-WORD II—Top view; cover removed.

TROUBLE SHOOTING TIPS

1. Solder bridges and cold solder joints are the number one enemy of kit builders. If your unit fails to operate properly, check all solder connections carefully.
2. Make sure ICs are inserted correctly with no bent under pins.
3. Double-check all diodes to make sure cathode (banded) end is oriented properly.
4. Re-check all tantalum and electrolytic capacitors to make sure proper polarity (+ sign) was observed when installed.
5. If you suspect an IC of being bad, swap it with another of the same type and carefully note the change in the symptoms, if any. No changes usually indicate good ICs while a change in the symptoms may indicate a defective IC.
6. If characters enter the display erratically or in the wrong position, check the circuit in the vicinity of IC16, IC17, or IC18.
7. If the display fails to move, check IC7 and its associated components.
8. The 1702A PROM (IC13) is seldom at fault and is 100% tested at the factory. If you suspect a problem with the display check everything else first--chances are the 1702A is okay unless it was damaged by incorrect voltages or mishandling.
9. It is a good idea to use a hand telegraph key to check out your unit. Closing the key should cause a tone in the speaker and the CODE LED to come on. After a short delay the DAH LED will come on. By keying the MORSE_A_WORD by hand you should be able to verify if IC3, IC6 and IC7 are working properly.

MODIFICATIONS FOR ADVANCED BUILDERS

The following notes are provided for advanced kit builders who wish to experiment. NOTE: Changes or modifications to factory wired units will void the warranty.

1. To get better code tracking at the higher code speeds, (25 to 35 WPM) remove C14 (0.2uF). The noise immunity will decrease slightly however.
2. For those wishing to change the speed range (5 to 35 WPM) only a few simple changes are required. Decrease R8 (330 ohm) to, say, 220 ohms. This will change the range to, say, 10 to 45 WPM. Also remove C14 (0.2uF) and change C15 (0.2uF) to 0.05uF to increase the filter bandwidth.

Manuals!   Manuals!   Manuals!