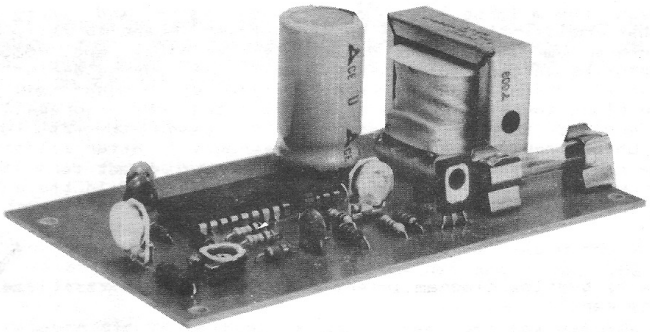
ELECTRONIC MUSIC MACHINE



BULLET ELECTRONICS

ELECTRONIC MUSIC MACHINE ASSEMBLY MANUAL

The Electronic Music Machine is a low cost kit designed to be used as a musical doorbell, mobile horn, toy or music box. The kit uses a 28 pin microprocessor IC that is mask programmed to play 25 songs and three chime sequences. Since the song memory is actually an integral part of the chip, only those tunes can be played. Changing tunes requires changing the mask and is practical only if large quantities are required.

The microprocessor chip is a MOS device and precautions should be taken to avoid a static discharge from your body to the chip during handling. Do not remove the chip from its protective carrier until you have grounded yourself to remove any static charge. Use a soldering iron with a grounded tip when soldering in the chip.

Excessive heat from a large iron can damage parts and cause the adhesive that holds the copper runs on the PC board to fail. When soldering, use a low wattage iron of 35 watts or less and .035 or smaller 60/40 rosin core solder. Wipe the tip of your soldering iron on a wet sponge between joints to keep the tip clean. Mount all the parts on the blank (non-foil) side of the PC board. Make sure all the parts are mounted firmly against the PC board (except Q1-Q4 transistors which should have about 1/8" clearance.) After soldering, clip the leads close to the foil side. BE CAREFUL! Leads tend to fly out rapily when clipped and can cause eye damage. Hold the excess length with one hand while clipping with the other.

ASSEMBLY:

Using the parts overlay diagram insert solder and clip excess leads on the following parts:

1.) R1 is a 1/2 watt resistor. It will be larger than the rest of the resistors.

2.) R2 and R13 are small vertical mount potentiometers.

3.) Mount the fuse clips to the board using the 4/40 screws and nuts. The heads of the screws should be on the top side.

4.) D1 is a 1 watt zener diode. Although it may look like the other diodes it is marked with a 1N4732 part number. Be sure to insert it with banded end as shown.

5.) D2-D6 are all 1 amp rectifier diodes. Insert them with the banded ends oriented as shown.

6.) C1, C2-C3 are small ceramic disc caps. C2 is a 220 pfd cap and will be marked with that number.

7.) Q1 and Q3 are small NPN transistors. Make sure the flat sides are turned as shown. The center pin (base) is bend forward towards the flat to form the triangle pattern to match the board.

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8.) Q2 is a small PNP transistor. Make sure it is mounted as shown.

9.) Q4 is a larger power transistor with a mounting hole. Note that is has a metal area on one side. Mount it so that the metal side is closest to the two speaker leads.

10.) C4 is a large electrolytic cap. It must be inserted in the proper polarity. Note that the overlay is marked with polarity symbols. The capacitor will be marked with polarity. The lead closest to the marking is that polarity.

11.) R5 is a small horizontal mount pot. Mount is as shown.

OPTIONAL TRANSFORMER MOUNTING

IF YOU INTEND ON USING THE UNIT ON 117 VAC AND HAVE PURCHASED THE OPTIONAL STEP DOWN TRANSFORMER FROM BULLET, MOUNT IT IN THE LOCATION SHOWN. MAKE SURE THE INPUT SIDE IS ON THE 117 VAC SIDE AND THE OUTPUT SIDE IS ON THE 12V SIDE.

PRELIMINARY TESTING:

Perform the following before putting the IC into the board:

1. Insert the fuse into the clips.

2. Connect a source of 12 VAC or 12 VDC to pads A and B (don't worry about polarity). If you are using the optional 117 VAC transformer connect it to the 117 line.

3. Measure the DC voltage between ground and the cathode side (banded end) of D1. It should be between 4.5 and 5.5 volts.

4. If the voltage checks out, remove power and carefully insert and solder in the 28 pin IC making sure the notch is oriented as shown. Adjust all pots to mid-range.

TUNE ADDRESS:

There are several options for selecting tunes. If only one of the tunes is desired, then that address can be hand wire jumpered on the PC board by strapping between the letter and number banks to the hole directly opposite. Study the address chart. Note that each tune is selected by grounding one of the letter locations and connecting the number location to pin 15. Thus to play JINGLE BELLS location B would be connected to ground and 4 to pin 15. The board is designed so that directly opposite each letter/number location there is a matching ground pad. The spacing is such that a 9 or 10 position DIP switch can be added and used to change the tune address.

Since each tune is selected with only two connections, it is simple to

use two rotary switches to remotely program the unit. A single pole 6 position switch will select all of the letter locations while a single pole 5 position will select all of the number locations. A single 2 pole 25 position switch could be used to select all of the tunes. If you only want to play your 10 favorite tunes a 2 pole 10 position switch would work.

Each time the "start" pad is grounded the tune selected by the Tune Address will be played; if instead the pad marked "next tune" is grounded the next tune in sequence from the Tune Address location will be played. Thus if JINGLE BELLS is the addressed tune grounding "next tune" will play LA VIE EN ROSE. Grounding it again will play STAR WARS and so on until all of the tunes have been played. If this pad is connected to a normlly open push button, the Music Machine will play a different tune each time it is pressed!

CHIME SEQUENCES:

In addition to the 25 tunes there are three chime sequences, one of which, the Descending Octave Chime, will always play if pad "C" is momentarily grounded. If the unit is being used as a doorbell, a seperate switch can be run to another door besides the front door and it will always chime that sequence. In addition, pad "D" will play a different tune than what is selected by the Tune Address, so up to three doors can have different tunes.

DOORBELL SYSTEMS:

Most home doorbell systems use a electro-mechanical chime and a step down transformer. Most often the front door switch is connected to the transformer secondary and activates the chime box when pressed. Some systems use a 3 wire system to provide for a lighted door switch. If you wish to use the existing wiring, trace the wire pair from the doorbell switch to the transformer. Usually it is in the attic. Some units have the transformer as an integral part of the chime box. Most current systems are 24 VAC but some are 10V or 12V. Measure the transformer secondary with a VOM. If it is 24V it can be used to power the board but the value of R1 must be increased to 470 ohms 1 W*. In addition the volume will be louder and the volume control may have to be adjusted. Remove the two wires coming FROM the doorbell switch from the transformer. Connect one wire to one of the ground pads and the other side to either the "start" pad or the "next tune" pad. Connect the board pads "A" and "B" to the secondary of the existing transformer. (See changes for 24V system above) or if you are using the optional on board transformer connect it to a source of 117VAC. BE CAREFUL! Turn off the circuit breaker to that line before making any connections. Other switches can be added to provide backdoor chimes.

*NOTE: If the unit is operated on 24VAC and high duty cycle operation is required, Q4 should have a small tab heatsink attached.

SPEAKER SYSTEMS:

The Music Machine is designed to drive an 8 or 16 ohm load. A 6" or 8" 8 ohm speaker will provide ample volume and if centrally located can be heard throughout the house. A more deluxe system can be realized if two 8 ohm speakerrs are wires in SERIES with one close to the front door. Do Not Wire in Parallel!

MOBILE OPERATION:

The Electronic Music Machine is designed to work on either 12VAC or 12 VDC. No modifications are necessary to operate the unit on 12 VDC. If you want to use this as a car horn, a horn style speaker is recommended for increased volume. A heatsink on Q4 is recommended. Connect 12 VDC to "A" and "B". Since the input is a diode bridge, the polarity does not matter.

OTHER MODS:

If the tone of the output is too raspy, a .1 mfd capacitor can be put in the location CX to soften the notes.

FINAL TESTING:

1. While the kit is still on the bench, connect a speaker and a switch between the start pad and ground.

2. Apply power. With no address selected, the unit will play the Westminster Chime Sequence.

3. Adjust the pitch and tempo controls to your satisfaction.

4. Check the next tune option by momentarily grounding the pad several times to step through some of the tunes.

PROBLEMS:

In the case of improper operation or system failure, check the following items:

A. Fuse
B. Voltage on pin 2 and 3 should be between 4.5 and 5.5 DC volts with respect to ground.
C. Pin 26 should have a squarewave of 50 to 250 Khz.

D. Check for waveform on base of Q1. Should appear on collectorand pin 8 of IC.
E. Logic level on Pin 28 should be high.
F. Check for Pulses on Pin 14 when "start" is activated.
G. Check all solder connections carefully.

WARRANTY:

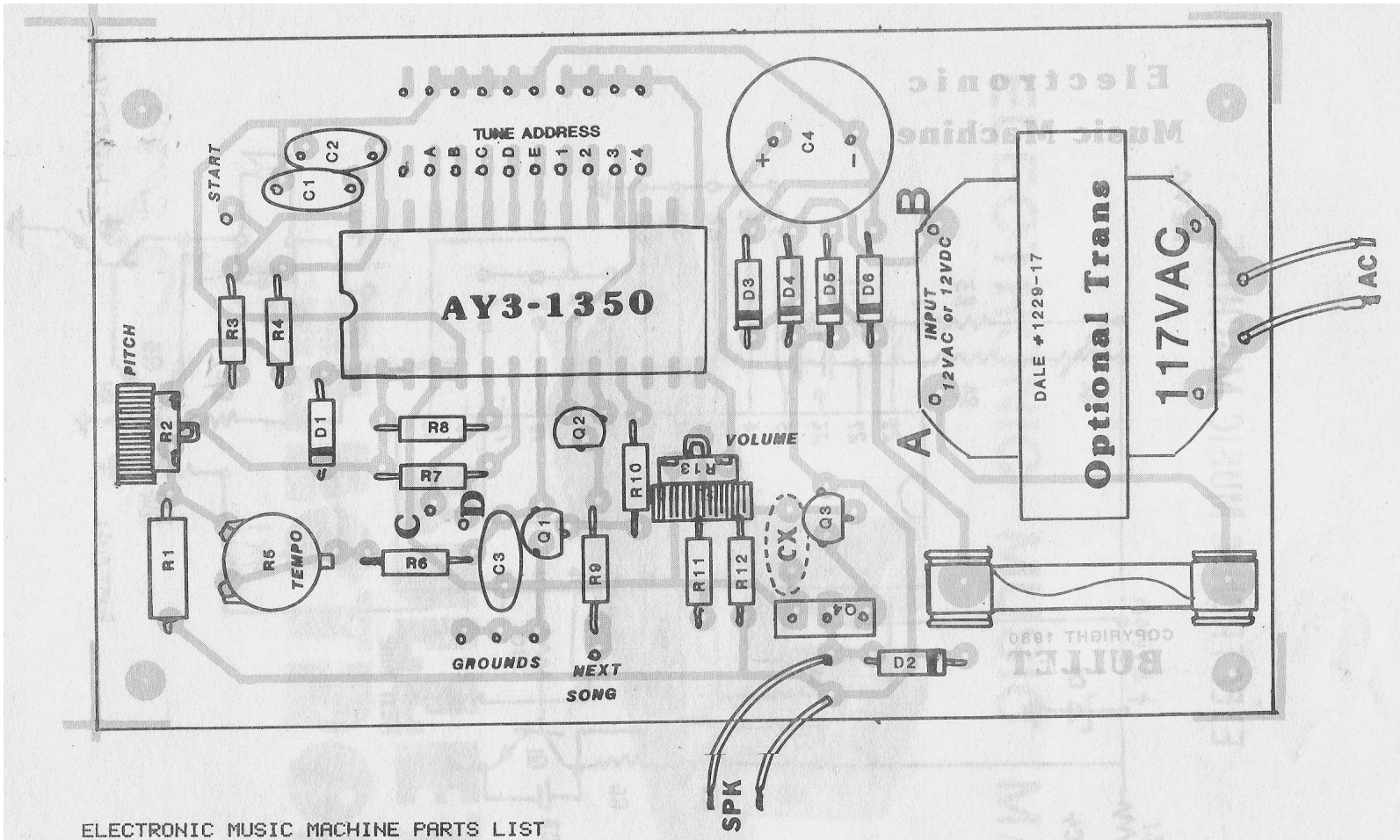
Bullet Electronics warranties the parts in this kit to be free from defects in materials for a Period of 90 days from date of Purchase. Defective parts must be returned in good Physical condition before replacements will be shipped. No other warranty is expressed or implied.

REPAIR:

Bullet Electronics will repair any Electronic Music Machine for $5.00 which includes return shipping. Return the unit to us along with a check for the above amount. Units soldered with acid core solder or that have been damaged by heat will not be repaired and the unit and repair funds will be returned to the customer.

ADDRESS CHART:

A0 Toreador	A1 John Brown's Body
B0 William Tell	B1 Clementine
C0 Hallelujah Chorus	C1 God Save The Queen
D0 Star Spangled Banner	D1 Colonel Bogey
E0 Yankee Doodle	E1 Marseillaise
A2 America, America	A3 O Sole Mio
B2 Deutschland Leid	B3 Santa Lucia
C2 Wedding March	C3 The End
D2 Beethoven's 5th	D3 Blue Danube
E2 Augustine	E3 Brahms' Lullaby
A4 Hell's Bells	Chime X Westminster Chime
B4 Jingle Bells	Chime Y Simple Chime
C4 La Vie En Rose	Chime Z Descending Octave
D4 Star Wars	Chime
E4 Beethoven's 9th	



ELECTRONIC MUSIC MACHINE PARTS LIST

R1	200 OHM (RED-BLK-BRN)1/2W
R2,R13	10K POT
R3	100K (BRN-BLK-YEL)
R4	1.5K (BRN-GRN-RED)
R5	2.2M POT
R6	1M (BRN-BLK-GRN)
R7,R8,R10	10K (BRN-BLK-ORG)
R9	33K (ORG-ORG-ORG)
R11	4.7K (YEL-VIO-RED)
R12	47K (YEL-VIO-ORG)

C1,C3	.1MFD DISC CAP
C2	220PFD DISC CAP
C4	2200MFD RADIAL CAP
D1	1N4732 1W ZENER
D2-D6	1N4000 SERIES DIODE
Q1,Q3	NPN MPS2222A
Q2	PNP 2N4402
Q4	NPN POWER TIP31B (926-11921)
IC	AY3-1350
MISC	1A FUSE; FUSE CLIPS; 4-40 HARDWARE; PC BOARD.

ELECTRONIC MUSIC MACHINE

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