

PROJECT

Melody GENERATORS

XZ47B
Issue 1

FEATURES

- Ideal beginners project
- Safe, low voltage operation
- Low current giving long battery life
- Directly drives speakers (included) or piezo sounders
- Large range of melodies supported (15 available)

APPLICATIONS

- Children's toys
- Teaching nursery rhymes
- Turn ordinary cards and gifts into novel presents

Circuit description

The complete circuit diagram of the Melody Generators is given in Figure 1. Most of the components shown are optional parts. Power is normally applied to the terminal marked B+ but the maximum input voltages given in Table 1 must not be exceeded.

To allow for supply voltages that exceed the maximum for the Melody IC IC1 a voltage regulator RG1 is used. The incoming supply line is decoupled by C2 and reverse polarity protection provided by D1. These parts are optional and are not supplied in the kit.

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Do you remember those awful Christmas and Birthday cards that used to drop through the post ten years ago. The ones that played 'Jingle Bells' or 'Happy Birthday To You' using only one note! You must remember – some companies still play them on their telephones when they put you on hold. Well, like all technological innovations, time moves on and the products improve. Those simple tune (what tune) generators have certainly improved and are now capable of playing pretty good renditions of most popular melodies.

The Maplin range used here have a wealth of features. They are low-cost (very low cost in fact), simple to use, difficult to destroy and come in a handy little package. All this and they sound pretty good too. In fact some sound so good that they are now called 'Melody Generators'.

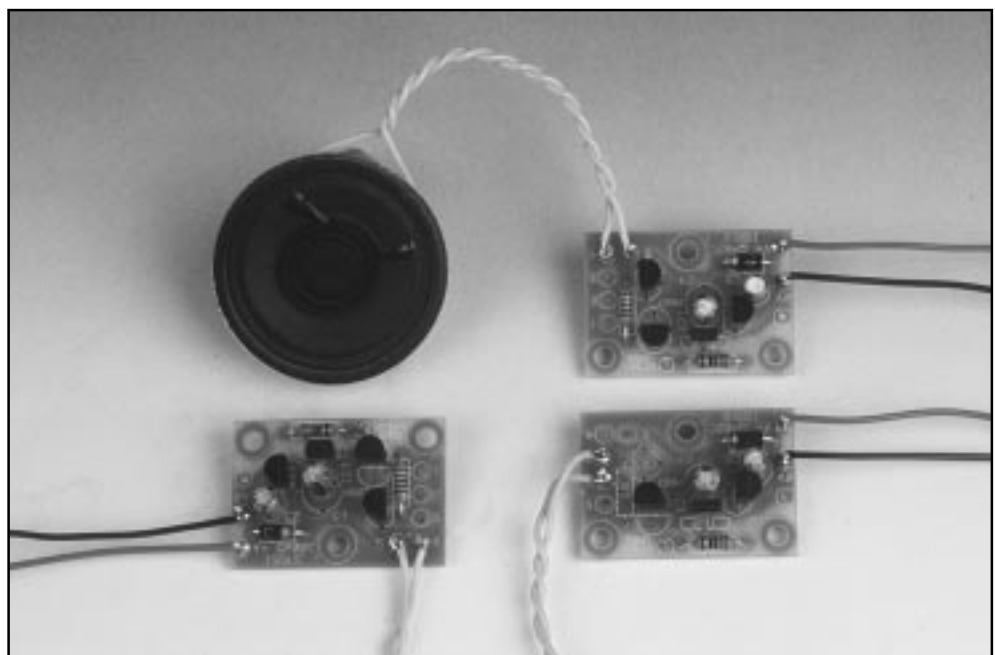
The range selected by Maplin for their Catalogue include popular songs, classical hits and well-known nursery rhymes. This kit allows the user to select one of 15 different tunes and connect it easily to a variety of batteries, power supplies or other equipment. A speaker is included so that the result can be heard immediately.

The supplied Melody IC IC1 can be replaced with a different Melody IC without changing any other components except, possibly, the speaker connections. See current Maplin catalogue for the full range of Melody ICs

available. If a socket is used to hold the Melody IC then the user can change the tune as frequently as they wish.

A pleasant, but noticeable, alarm sound has been added

to complete the range. This is called a Warning Tone but it is actually a pulsed chirrup. This particular device needs only the speaker and a battery to operate!



SPECIFICATION

Supply voltage (without regulator)	1.2V to 3.6V DC (M66T series) 2.4V to 5.0V DC (HT381series) 1.3V to 3.3V DC (UM66 series)
Supply voltage (with regulator)	3.2V to 12V DC (M66T and UM66 series) 3.2V to 12V DC (HT381series)
Supply current	50mA max. 25mA typical
Standby current	<< 100µA (without regulator) < 130µA (with regulator)
Speaker impedance	64Ω
Speaker power	100mW (200mW max.)

Note: Speaker connection to be twisted pair 100mm max.
Power connections to be 100mm max.

A simple power amplifier is added to the circuit to allow the Melody ICs to drive a small (up to 200mW) speaker. R1 limits the current sunk by the base of TR1, IC1 providing the necessary bias.

Because of the slight differences between the various Melody ICs it is necessary to provide two options for output connections. These same options allow the direct connection of piezo transducers but the results are rather poor. An alternative connection is added that allows IC1 to drive a piezo transducer

at a higher voltage.

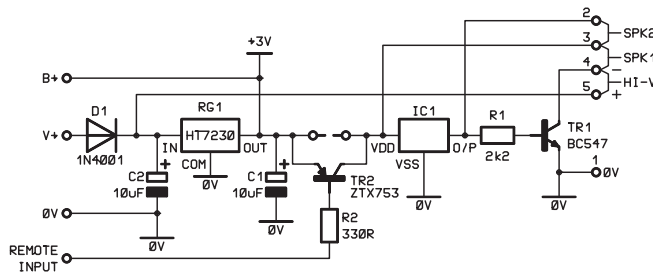
This connection can also be used to drive the speaker at a high volume. The full connection details are given in Figures 3 and 4, and Table 1.

The M66T series device generates harmonics at 35MHz that must be removed to comply with EC directives. C3 is provided in the kit to filter this noise and must be fitted if a M66T series device is used. See Figure 3.

Glimpse inside a Melody IC

The Melody IC, is a very complex device, a fact that is completely cloaked by the simple package. For example, the UM66T series contains an in-built oscillator, 190 note / 14 scale tone generator, 64 note ROM and can manage 15 different beats and 15 different tempos. The HT3810 series contains two tone generators, a 'cha' accompaniment circuit, envelope generator, time base generator, 128 note ROM and output amplifier.

Figure 1. The complete circuit diagram for the Melody Generators.



No reverse polarity protection is provided on the B+ terminal because this can prevent the circuit operating when the batteries are running low. C1 decouples the supply to IC1.

The PCB connections for TR2 allow several circuit switch options (See Figure 2):

1. The tracks are made to form a link that allows continuous operation (except the UM66 series which goes into standby after playing once) or an external switch in the power line. This solder link can be replaced by the 'good old wire link' if desired.
2. An external switch wired across the tracks. This interrupts the power to IC1 but leaves C1 in circuit. This is not a great problem because C1 will only slowly discharge the battery. A good AA battery should last around the same time as it would when stood unused on a shelf! C1 can be replaced by a Tantalum type if leakage is a problem.
3. An internal switch such as the Maplin Tactile Switch KR91. This can be connected on either side of the board and alternatives are available with different shaft lengths.

Melody IC Series	Input Voltage TO B+	Battery Connection		Output	
		normal	recharg.	SPKR	PIEZO
HT381	2.4 to 5.0	2 x 1.5V	2 or 3 x 1.2V	3 / 4	no
UM66	1.3 to 3.3	1 x 1.5V	2 x 1.2V	3 / 4	no
M66T	1.2 to 3.6	1 x 1.5V	2 x 1.2V	3 / 4	no

Melody IC Series	Input Voltage to V+	Output-Lo		Output-Hi	
		SPKR	PIEZO	SPKR	PIEZO
HT381	3.2 to 12	3 / 4	no	4 / 5	4 / 5
UM66	3.2 to 12	3 / 4	no	4 / 5	4 / 5
M66T	3.2 to 12	2 / 3	no	no	4 / 5

Table 1. Supply voltage and speaker connection guide.

4. An electronic switch formed by fitting R2 and TR2. TR2 is a PNP transistor that conducts when its base is pulled below the supply voltage. The base current is limited by R2 to less than 10mA making it suitable for connection to open collector, TTL buffers or, digital and analogue circuits connected via a transistor buffer. A connection is provided for the remote input but this is not marked on the PCB. Refer to Figure 2 for guidance.

CAUTION: The electronic switch has no turn off resistor and should not be left floating. If it not used, do not fit R2 and TR2, or tie the remote input pin to 0V. Do not use gate voltages higher than 3V DC as TR1 collector-base junction will forward bias and IC1 could be destroyed.

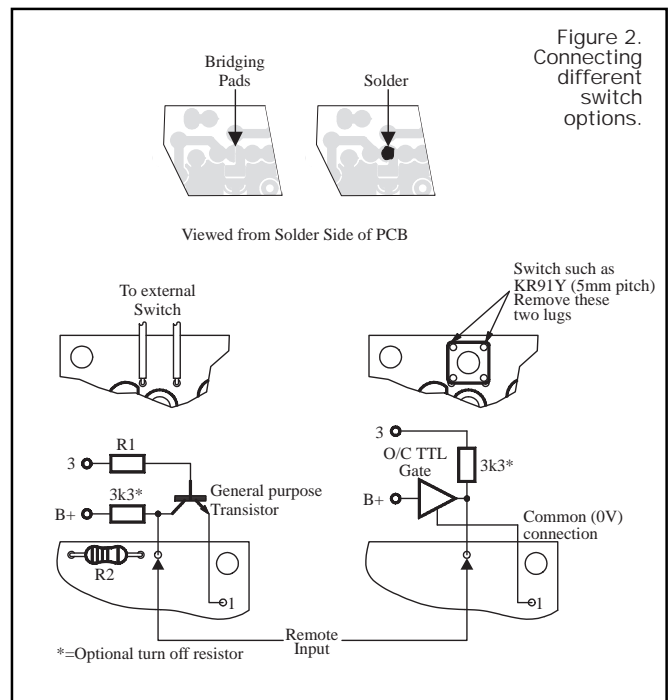
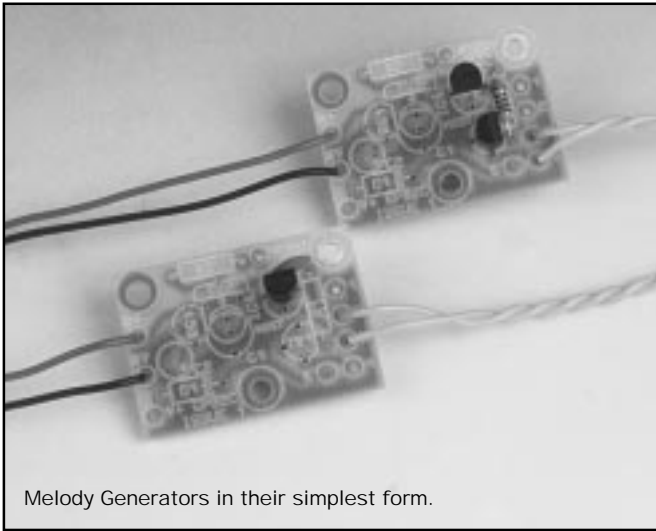


Figure 2. Connecting different switch options.



Melody Generators in their simplest form.

Construction

The Melody Generator kit contains components that allow any of the Melody ICs from the M66T, HT381 or UM66 series to be fitted. Each

Melody IC is marked with its series or use Table 2 which provides a cross reference from the Maplin Stock Code. Next, read the text below to decide which connection to use. Note

that the higher voltage options will require additional parts to be purchased.

Identify the parts you need from the drawings and separate these from the rest of the kit. The following assumes that all parts are fitted so pick from the text only those parts that

apply to the selected option.

Begin by soldering across the link pads. Fit R1, R2 and D1. Next fit C1, C2 and C3.

Fit IC1, RG1, TR1 and TR2. Fit the switch option required.

Remove 5mm of insulation from one end of the red and black wire, tin the stripped ends and solder them through the PCB holes as indicated in Figures 3 or 4. Prepare the other ends as required by the power source used.

Cut the yellow wire in half and remove 5mm of insulation from each end of both pieces. Tin the stripped ends and form one end of each wire into a 'hook'. Twist the wires together with both 'hooks' at one end. Pass the hooks through the speaker terminals and solder them in place. Solder the other ends through the PCB holes as indicated in Figures 3 or 4. It does not matter which way round the speaker terminals are connected.

Kit Code Device Series

LU64U	HT381
LU66W	HT381
LU67X	HT381
LU68Y	HT381
LU69A	HT381
LU70M	HT381
LU75S	HT381
LU76H	HT381
LU77J	HT381
LU80B	HT381
LU81C	M66T
LU84F	M66T
LU90X	M66T
LU91H	M66T
LU92A	UM66T

Table 2. Maplin kit codes to device series cross reference.

Figure 3. M66T series. Supply options.

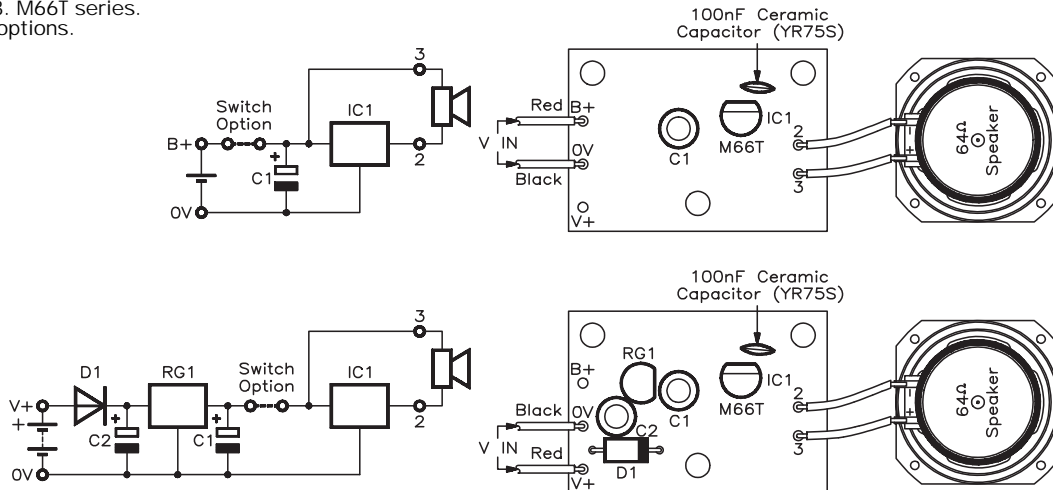
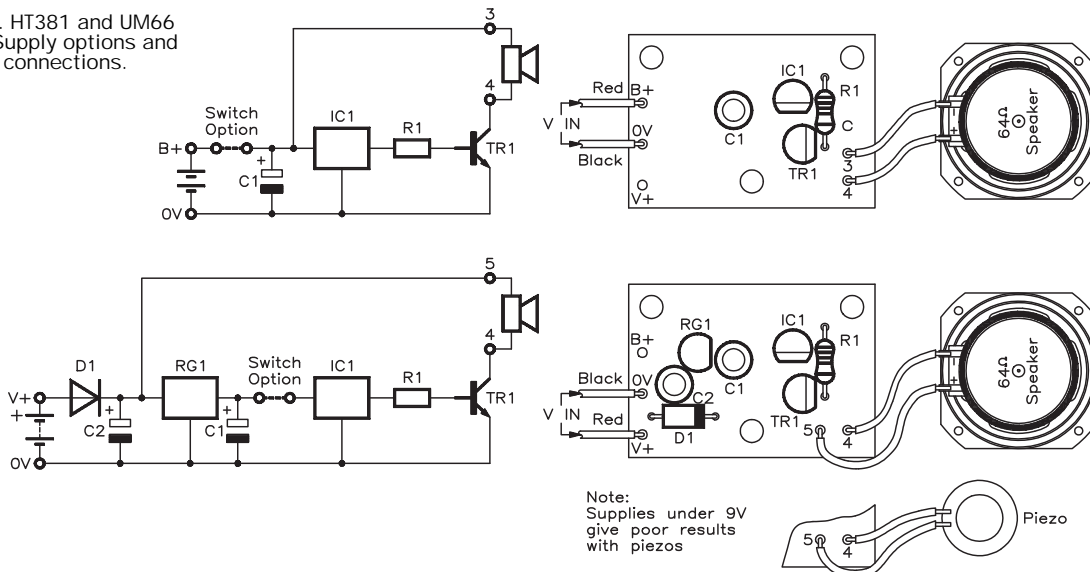


Figure 4. HT381 and UM66 series. Supply options and speaker connections.



The wire lengths for the supply and speaker connections can be increased. The prototype units conformed to CE directives when lengths of 5 metres were used. The speaker wire must be twisted to ensure compliance.

Carefully check all connections and solder joints. Equally carefully, check that the correct components are fitted the right way round and in the right place. The circuit is ready to use as soon as the power source is connected.

M66T series

Figure 3 shows the connections that can be made to the M66T series Melody IC. The upper figure shows the kit configuration for low voltage operation and speaker connection. Table 1 gives information on the supply voltage and how this is obtained.

The lower figure shows the

connection for high voltage driving the Melody Generator. The battery could be a PP3 type or a car battery via a suitable fuse. High voltage drive does not affect the volume produced by the M66T series significantly. Note that the kit does not contain the parts required for the high voltage drive.

To comply with the EMC regulations it is essential that C3 is fitted as shown.

HT381 / UM66 series

Figure 4 shows the connections that can be made to the HT381 series and the UM66 'Wedding March' Melody Generators. Once again, the upper figure shows the kit configuration for low voltage operation and speaker connection. Table 1 gives information on the supply voltage and how this is obtained.

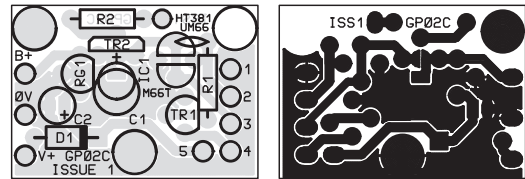


Figure 5. Track legend and component overlay for the Melody Generator.

The lower figure shows the connection for high voltage driving the Melody Generator. The battery could be a PP3 type or a car battery via a suitable fuse. Using a PP3 and this connection gives a much louder sound than the low voltage connections.

Also shown is the method of adding a piezo sounder to the Melody Generator. If a piezo sounder is used this should be mounted on or in a resonant enclosure. The Maplin Design Team used a small cardboard

box, measuring 40 x 40 x 18mm deep, to test the piezo sounder. If one is supplied with the speaker it should be just about the right size. Press the face of the piezo sounder that is not connected to the wires, flat to the largest face of the box. The sound should come from inside. Presto, a resonant chamber!

Note that the kit does not contain the parts required for the high voltage drive or the piezo sounder.

PROJECT PARTS LIST

RESISTORS: All 0.6W 1% Metal film [Unless specified].

R1	2K2	1	M2K2
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CAPACITORS

C1	10µF 63V Radial Electrolytic	1	AT77J
C3	100n Ceramic	1	YR75S

SEMICONDUCTORS

IC1	Melody Generator IC	1	As supplied
TR1	BC547	1	QQ14Q

MISCELLANEOUS

Speaker	64Ω 200mW	1	YT27E
Wire	7.02 Black	10cm	BL00A
Wire	7.02 Red	10cm	BL07H
Wire	7.02 Yellow	20cm	BL10L
Melody Generator PCB		1	GP02C
Melody Generator Leaflet		1	XZ47B
Constructors' Guide		1	XH79L

OPTIONAL ITEMS (Not in Kit)

R2	330Ω	1	M330R
C2	10µF 63V Radial Electrolytic	1	AT77J
RG1	HT7230 3.0V Regulator	1	LE77J
TR2	ZTX753	1	UH53H
D1	1N4001	1	QL73Q

Veropins	100	FL24B ★
Transistor Socket	1	WR29G
Click Switch	1	KR91Y
PP3 Battery Clip	1	HF28F
Duracell PP3 battery	1	JY49D
Duracell AA battery	As req.	JY48C

The Maplin 'Get-You-Working' service is available for this project, see Constructors' Guide or current Maplin Catalogue for details.

The above items (excluding optional) are available as kits.

Order as:

LU64U Happy Birthday	LU66W London Bridge
LU67X Old McDonald	LU68Y Greensleeves
LU69A Love Me Tender	LU70M Jingle Bells
LU75S Merry Christmas	LU76H 12 Days of Christmas
LU77J You Are My Sunshine	LU80B I Just Called
LU81C Twinkle Twinkle	LU84F I'd Like To Teach
LU90X White Christmas	LU91H Warning Tone
LU92A Wedding March	
GP02C PCB	

Please note: Items in the Parts List marked with a ★ are supplied in 'package' quantities (e.g., packet strip, reel etc.), see current Maplin Catalogue for full ordering information.

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