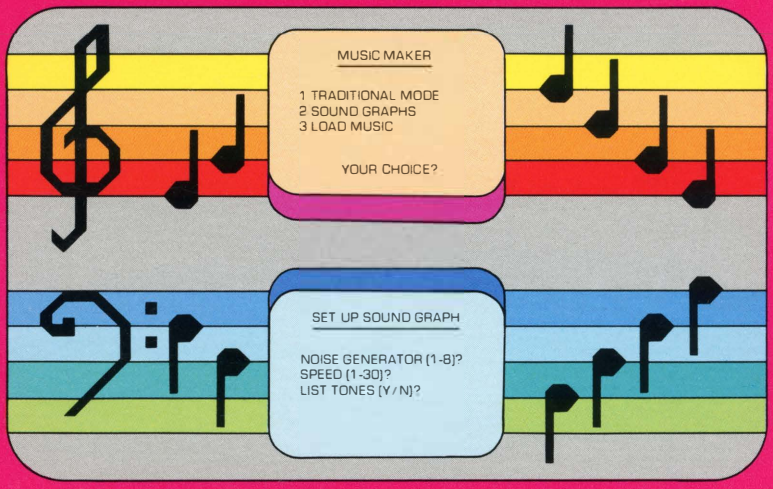
Texas Instruments Home Computer

Music Maker

SOLID STATE SOFTWARE™ **COMMAND MODULE**

Use the computer to compose music! Simply enter your composition, and the computer plays it back for you instantly.



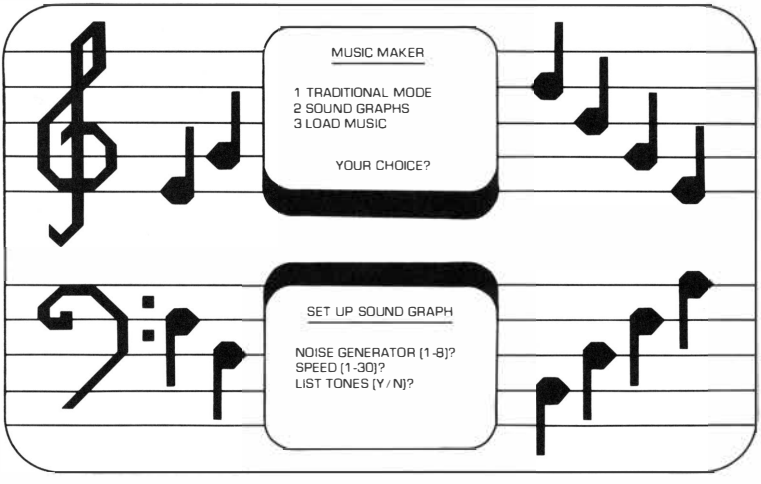
Quick Reference Guide

Note that the key sequences required to access special functions depend on the type of computer console you have. Important keystroke sequences are summarized here for your "quick reference."

TI-99/4	*TI-99/4A*	
↖ W, ↑ E ↗ R, ← S → D, ↙ Z ↓ X, ↘ C	↖ W, ↑ E ↗ R, ← S → D, ↙ Z ↓ X, ↘ C	Moves the cursor to the desired position on the display. If the Wired Remote controllers are connected, the lever is used instead of the arrow keys.
ENTER	**ENTER**	■ Signals the end of an input. ■ Changes the mode of the cursor to "move," "erase," or "draw." You also press **ENTER** to dot a note in Traditional Mode. If the Wired Remote Controllers are connected, the FIRE button is used instead of the **ENTER** key.
SHIFT V (PROC'D)	**FCTN 6 (PROC'D)**	■ Displays the next measure of a composition. ■ Exits the frequency list in Sound Graphs.
SHIFT R (REDO)	**FCTN 8 (REDO)**	■ Returns to the previous measure of a composition. ■ Replays a composition starting with the first measure (play mode).
SHIFT Z (BACK)	**FCTN 9 (BACK)**	Returns to the selection list for the activity.
SHIFT A (AID)	**FCTN 7 (AID)**	Plays the displayed measure without moving the cursor.
SPACE BAR	**SPACE BAR**	Stops the music and displays the current measure (play mode). Press the **SPACE BAR** again to continue playing the song.
SHIFT P	**FCTN P**	Prints any display except the title screen.
SHIFT H	**SHIFT <**	Returns the cursor to its home position.
SHIFT Q (QUIT)	**FCTN = (QUIT)**	Returns the computer to the master title screen. *Note*: All data you have entered will be erased unless it has been stored on a cassette tape or diskette.

TEXAS INSTRUMENTS
HOME COMPUTER

Music Maker



This *Solid State Software*™ Command Module is designed to be used with the Texas Instruments Home Computer. Its preprogrammed solid-state memory expands the power, versatility, and capability of your Home Computer.

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Command Module program and data base contents copyright © 1980 Texas Instruments Incorporated.
See important warranty information at back of book.

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INTRODUCTION

Listening to music is both a relaxing and an enjoyable pastime, and listening to music which you've written can be especially entertaining.

However, writing music isn't always as easy as we'd like for it to be. When composing, you must play the tune and record the notes as you go along. Then, to hear what you've created, you need to play back the tune at different stages as you continue to compose and revise. As you can tell, quite a bit of musical knowledge is necessary if you are composing with a musical instrument and a sheet of paper.

Now, with the Music Maker *Solid State Software*™ Command Module, you can create a musical composition whether or not you have a music background. All you have to do is enter your music one measure at a time. The computer automatically stores your composition and then plays it back for you at the touch of a key.

The Music Maker module gives you two different methods for composing music. With the TRADITIONAL MODE, you place notes on the musical staff one measure at a time. In SOUND GRAPHS, you create music by drawing lines to represent musical tones. Both methods let you write music for up to three voices, and you can play the music back as many times as you wish.

In addition, if the TI Solid State Thermal Printer* is attached to the computer, you can print any of the music you write. And it's easy to save your music if you want to replay it at a later time. You can record the composition either on a diskette with the TI Disk Memory System* or on a cassette tape with a cassette recorder.

*sold separately

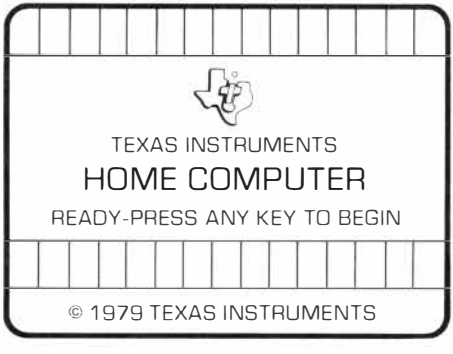
The module is also designed to utilize the TI Wired Remote Controllers (sold separately). With the controllers attached to your computer, you can place the musical notes or sound lines in your composition by moving the lever and pressing the FIRE button, instead of using the arrow keys and the **ENTER** key on the keyboard. *Note*: With the Music Maker module, you do not have to hold down the **SHIFT** key while you press the arrow keys.

Although an extensive knowledge of music theory isn't necessary for composition with the Music Maker module, you may find it helpful to know some of the basics involved in reading music before using the module's Traditional Mode. For an explanation of the basics of musical staffs, key signatures, and time signatures, see the appendices.

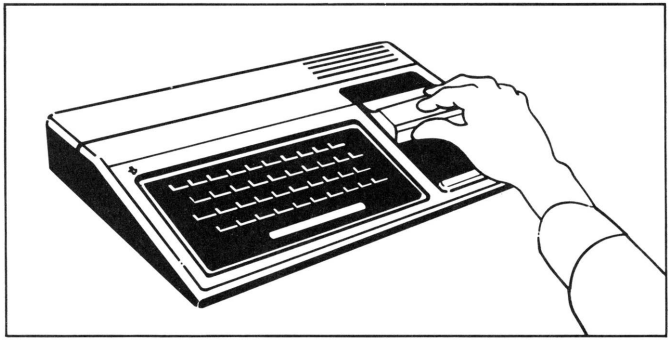
USING THE *SOLID STATE SOFTWARE*™ COMMAND MODULE

An automatic reset feature is built into the computer. When a module is plugged into the console, the computer returns to the master title screen. All data and program material you have entered will be erased, unless they have been previously saved on a cassette tape or diskette.

Note: Be sure the module is free of static electricity before inserting it into the computer. See page 32.



1. Turn the computer ON and wait for the master title screen to appear. Then slide the module into the slot on the console.



2. Press any key to make the master selection list appear. To select the module, press the key corresponding to the number beside MUSIC MAKER.

Note: To remove the module, *first* return the computer to the master title screen by pressing **SHIFT Q**. *Then* remove the module from the slot. If you have any problem inserting the module, or if it is accidentally removed from the slot while in use, please see "In Case of Difficulty" on page 33.

DEMONSTRATION

Now we're ready to see how easy it is to compose music with the module. For this demonstration, we've selected the SOUND GRAPHS activity. Since the purpose of this section is to help you familiarize yourself with one of the module's activities, it just tells you which keys to press and doesn't explain the meanings of the various selections. However, a detailed explanation of the SOUND GRAPHS selection list and options is provided in the "Sound Graphs" section of the manual.

After you select the module, the title sequence for MUSIC MAKER begins. You can press any key at this time to go on to the MUSIC MAKER selection list, or you can wait for the title sequence to end and the list to appear automatically.

```
MUSIC MAKER

1 TRADITIONAL MODE
2 SOUND GRAPHS
3 LOAD MUSIC

YOUR CHOICE?  1
```

Let's press **2** to experiment with the SOUND GRAPHS activity. The next display shows the SET-UP SOUND GRAPH selection list. You have two options, Discrete and Continuous. For now, press **1** for *Discrete*.

Then these SET-UP SOUND GRAPH options appear.

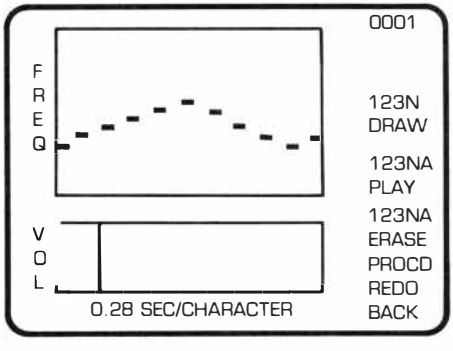
```
SET-UP SOUND GRAPH

NOISE GENERATOR (1-8)?  1
SPEED (1-30)?  15
LIST TONES (Y/N)?  N
```

Notice that each option appears with an answer already displayed. These answers are called default values. Press **ENTER** to select the default noise generator (1). Next, press **ENTER** again for a default speed of 15. For LIST TONES (Y/N)?, type N for "no" and press **ENTER**.

The first measure of the sound graph then appears, showing the cursor, a square symbol (⛶), to the left of DRAW 1. Next, press [→] (RIGHT) or move the lever on the Wired Remote Controllers to the right until the cursor is positioned over the 1. Then, press **ENTER** or the FIRE button on your controller, and the cursor moves to the left side of the measure in the "frequency" area.

Before you can actually draw any music, the cursor must be in "draw" mode, indicated by the "+" symbol on the display. Press **ENTER** (or FIRE) twice to change the cursor symbol to "+."

Now you're ready to draw a sound graph. Simply press the arrow keys, ↖ (W), ↑ (E), ↗ (R), ← (S), → (D), ↙ (Z), ↓ (X), ↘ (C), or move the lever on your controller in the desired direction. Each time you indicate a direction, the computer draws a line and plays the note for you. Continue to press the arrow keys or lever until the cursor reaches the right boundary of the frequency area. You have now completed one measure. A sample graph is illustrated here:



Now, if you wish, you can play the measure you just composed. Press **SHIFT A** (AID), or with the arrow keys (or the lever), move the cursor to PLAY 1 and press **ENTER** (or FIRE). The computer then plays the tune for you.

You have now completed the SOUND GRAPHS demonstration. Press **SHIFT W** (BEGIN) to leave the SOUND GRAPHS activity. A warning screen appears next. Enter Y, and the MUSIC MAKER selection list is displayed. *Note*: Anytime you return to the MUSIC MAKER selection list, any music not saved on a cassette tape or diskette is lost.

TRADITIONAL MODE

To compose or copy music by placing notes on the musical staff, select option 1 for *Traditional Mode* when the MUSIC MAKER selection list is displayed.

Set Up Traditional Mode

When you select Traditional Mode, the SET-UP TRADITIONAL MODE display automatically appears. Before you actually begin writing music, you need to answer the questions on this display.

```
SET-UP TRADITIONAL MODE

FLATS [0-7]?  1
TIME SIGNATURE?  4/4
SPEED [1-30]?  15
```

Key Signature

First, specify your key signature by entering the number of sharps (up to seven) in your composition. If the music doesn't contain any sharps, press **ENTER** for zero sharps, and the computer then asks for the number of flats. Enter a number from zero through seven. *Note*: If you enter a number from one through seven for sharps, you are not asked for the number of flats. For information on the number of sharps or flats and the corresponding key, see *Appendix B*.

Time Signature

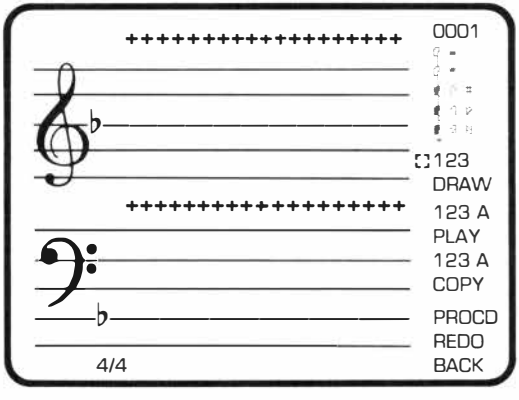
After you enter the key signature, the computer asks for the time signature. To answer this question, specify the number of beats per measure (the first number) by typing a number from 1 through 16 and pressing **ENTER**. Next, specify which type of note gets one beat (the second number) by entering a number from 1 through 16. If you simply press **ENTER** twice, the time signature has the preset (default) value of 4/4, meaning there are four beats per measure and a quarter note gets one beat. (*Note*: The first number entered *cannot* be greater than the second number.) For more information on various time signatures, see *Appendix C*.

Speed

Now you're ready to select the playing speed for the music you compose. Enter any number from 1 through 30, with 1 being the slowest speed and 30 the fastest.

The Traditional Mode Measure

After you enter the speed, the first measure is displayed.



The measure itself consists of two musical staffs, one for the treble (𝄞) and one for the bass (𝄢). The key signature automatically appears on each staff with the sharps (♯) or flats (♭) in the appropriate positions, according to your key selection.

The number of the measure currently displayed is shown in the upper right-hand corner. The various note and rest values, ranging from whole (𝅝 or 𝄻) to sixteenth (𝅘𝅥𝅯 or 𝄿), and a sharp (♯), flat (♭), and natural (♮) are below the measure number.

The time signature you entered is displayed below the bass clef staff. To the right of the time signature, a row of squares, the Volume and Note Position Indicators, indicates the playing volume of each note and the number of sixteenth notes you can enter per measure.

Between the two staffs and above the treble clef staff, you'll see a row of crosses (+) which serve two purposes. First, they correspond to the squares in the Note Position Indicator to help you place your notes in the proper position on the staff. Second, they represent the positions of middle C and the second A above middle C, respectively.

The options available for the measure — DRAW, PLAY, and COPY — are displayed to the right of the staffs. We'll discuss these options in detail later in this section.

Drawing a Traditional Measure

Drawing a measure of music is a simple procedure, requiring only the arrow keys and the **ENTER** key (or the lever and FIRE button on your remote controllers). When the measure first appears on the display, the cursor is located to the left of DRAW 1. Select the voice for your composition by moving the cursor over the appropriate number in the DRAW area and pressing **ENTER**.

Next, select the first note or rest you want to place on the staff. To do so, move the cursor over the desired character and press **ENTER** (or FIRE). The cursor then moves to middle C and appears as the selected note or rest. To move the note elsewhere on the staff, press the arrow keys or lever.

When you have placed the note where you want it, press **ENTER** (or FIRE) and the note plays. If you want to "dot" the note, press **ENTER** (or FIRE) again.

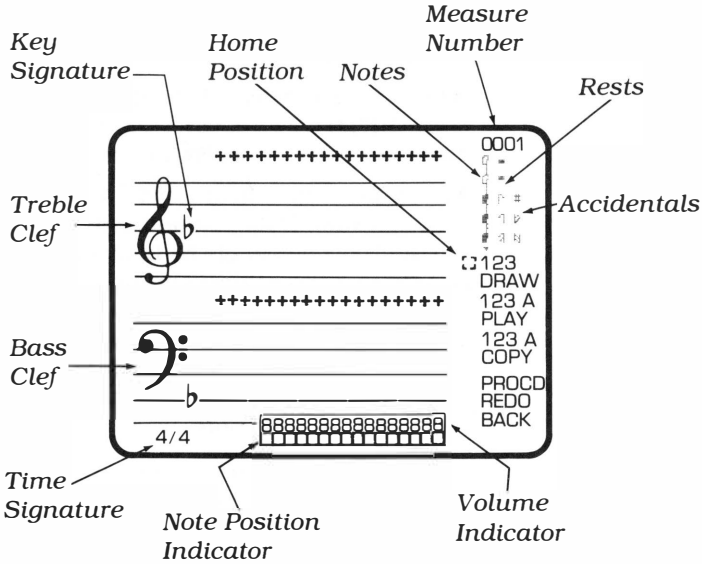
As you play the note and add a dot, you'll notice some activity in the Note Position Indicator below the bass clef staff. A portion of the Indicator now displays solid-colored squares corresponding to the value of the note you entered. The first position after the solid squares shows where you can place the next note (or rest) on the staff. This is important because the computer does not let you place a note in a location occupied by a previously entered note.

After a note is entered, it remains in the selected position when you move the cursor. Now you're ready to enter more notes and rests in the measure. Anytime the next note or rest is the same as the previous one, simply move the cursor to the next position with the arrow keys or lever. Then press **ENTER** (or FIRE) as necessary to play and, if desired, dot the note. To select a different note or rest, move the cursor over the required note or rest value to the right of the measure. Next, press **ENTER** (or FIRE), and the new value appears over the last note or rest you entered. Use the arrow keys and the **ENTER** key (or the lever and the FIRE button) to position and enter the new note or rest. Continue this procedure until you finish the measure.

Once a measure is completed for a chosen voice, you can add another voice to the same measure. To do this, move the cursor over a different voice number in the DRAW area, and press **ENTER**. You can enter up to three voices in any order you wish.

Features of Traditional Mode

Now that you're familiar with the basics of composing in TRADITIONAL MODE, let's look at some of the additional features that add to the enjoyment of this activity.



Color-coding — The notes on the staff and the squares in the Volume and Note Position Indicators are color-coded by the voice you select in the DRAW area. The first voice is represented by blue; the second, by red; and the third, by green.

Cursor — The cursor operates in the following modes in this activity:

note — "draw" mode which tells the computer you have the note where you want it

• — "dot" mode which adds a dot to the note you just entered

× — "erase" or "change" mode for changing the value or position of a note

To change modes, press **ENTER** (or FIRE) until you see the symbol for the mode you want displayed in the measure. When the cursor is to the right of the measure, it is a square (⁚).

Note selection — To select a specific note value, the cursor must be over the base of the note, not its flag.

Note position — When you press **ENTER** (or FIRE) to choose a specific note from the area to the right of the measure, the note appears in the measure over the last note entered in that same voice. When you go on to the next measure, the cursor remains in the position it last occupied in the previous measure.

Rests — Any blank spaces left in a measure are played as rests. Also, before you enter a whole rest or a half rest, it must be positioned on a line, not in a space.

Volume Indicator — The row of eights above the Note Position Indicator is called the Volume Indicator and is used to tell the computer how loud to play each note. You can enter any number from 1 through 8 in these spaces, with 1 being the lowest volume and 8 the loudest. To change the volume of a note, move the cursor over the number directly below the note, and press the number key for the new volume. The new number automatically appears in all of the boxes corresponding to the duration of the specified note.

Home position — At any time, you can return the cursor to its "home" position at the left of the DRAW area by pressing **SHIFT H**.

Range — The module accepts any notes in the three-octave range from the second A below middle C to the second A above middle C.

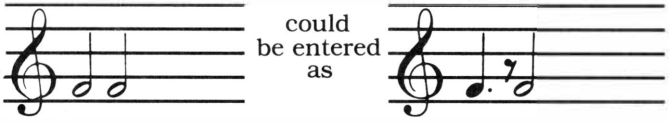
Accidentals — The computer automatically makes a note a sharp or flat as specified by the key signature. To add additional sharps or flats, or to change a note to a natural, use the symbols to the right of the measure. Use the arrow keys (or lever) to place them over the note to which they apply. Then, when you press **ENTER** (or FIRE), a small S (for sharp), F (for flat), or N (for natural) appears to the left of the note. Unlike what you do when you read sheet music, the computer applies an accidental only to the note immediately following the accidental. Therefore, a sharp, flat, or natural must be added to notes on an individual basis as required. To remove a sharp or a flat from a note, place a natural over the note and press **ENTER**.

Length of Composition — The number of measures you can enter in your song depends on the type of notes and the number of voices you enter. For example, if you enter all quarter notes and use three voices, the maximum number of measures is 224, while with sixteenth notes and three voices, the maximum is 57. *Note*: If your computer has 8K bytes of RAM, the maximum number of measures using quarter notes and three voices is 60 and the maximum with sixteenth notes is 15.

Special Functions — When a measure is completed, you can press **SHIFT V** (PROC'D) to go on to the next measure, **SHIFT R** (REDO) to return to the previous measure, or **SHIFT Z** (BACK) to go to the TRADITIONAL MODE selection list. Or, instead of pressing **SHIFT V**, **SHIFT R**, or **SHIFT Z**, you can move the cursor to PROCD, REDO, or BACK on the display and then press **ENTER** (or FIRE).

Note: If two or more consecutive notes are in the same position on the staff (on F, for example), the computer slurs them as an organ would. The length of the note equals the sum of the lengths of the individual notes. If you do find it necessary to place two consecutive notes

in the same position, you might want to try separating the notes with a short rest. For example, in 4/4 time, the measure



Playing a Traditional Measure

You can play the notes you've entered on a displayed measure at any time — during a composition, after completing a voice, or after completing an entire measure. To play the music, move the cursor to the area labeled PLAY. If you want to hear a specific voice, place the cursor over the number corresponding to that voice. If you want to hear all of the voices together, move the cursor to A (all). After the cursor is in the desired position, press **ENTER** (or FIRE), and the computer plays the requested voice(s) in the displayed measure. You can also play all of the voices in a measure without moving the cursor to PLAY by pressing **SHIFT A** (AID). For information on playing more than one measure of a song, see "Playing a Traditional Mode Composition."

Changing a Note in Traditional Mode

After listening to a measure, you may decide to change the value or position of some of the notes. The procedure is basically the same one you used to draw the music in the first place.

Move the cursor to the appropriate voice in the DRAW area, and press **ENTER** (or FIRE). Next, move the cursor to the desired note value, and press **ENTER** (or FIRE) again. The selected note is now displayed over the last note you entered in the specified voice. Move the note over the note you wish to change, and press **ENTER** (or FIRE) to play the note and to tell the computer you have the note where you want it.

After you have completed your changes, you can press **SHIFT V** (PROC'D) to go on to the next measure or **SHIFT R** (REDO) to return to the previous measure.

Copying and Erasing a Traditional Measure

Sometimes, a song might have several measures which are exactly the same or which differ only slightly. If so, you can save yourself some time by following this procedure to copy a measure of a song.

When a new measure first appears on the display, the area under PLAY is labeled COPY. To copy any of your previous measures to the new measure, move the cursor to the number of the voice you wish to copy and press **ENTER**. COPY is replaced by blank spaces so that you can enter the number of the measure you wish to copy. If you enter the number of a measure which is empty, the module does not respond and waits for you to enter a valid number or select another option. After an appropriate number is entered, the computer automatically displays the indicated voice(s) from the previous measure in the current measure. At this point, you can change any notes, if necessary, or you can proceed to the next measure.

Notice that as soon as a note or rest appears in a measure, the word in the COPY area changes to ERASE. To erase a specific voice, move the cursor over the number of that voice and press **ENTER**. The computer then automatically erases the voice you indicated. If you specify all of the voices (A) in the displayed measure, the entire measure is erased, and ERASE changes back to COPY.

Editing Traditional Mode Music

Occasionally, you may decide to change a previous measure of your song. To do this, select option 1, *Edit*, when the TRADITIONAL MODE selection list is displayed.

The EDIT display then appears, showing you the number of completed measures and the percentage of the computer's memory you have used. You are also asked to enter the playing speed for the music. This value does not have to be the same as the speed entered when you set up the Traditional Mode. In this way, you can play the song faster or slower if you wish.

Next, the computer asks you to enter the number of the first measure you want to edit. The measure that you indicate is then displayed so that you can change the position or value of the notes as described previously.

When your changes are complete, press **SHIFT V** (PROC'D) to go to the next measure, or press **SHIFT R** (REDO) to go to the previous measure. To select another option, press **SHIFT Z** (BACK), and the TRADITIONAL MODE selection list is displayed.

Playing a Traditional Mode Composition

To play more than one measure of your composition, press **2** for *Play* when the TRADITIONAL MODE selection list is displayed. The PLAY options then appear, showing the number of completed measures and the default values for the questions:

```
PLAY

COMPLETED MEASURES: 1
SPEED (1-30)? 15
VOICE(S)? 1
TRANSPOSE DOWN (0-11)? 0
START AT MEASURE? 1
END AT MEASURE? 1
```

Press **ENTER** to skip the cursor over any entries you wish to leave unchanged. To change any of these values, simply type the new number and press **ENTER**. If necessary, press **SHIFT G** (INS) or **SHIFT F** (DEL) to insert or delete characters, or press **SHIFT C** (CLEAR) to erase the old value before you type the new one. When you're asked about transposing the music, enter the number of half steps you want to raise or lower the composition. (*Note*: Any note which is transposed below the second A below middle C becomes a rest.) The values you enter for START AT MEASURE? and END AT MEASURE? determine how much of the song is played.

After you specify the last measure to be played, the computer plays the song and displays the number of the measure it's currently playing. You have three additional options while the music is playing. First, you can press **SHIFT R** (REDO) to replay the music starting at the first measure you selected. You can also press the **SPACE BAR** to stop the music and display the current measure (press the **SPACE BAR** again when you're ready to continue playing the song). Finally, you can press **SHIFT Z** (BACK) to stop the music and return to the TRADITIONAL MODE selection list. Note that the repeat and pause options can be particularly helpful when you're deciding whether or not to edit your composition.

Save or Print with Traditional Mode

The other options on the TRADITIONAL MODE selection list are 3 for *Save* and 4 for *Print*. With option 3, you can save any of your compositions on a mass storage device, such as a diskette or cassette tape. With option 4, you can print as many of your completed measures as you wish when the TI Solid State Thermal Printer is attached to the computer. For more information on these options, see the "Save, Load, and Print" section of this manual.

SOUND GRAPHS

In contrast to the Traditional Mode, Sound Graphs does not require any knowledge of music theory before you can compose a tune. Instead, you create music by drawing a series of horizontal lines on a graph and listening to the tones represented by the lines. As in Traditional Mode, you can change the position of the notes, and you can play back your composition.

As you become accustomed to Sound Graphs as a method of composing music, be willing to experiment! With this activity, you can create sound effects (such as sirens or motorcycles), draw familiar tunes, or enter your own original compositions.

Set Up Sound Graphs

To select *Sound Graphs*, press **2** when the MUSIC MAKER selection list is displayed. The SET-UP SOUND GRAPH selection list appears next. If you press **1** for

Discrete, the measure has a range of 30 frequencies; if you press **2** for *Continuous*, the measures consist of 120 frequencies.

After you select one of these, the SET-UP SOUND GRAPH options are displayed with certain default values supplied, as shown here:

```
SET-UP SOUND GRAPH

NOISE GENERATOR (1-8)?  1
SPEED (1-30)?  15
LIST TONES (Y/N)?  Y
```

Noise Generator

To select a noise generator, enter a number from one through eight. Generators one through four represent "periodic" noise, while generators five through eight represent "white" noise. Also, generators four and eight play noise based on the frequency of the third voice. (Since the difference between noises is difficult to describe, you can try out the various noises yourself to become familiar with each one.)

Speed

Next, specify the speed of play for the composition. The value you enter determines how fast the computer plays the composition, with 1 being the slowest speed, and 30 the fastest.

Tone Frequencies

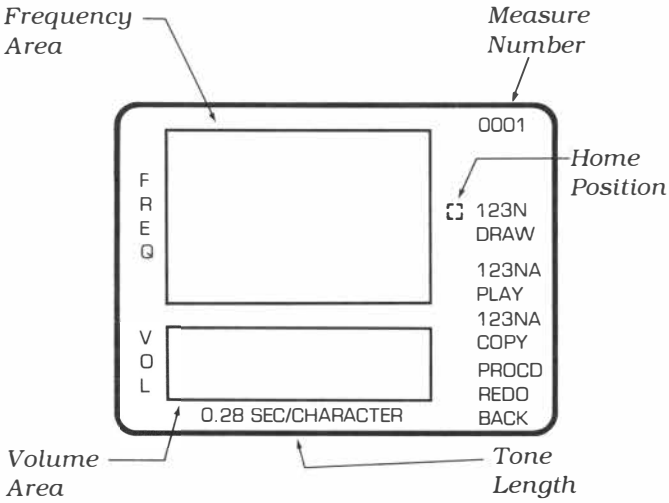
If you selected Discrete tones, the last question asks whether or not you want to see a list of the tone frequencies. (If you selected Continuous tones, this question does not appear.) Then, if you enter N for no list, the first measure appears next. If you press Y for yes, the 30 default values are listed.

To play each of the frequencies, press **ENTER**, and the cursor moves to each value in order. To change a frequency, enter the new frequency as a value from 110 Hertz (low) through 20000 Hertz (high) when the cursor is in the desired location. To change any frequency back to its default value, follow this same procedure. (For a list of the default frequencies with their corresponding note values, see *Appendix D*.) You can return to the beginning of this list at any time while it's displayed by pressing **SHIFT R** (REDO). After you've finished reviewing the frequency list, press **SHIFT V** (PROC'D) to go on to the first measure of the SOUND GRAPHS display.

While you are composing a Sound Graph, you can return to this list and change the frequencies used in the music. To do this, press **SHIFT Z** (BACK) to return to the SOUND GRAPHS selection list. Then press **1** for *Set-Up Sound Graph*, and repeat the procedure explained above.

The Sound Graphs Measure

After you have set up your sound graph, the first measure appears:



The larger graph area is used to draw the frequency tones for up to three voices, while the smaller area displays the volume you draw for any of three voices or the noise generator.

The number below the volume area represents the length of a tone as seconds per character, based on the speed previously entered. Since each measure contains 20 horizontal positions, the length of a measure is 20 times the length of a tone. For example, with a speed of 30, a tone plays for approximately .03 seconds/character and a measure lasts about one second.

The number of the current measure is shown in the upper right-hand corner of the display. *Note*: You can enter a maximum of 46 measures (12 measures with 8K bytes of RAM) in a Sound Graphs composition.

Below the measure number, the various options are listed. Let's look at DRAW, PLAY, and COPY in the order in which they appear.

Drawing a Sound Graphs Measure

To draw a measure in the Sound Graphs mode, use the eight arrow keys, ↖ (W), ↑ (E), ↗ (R), ← (S), → (D), ↙ (Z), ↓ (X), and ↘ (C), or the lever on the Wired Remote Controllers to move the cursor over the desired voice (1, 2, or 3) or noise (N), and press **ENTER** or the FIRE button. The cursor then appears at the left boundary of the frequency area (or the volume area for noise). In Sound Graphs, the cursor operates in three different modes as indicated by the displayed symbol.

- ⛶ "Move" mode — You can move the cursor to another position without drawing or erasing any tones.
- × "Erase" mode — You can place the cursor over any line in the same voice and remove those tones from the measure.
- + "Draw" mode — You can draw the line in the measure and play the tones at the same time.

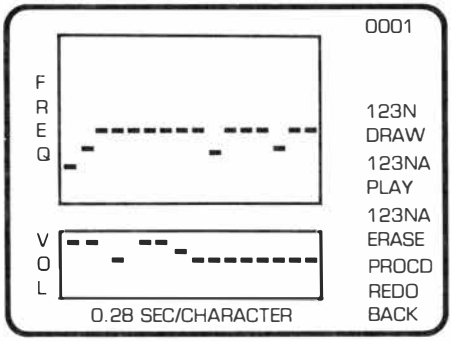
To change the cursor to a different mode, press **ENTER** or the FIRE button.

You're now ready to draw a sound graph with the arrow keys or the lever. When the cursor is in the draw mode, it leaves a color-coded line on the display as it's moved. Blue indicates the first voice; red, the second; green, the third; and purple, noise. (*Note*: Noise can only be drawn in the volume area.) If two or more voices appear in the same position, the line is cyan (light blue).

When you finish drawing a measure with one voice, you may wish to add another one. If so, move the cursor to the number of the new voice or noise in the area labeled DRAW and press **ENTER** or the FIRE button. The different voices and noise can be entered in any order you wish. *Note*: If you select noise from the area labeled DRAW, the cursor automatically appears in the volume area since you can only enter noise as a volume.

You can also change any line you draw easily. Simply select the appropriate voice, press **ENTER** to change the cursor to the play mode, and draw the new line. The previous line is automatically erased as the new line is drawn and played.

In addition, you can indicate the volume for any voice or noise in the Sound Graphs activity. Simply move the cursor to the volume area of the display and draw the volume line. The higher the line is in the area, the louder the volume is when the measure is played. When you select a different voice and begin to enter its volume, the line for the previous voice is erased. However, the volume which you entered is stored in the computer's memory and is still used when the measure is played. A typical measure illustrating tones and volume for one voice is shown here.



Once you complete a measure, you can press **SHIFT V** (PROC'D) to go to the next measure, **SHIFT R** (REDO) to return to the previous measure, or **SHIFT Z** (BACK) to display the SOUND GRAPHS selection list. Instead of pressing **SHIFT V**, **SHIFT R**, or **SHIFT Z**, you can move the cursor to PROCD, REDO, or BACK, and press **ENTER** (or FIRE).

Notice that as you go from one measure to the next, a space appears in the left boundary of the measure. This space shows you where the line for the voice you are now drawing ended in the previous measure. That way you can continue drawing the voice from that position, if you wish. As you change to a different voice, the space moves to show where that voice ended in the preceding measure. Once you draw a sound graph in a measure and then return to the previous measure, the space in the right boundary indicates where the chosen voice begins in the next measure.

Playing a Sound Graphs Measure

You can play a displayed measure at any time by moving the cursor to the area labeled PLAY. For a particular voice, place the cursor over the appropriate number; or for the noise generator, over N. To play all the voices and noise you've entered, move the cursor to A. After you've positioned the cursor, press **ENTER**, and the computer plays the measure for you, incorporating any volume you've indicated. In addition, you can play all of the voices and noise you've entered in a measure at any time by pressing **SHIFT A** (AID).

Copying or Erasing a Sound Graphs Measure

When a new measure first appears on the display, the area below PLAY is labeled COPY. To copy all or part of a previously drawn measure to the current measure, move the cursor to the desired voice in the COPY area and press **ENTER**. Next enter the number of the measure you want to copy. The computer then copies the voice(s) from the measure you've indicated onto the measure that is currently displayed.

As soon as a note is entered in a measure, COPY changes to ERASE. To erase all or part of a measure, move the cursor to the number of the voice(s), or N for noise, that you wish to erase and press **ENTER**. If you erase the entire measure, ERASE changes back to COPY.

Editing a Sound Graphs Measure

As you compose, you might find it necessary to edit selected measures of your song. To save time, you can display only those measures you wish to edit, instead of going through an entire composition one measure at a time. When a measure of your song is displayed, press **SHIFT Z** (BACK) to return to the SOUND GRAPHS selection list. Then press **2** for *Edit*.

The first information on the EDIT options display tells you the number of completed measures and the percentage of the computer's available storage space you've used. The display then shows the speed you entered during setup. To change the given speed, enter your new number, pressing **SHIFT C** (CLEAR), if the old number is longer than the new one. The final option asks you to enter the number of the measure you wish to edit. (When answering the EDIT options, you can insert or delete characters by pressing **SHIFT G** (INS) or **SHIFT F** (DEL), respectively.)

The measure you indicated is then displayed. Follow the procedure explained in "Drawing a Sound Graphs Measure" to edit your composition.

Playing a Sound Graphs Composition

While you are composing or after a composition is complete, you'll probably want to play the entire piece. In this way you can determine whether any editing is necessary or if your composition is ready to be stored on a mass storage device (tape or diskette).

When the SOUND GRAPHS selection list is shown, press **3** for *Play*. The next display tells how many measures you've completed and asks you to enter the speed, voices, noise generator, and the starting and ending measures. All of the questions show a default value when they first appear. If that is the value you want, press **ENTER** to go to the next question. Otherwise, enter a new value. In some instances, you might need to press **SHIFT C** (CLEAR) to erase the old value first. *Note*: If you do not enter anything after VOICE(S)?, the NOISE GENERATOR (Y/N)? N automatically changes to Y for "yes," and the computer plays noise instead of tones.

After you answer all of the questions, the music is played and the display shows the number of the measure in progress. At this point, you can press **SHIFT R** (REDO) to start the music over from the beginning, the **SPACE BAR** to stop the music and display the current measure (press the **SPACE BAR** again to continue), or **SHIFT Z** (BACK) to return to the SOUND GRAPHS selection list.

Saving or Printing a Sound Graph

The Music Maker module also gives you the options of saving and/or printing a Sound Graphs composition. When the SOUND GRAPHS selection list is displayed, press **4** for *Save* or **5** for *Print*. Depending on your choice, you can save the graph on a mass storage medium, such as a cassette tape or a diskette, or you can print part or all of your SOUND GRAPHS composition. For more information on the saving and printing procedures, see "Save, Load, and Print."

SAVE, LOAD, AND PRINT

When you have completed a composition in either the Traditional Mode or Sound Graphs activity and expect to play it again sometime, you can save it on a mass storage medium, such as a cassette tape or a diskette. Then when you're ready to play the music again, you can easily load the song into the computer's memory instead of starting over from the beginning.

Note: Any music you have composed that is not saved on a mass storage device is erased when you leave the Traditional Mode or Sound Graphs activity. The computer first displays a warning to remind you to save your music.

```
* WARNING *

UNSAVED MUSIC IS LOST UPON
LEAVING THIS MODE.

EXIT [Y/N]?  N
```

Saving a Composition

To save music composed in Traditional Mode, press **3** for *Save* when the TRADITIONAL MODE selection list is displayed. If the music was created with Sound Graphs, select option 4 (*Save*) from the SOUND GRAPHS selection list.

The next display asks you for the title and the date. The title can be a maximum of 10 characters without any spaces or periods. You can enter anything you want after DATE, such as your name as the composer. When you have entered your answers to both questions, the STORAGE DEVICE selection list offers you the following options.

```
STORAGE DEVICE

1 CS1
2 CS2
3 DSK1
4 DSK2
5 DSK3
6 OTHER

YOUR CHOICE?  1
```

CS1 and CS2 refer to audio cassette recorders attached to the computer via the Cassette Interface Cable. To store your music on a cassette tape, first connect the cassette recorder to the computer console, following the directions in the *User's Reference Guide*. Then press **1** for *CS1* or **2** for *CS2* and follow the procedure that appears on the display. After the music is properly recorded on cassette tape, remove the tape from the cassette recorder and label it for identification.

DSK1, DSK2, and DSK3 refer to the TI Disk Memory Drives. If the Texas Instruments Disk Memory System is properly attached to the computer and turned on, select DSK1, DSK2, or DSK3 (depending on which disk drive you are using). The computer stores the file information on the diskette you have indicated. For more information on setting up and using your TI disk system, refer to the Disk Memory System and Disk Memory Drive owner's manuals.

Option 6, *Other*, refers to the TI RS232 Interface or any future mass storage device. If you are using an RS232C-compatible storage device plugged into the RS232 Interface, enter the device name as RS232/1 or RS232/2, depending on which RS232 port you're using. (See the RS232 Interface owner's manual for set-up instructions.) Then refer to the appropriate owner's manual for complete directions on the saving procedure.

Loading a Composition

To load music which you have previously saved back into the computer's memory, select option 3, *Load Music*, from the MUSIC MAKER selection list. (*Note*: In order to load your music, the appropriate mass storage device must be properly attached to the computer and turned on.) The LOAD MUSIC selection list appears with these options:

```
LOAD MUSIC

1 CS1
2 DSK1
3 DSK2
4 DSK3
5 OTHER

YOUR CHOICE?  1
```

If you saved your music on a cassette tape, press **1** for *CS1*, and the computer prompts you through the loading routine. With options 2, 3, and 4, which refer to TI Disk Memory Drives, the computer asks you for the title. This must be the same title you entered to save the music. The computer then loads the music into its memory. If you select option 5, *Other*, enter the device name as RS232/1 or RS232/2, depending on which RS232 port you're using. Next enter the title as specified in the appropriate owner's manual. Then follow the proper procedure for loading the music into the computer's memory.

After the music is properly loaded, you are ready to play your composition.

Note: If you save music on a cassette tape *without the TI Disk Memory System attached to the computer*, then you must also load the music on the cassette tape without the disk system attached.

Obtaining Printed Copies

To obtain printed copies of a display, the TI Solid State Thermal Printer must be attached to the Home Computer. Since the Music Maker module uses special graphics characters, other printers do not work with the module.

You can print any display in the module, except the title screen, by pressing **SHIFT P**. The display is then printed as it appears on the screen. *Note*: The computer will not print a display while it's playing your music.

Printing several measures of a composition at one time is also a simple procedure. Either press **4** for *Print* when the TRADITIONAL MODE selection list is displayed or **5** for *Print* when the SOUND GRAPHS selection list is displayed. The PRINT options appear next, showing the number of completed measures. Enter the numbers of the first and last measures you want to print. If you decide to stop printing before reaching the last measure you entered, press **SHIFT Z** (BACK). The printer stops, and the display returns to the selection list for the activity. Printed copy obtained with this procedure does not reproduce the characters and functions which appear to the right of the measure.

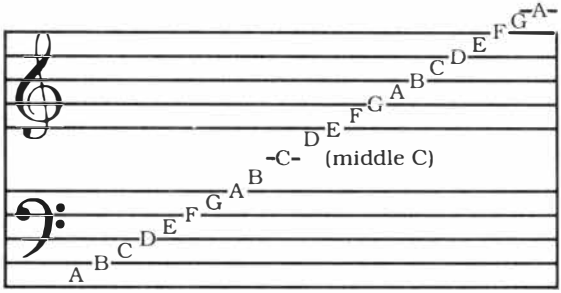
IMPORTANT: Characters printed by the printer are composed of a 5×7 dot matrix, while the characters displayed on the Home Computer screen are composed of an 8×8 dot matrix. This means that some of the characters in your composition may be only partially printed. If you have added accidentals to the notes in a measure, you may find it necessary to write them on the printout yourself.

Appendix A

Musical Staffs

On a piano keyboard, the white keys are named as follows:

These keys correspond to the lines and spaces on the musical staffs as shown here:



The black keys on the keyboard are used when a note is a sharp or a flat, which means that the tone is raised or lowered one-half step.

Appendix B

Key Signatures

The following tables explain the various key signatures available with the module's Traditional Mode.

Number of Sharps	*Major Key*	*Minor Key*
0	C	A
1	G	E
2	D	B
3	A	F#
4	E	C#
5	B	G#
6	F#	D#
7	C#	A#

Number of Flats	*Major Key*	*Minor Key*
0	C	A
1	F	D
2	B♭	G
3	E♭	C
4	A♭	F
5	D♭	B♭
6	G♭	E♭
7	C♭	A♭

Appendix C

Time Signatures

Some examples of time signatures are listed here, along with an explanation of their meanings.

Time Signature	*Number of Beats per Measure*	*Note Which Gets One Beat*
2/2	2	Half
2/4	2	Quarter
3/4	3	Quarter
4/4	4	Quarter
6/8	6	Eighth
8/16	8	Sixteenth

Notice that the first number in the time signature indicates the number of beats per measure, while the second number indicates which note gets one beat.

Appendix D

Sound Graphs Frequencies

The following table gives the default frequencies (rounded to the nearest whole number) and the corresponding notes for the discrete tones in Sound Graphs.

Frequency	*Note*	*Frequency*	*Note*
110	A	494	B
123	B	523	C (high C)
131	C (low C)	587	D
147	D	659	E
165	E	698	F
175	F	784	G
196	G	880	A (above high C)
220	A (below middle C)	988	B
247	B	1047	C
262	C (middle C)	1175	D
294	D	1319	E
330	E	1397	F
349	F	1568	G
392	G	1760	A
440	A (above middle C)	1976	B

For variety, you might want to try composing a Sound Graph with some of these scales.

Chromatic

Frequency	*Note*	*Frequency*	*Note*
131	C	311	D#
139	C#	330	E
147	D	349	F
156	D#	370	F#
165	E	392	G
175	F	415	G#
185	F#	440	A
196	G	466	A#
208	G#	494	B
220	A	523	C
233	A#	554	C#
247	B	587	D
262	C (middle C)	622	D#
277	C#	659	E
294	D	698	F

Pentatonic

Frequency	*Note*	*Frequency*	*Note*
131	C	1047	C
147	D	1175	D
165	E	1319	E
196	G	1568	G
220	A	1760	A
262	C (middle C)	2093	C
294	D	2349	D
330	E	2637	E
392	G	3136	G
440	A	3520	A
523	C	4186	C
587	D	4699	D
659	E	5274	E
784	G	6272	G
880	A	7040	A

Gypsy

Frequency	*Note*	*Frequency*	*Note*
131	C	587	D
147	D	622	E♭
156	E♭	740	F#
185	F#	784	G
196	G	831	A♭
208	A♭	988	B
247	B	1047	C
262	C (middle C)	1175	D
294	D	1245	E♭
311	E♭	1480	F#
370	F#	1568	G
392	G	1661	A♭
415	A♭	1976	B
494	B	2093	C
523	C	2349	D

To compute additional frequencies based on one-half step between notes, you can enter the following TI BASIC program.

```
10 LET F=110
20 FOR I=1 TO 91
30 PRINT F
40 LET F=F*[2∧[1/12]]
50 NEXT I
60 END
```

Note: This program should be entered before you use the module or after you have saved your music on a cassette tape or diskette. If you leave the module to run the program, any music you have not saved on a mass storage medium will be lost.

CARING FOR THE MODULE

Command modules are durable devices, but they should be handled with the same care you would give any other piece of electronic equipment. Keep the module and its recessed contacts clean and dry.

CAUTION:
The contents of a Command Module can be damaged by static electricity discharges.

Static electricity build-ups are more likely to occur when the natural humidity of the air is low (during winter, for example, or in very dry climates). To avoid possible damage to the Command Module, touch any metal object (a doorknob, a desklamp, etc.) before handling the module.

If static electricity is a problem in your area, you may want to purchase a special carpet treatment that reduces static electricity build-up. These commercial preparations are usually available from local hardware and office supply stores.

IN CASE OF DIFFICULTY

If the module activities do not appear to be operating properly, return to the master title screen by pressing **SHIFT Q**. Withdraw the module, align it with the module opening, and reinsert it carefully. Then press any key to make the master selection list appear. Repeat the selection process. (*Note*: In some instances, it may be necessary to turn the computer off, wait several seconds, and then turn it on again.)

If the module is accidentally removed from the slot while the module contents are being used, the computer may behave erratically. To restore the computer to normal operation, turn the computer console off, and wait a few seconds. Then, reinsert the module, and turn the computer on again.

If you have any difficulty with your computer or the MUSIC MAKER module, please contact the dealer from whom you purchased the unit and/or module for service directions.

Additional information concerning use and service can and be found in your *User's Reference Guide*.

THREE-MONTH LIMITED WARRANTY
HOME COMPUTER SOFTWARE MODULE

Texas Instruments Incorporated extends this consumer warranty only to the original consumer purchaser.

WARRANTY COVERAGE

This warranty covers the electronic and case components of the software module. These components include all semiconductor chips and devices, plastics, boards, wiring and all other hardware contained in this module ("the Hardware"). This limited warranty does not extend to the programs contained in the software module and in the accompanying book materials ("the Programs").

The Hardware is warranted against malfunction due to defective materials or construction. **THIS WARRANTY IS VOID IF THE HARDWARE HAS BEEN DAMAGED BY ACCIDENT, UNREASONABLE USE, NEGLECT, IMPROPER SERVICE OR OTHER CAUSES NOT ARISING OUT OF DEFECTS IN MATERIALS OR WORKMANSHIP.**

WARRANTY DURATION

The Hardware is warranted for a period of three months from the date of the original purchase by the consumer.

WARRANTY DISCLAIMERS

ANY IMPLIED WARRANTIES ARISING OUT OF THIS SALE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE ABOVE THREE-MONTH PERIOD. TEXAS INSTRUMENTS SHALL NOT BE LIABLE FOR LOSS OF USE OF THE HARDWARE OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS, EXPENSES, OR DAMAGES INCURRED BY THE CONSUMER OR ANY OTHER USER.

Some states do not allow the exclusion or limitation of implied warranties or consequential damages, so the above limitations or exclusions may not apply to you in those states.

LEGAL REMEDIES

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

PERFORMANCE BY TI UNDER WARRANTY

During the above three month warranty period, defective Hardware will be replaced when it is returned postage prepaid to a Texas Instruments Service Facility listed below. The replacement Hardware will be warranted for three months from date of replacement. Other than the postage requirement, no charge will be made for replacement.

Composing music is both an exciting challenge and an interesting pastime. With the Music Maker Command Module, you can create musical compositions whether you are a novice or a serious musician. You can also enter your favorite pieces by other composers. The module makes it easy to compose, edit, and play music on the Home Computer. In addition, you can save the music on a cassette tape or diskette so that the computer can replay the songs as often as you wish.

Music Maker module selections let you enter your compositions in one of two ways:

- ***Traditional Mode*** — You place notes on a musical staff one measure at a time.
- ***Sound Graphs*** — You create music by drawing lines to represent musical tones.

If the TI Solid State Thermal Printer (sold separately) is attached to the computer, you can print any of the music you write. Activities in this module are also designed to work with the optional Wired Remote Controllers.

Adds 18K bytes of active memory with stored program to your TI Home Computer.

Command Module program and data base contents
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