Piano Automation

MC-1 Owner's Manual

Section

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4. Using Computers/Sequencers
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Section1 - Introduction

The MC-1 MIDI Converter is an microprocessor-controlled accessory which adds MIDI input and output capabilities to Pianocorder™ equipped pianos.

What is MIDI? MIDI is an acronym for Musical Instrument Digital Interface. It allows musical instruments, computers, and MIDI sequencers to "talk" to each other, in much the same way that people do when they are holding a phone conversation. The difference is that, instead of communicating in English, MIDI instruments communicate in the ones and zeros of computer language. Fortunately, for you to *use* MIDI, you *don't* have to learn this special "computer language".

When you hook up a MIDI cable from one instrument to another, the actual sound of the instrument does not travel down the wire. In reality, a sophisticated series of commands tells the synthesizer(s) what note(s) to play, how long they are to be played, and other information such as soft and sustain pedal positions. When MIDI is recorded, it is done on a computer or stand-alone device generally called a sequencer. A sequencer does not record audio information, but instead memorizes a series of MIDI commands that tell all the instruments what and when to play.

MIDI is not limited to controlling a single instrument at a time. Up to sixteen different instruments can be controlled simultaneously - each receiving MIDI commands on its own "channel" - in much the same way that a television set can receive different programs over one cable. If you had three televisions connected to the same cable, each could be playing different programs. MIDI instruments can be instructed to "listen" for information on their own dedicated MIDI channel - even if messages on different channels are being sent simultaneously over a single MIDI cable.

Now that MIDI capability has been added to your Pianocorder, many exciting possibilities are opened up. But, please don't be overwhelmed at this point. You don't *have* to add a new wing to your house for your 16 instrument MIDI recording studio. You will get great pleasure by just adding a single new instrument to play in unison with your piano. To do this, all you need are the three items on the next page.

1 MIDI Cable

1 MIDI equipped Keyboard or Synthesizer

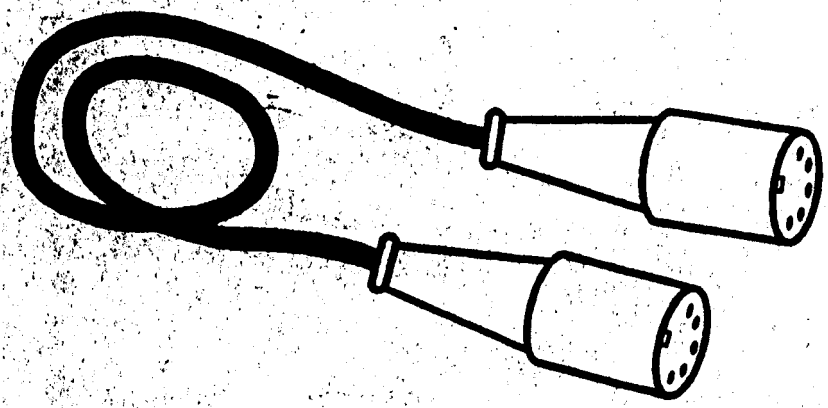
Most models of electronic keyboards are available in a box form that just has the sound generating electronics, i.e., everything but the keyboard. This is generally called a synthesizer. For good reproduction, the synthesizer should be "12 to16 note polyphonic". This means that it can play 12 to 16 simultaneous violin, or, say, harpsichord notes. (Many older ones can only play 8 notes.) Since a pianist only has 10 fingers, 8 or, at most, 10 notes would seem to be enough. However, much of the pre-recorded tape music for the Pianocorder has many more than 8 notes playing at the same time. If your synthesizer can only play 8 notes, then some will be "lost" and the music will sound jumpy. **Note:** Some synthesizers, although described as 12 or 16 note polyphonic, will only play 8 notes on any one MIDI channel. To be effective, the synthesizer must be able to play 12 or 16 notes on a single MIDI channel.

1 Stereo (or Mono) Sound System

The sound system will not be required if your keyboard has speakers.

The next section is designed to get you playing with a minimum of fuss.

Let's go play some music!



This is a MIDI Cable

Section 2 - Getting Started Fast

One of the most exciting (and easiest) things that the MC-1 can do is allow an electronic instrument to play along with your Pianocorder. This chapter is written to accomplish this with a minimum of instructions. Detailed explanations will come in later sections. And, if we don't hear violins, you may have to read on to find the reason! But, for now, if you follow these steps, you should be up and running in no time at all.

Before we hook up any MIDI equipment, let's initialize the MC-1 and play the piano by itself.

If the MC-1 is on , please use the switch on the front panel to turn it off. The MC-1 has several changeable System Parameters that affect it's operation. What we are going to do is make sure that it is set up correctly for simply sending MIDI to an accompaniment instrument. You don't have to understand this operation now; just please do the following steps:

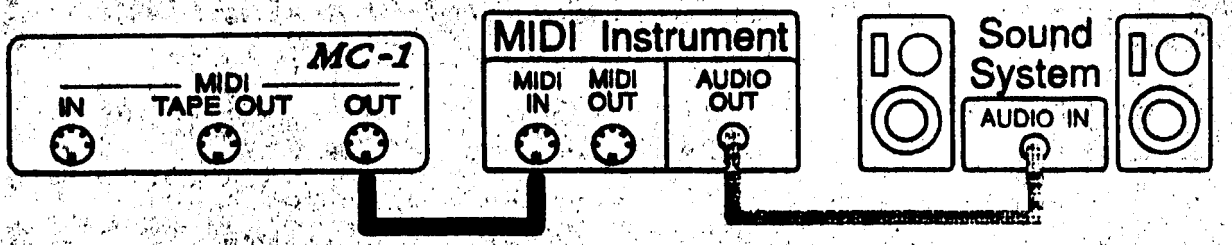
1. Make sure the MC-1 is off. (The display will be blank.)
2. Hold down both the [+] and [-] keys on the MC-1 top panel. Keep them down.
3. Turn on the MC-1. You should see these messages:
   Piano Automation
   System to Default
   Ready Ver 1.0 (Your Version number may be different.)
4. Release the [+] and [-] keys.
5. Press the [s] key about 9 times until you see this message:
   + Saves Setup

   If you miss the message, just keep pressing [s] until it appears again.
6. Press the [+] key. You should see:
   + Confirms Save
7. Press the [+] key again. You should see:
   Setup Saved

You will probably never need to return the MC-1 to its "factory set" System Parameters. But, by doing this step now, we may prevent confusion by being sure of our starting point.

The next step is to confirm that the Pianocorder can operate normally. Both the Pianocorder *and* the MC-1 must be on for normal operation. If they are off, turn them both on now. Play a pre-recorded Pianocorder tape. The system should behave the same as it did before the MC-1 was installed. If the piano is not playing, please give us a call.

Now you may connect up the rest of the system as shown below. It is usually advisable to turn off all equipment while changing cable connections. Note that you may not need a sound system if your keyboard has self contained speakers.



Turn on all of the equipment. On your MIDI Instrument, select a percussive instrument such as a harpsichord. Put your favorite tape in the Pianocorder and press play. When the Fine Tuning light goes out, your piano should start playing. Additionally, you should hear another instrument playing along with the piano. Now comes the fun part. Experiment with different instruments on your synthesizer. Some you will like, and some just won't work at all. Most piano music doesn't sound good played by "Laser Gun"! Usually, the closer the instrument is to a piano, i.e. struck or plucked strings, the better the music will sound.

Now, what if you are not getting the synthesizer to play? The next section covers this same mode of operation, but in greater detail.

Section 3 - Playing an Accompaniment Instrument

This section presents additional information about playing an accompaniment instrument. The basics are covered in Section 2.

When the MC-1 is in "Input from TAPE" mode, it sends MIDI information about the notes being played and pedal positions out both the MIDI TAPE OUT and MIDI OUT connectors on the front panel. The MIDI note on messages also contain information taken from the tape about the note volume. Additionally, each piece of MIDI information includes a MIDI channel number.

Generally speaking, for your keyboard or synthesizer to act on MIDI information, it must be "tuned" to the same MIDI channel as the message another device is sending. The MC-1 can send MIDI messages on any of 16 MIDI channels. Normally, there is no reason to use anything other than the default of channel 1. If you want to check or change the channel, this is done on the top panel. (See Section 5 - Changing System Parameters.) Right now, if you keep pressing the [s] key, the MIDI Channel number message will come into view. Pressing the [+] or [-] keys will change the number up or down. The important thing to understand is that *any* channel will work as long as the receiving instrument is set to the *same* channel.

There is another parameter that will affect which channel an instrument accepts MIDI information. It is called Omni. If Omni is ON, then your synthesizer will usually play notes assigned to any of the 16 MIDI channels. For the purposes of this section, it probably won't matter if Omni is ON or OFF . Please note that we are talking about the setting on your synthesizer, not the setting on the MC-1.

Synthesizers may also be told to respond in either Mono or Poly modes. In mono mode, only one note will play at a time. Since we clearly want all notes to play, the synthesizer should be set to Poly mode. Sometimes the modes will be chosen by standard MIDI Mode numbers. The two that interest us are:

Mode 1	Omni On / Poly	(Channel numbers won't matter.)
Mode 3	Omni Off / Poly	(Channel numbers on the MC-1 and your synthesizer must match.)

Although this may seem a bit complicated, don't worry. Most synthesizers will "power up" in Mode 1, so their defaults will work fine the first time. This information is here to help you if you are having problems.

There are two parameters on the MC-1 that affect how your accompaniment sounds. They are Volume Expand and MIDI Delay. These are changed by pressing the [s] button until the correct parameter comes into view and then pressing [+] or [-] to change the value. Details on all MC-1 parameters are found in Section 5.

Briefly, Volume Expand controls how Pianocorder expression numbers (how loud a note should be played) into MIDI values. The higher the Volume Convert number, the greater the range used to send MIDI information. There is no "right" setting. Simply play some music and adjust the number to suit your taste.

Midi Delay controls how long the MC-1 waits before sending MIDI data that corresponds to the Pianocorder tape information. If the MIDI note was sent at the same time as the Pianocorder, it would be heard much sooner, since solenoids take about 90 milliseconds to physically actuate. Again, this parameter is simply adjusted until the music sounds good to you.

The MC-1 has another parameter called Volume Adjust. Although the adjust number may be used to raise or lower the MIDI volume information, this parameter should only be used in special occasions. Use the regular Pianissimo and Fortissimo controls to control the piano volume, and the volume adjustment on your synthesizer or stereo to control the accompaniment level.

Section 4 - Using Computers / Sequencers

Adding a sequencer will greatly expand the capabilities of your system. The most useful is the ability to move music from the Pianocorder system to an environment where it may be stored, edited, and played back in any order you want.

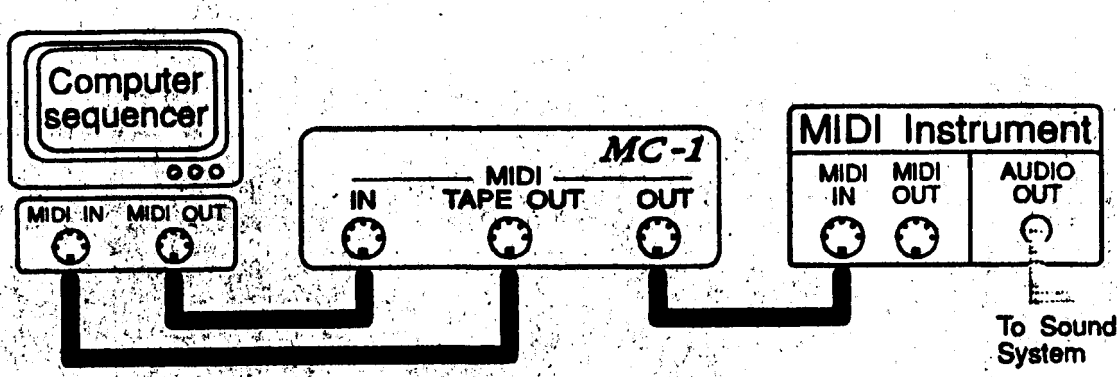
What is a sequencer? Basically a sequencer is a "computer" device that can store and manipulate music. There are two approaches to gaining this ability. One is to have a stand-alone device that is made specifically for sequencing. These devices are called Sequencers and are typically made by the same companies that make synthesizers. One new approach is to build sequencing capability into a keyboard. This combination device is called a Workstation. But, the most flexible arrangement for sequencing is to use a personal computer.

It is way beyond the scope of this manual to get into the details of selecting computer hardware or software. If you are new to MIDI, you might want to buy a MIDI primer book. There are several good ones to choose from. Some cities have computer or MIDI user groups that are valuable sources of help and information. They are often specific to a particular brand of computer. Many computer music stores offer classes. Certainly they will be able to demonstrate a variety of software to you.

A computer needs two things to be "turned into" a sequencer. First, it must have the proper sequencing software. For every brand of computer, there is a wide range of software available. Since any one software package will only run on one type of computer, many people find the software first and let that choice dictate what hardware to buy.

The second requirement is that the computer have a MIDI interface. This interface usually plugs into the computer and adds the proper hardware and connectors so that the computer will be able to send and receive MIDI messages. (One exception: Atari computers come with a MIDI interface already built in.)

The various components should be connected as shown on the next page.



Is important that the MC-1 MIDI TAPE OUT be connected to the sequencer. This MIDI output is slightly different from the regular MIDI OUT in that it is turned off when the MC-1 is in Input from MIDI mode. This prevents a "MIDI feedback loop" from occurring when the sequencer is simultaneously outputting MIDI and recording. The output MIDI data would go in the MC-1, be re-output and returned to the sequencer. Most sequencer programs would re-record this data on top of it's output, resulting in a doubling of all notes

The following topics are treated only in much as they apply to specific operation of the MC-1. For general information, you should refer to your sequencer manual of general MIDI books.

Capturing MIDI from Pianocorder tapes

Generally speaking, to capture Pianocorder tapes into a sequencer, it only requires setting the program to record and pressing Play on the tape recorder. After the recording is finished, it may be saved (usually to a diskette) and played back at any time. Note that MIDI channel settings must be observed, the same as before. But once the music is captured, the sequencer program will let you make a whole range of changes to the music. Tempo may be changed; the music can be transposed to another key; rhythm and melody parts can be split so that the synthesizer only plays (on a separate MIDI channel) part of the music, etc.

The MIDI volume recorded with each note will be affected by the MC-1 settings by the Volume Convert and Volume Shift parameters. If you change the MC-1 settings for playback, you may get unusual results. It is best that Volume Shift be left at 0 and the same Volume Shift be used for both capture and playback. If you want further details on this subject, please call us.

One important thing is knowing whether or not all of the Pianocorder tape data was captured without "Fine Tuning" errors. As you know, a number of things may occur to cause the information coming off a tape to be garbled. Whenever the MC-1 detects invalid information coming off a tape, it sends out precautionary note and pedal off messages. (This always happens between songs!) This practice keeps you from possibly listening to "stuck" notes and also insures that your computer recorded sequences turn everything off during playback. Another message sent is a Controller 98 (decimal) message. The MIDI definition for controller 98 is "Non-registered Parameter Number LSB". This particular controller number was chosen because, during playback, it shouldn't mean anything to any other MIDI equipment you have. *But*, we can use this message to "flag" the places where the MC-1 has detected garbled tape information. By searching the MIDI event list in your sequencer capture for Controller 98 changes, you can determine if there was any bad Pianocorder tape signals in the middle of a song. If this Controller 98 message is only found at the *end* of a song, then you know there were no tape problems in the middle.

The Controller 98 message data *value* (the third byte) starts at 1 and is incremented each time a new Controller 98 message is sent. It is *reset* back to 1 whenever you switch into Input to Tape mode or press the [-] key while viewing the Timer and System Status message on the display.

So, let's say you want to capture one whole side of a tape that has 5 songs. Change the viewed parameter on the MC-1 to Timer and System Status. Press the [-] key to reset the Controller 98 count to 1. Now capture the entire side of the tape. At the end of recording, look at the MIDI events at the end of the data. If all went perfectly, you should find a Controller 98 - 5 message. This tells you that there were only 5 "breaks" in the music, the ones you would expect after each of the 5 songs on the tape. Additionally, your sequencer should let you search for Controller 98 messages. When you find them, you know this is "break" between songs.

What if the count is greater than 5? Maybe Fine Tuning on the tape recorder needs adjusting. Dirty tape heads? Sometimes, there are just bad spots on the tape. If the count is relatively small, listen to a playback of the music. If you can't hear the problem area(s), then you can elect to use the capture as it is. If the count is large, and no adjustments seem to make a new capture better, you might consider returning the tape for replacement. Unfortunately, we are told, a lot of tapes have been of poor quality

Capturing MIDI from the Pianocorder Keyboard Record Option

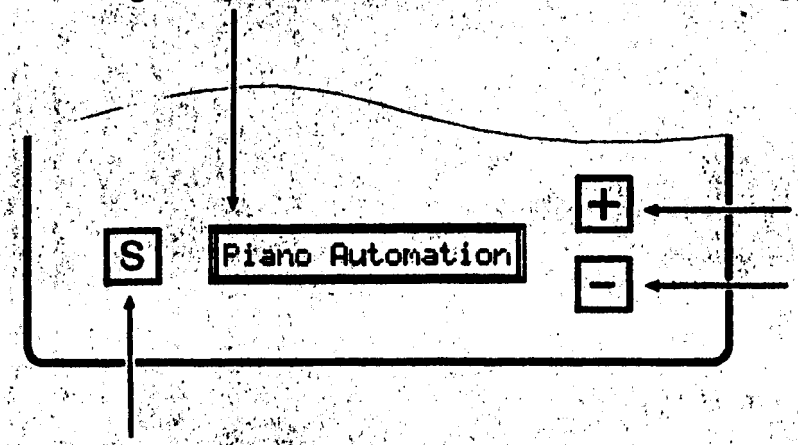
If you have the Record Option, you can capture your music on your sequencer from the piano. One big advantage over recording directly to tape is that you can edit out any mistakes. Afterward, the music may be played from the sequencer or you can record a "perfect" tape. To use this method, you must have a dummy blank tape in the tape unit. Set the sequencer to record, press Rec(ord) on the Pianocorder tape recorder and play the music on the keyboard. (The dummy tape is only required so that you can press Rec(ord) on the tape unit. This is needed so the MC-1 can determine the proper source of input. If you plan to do this a lot, you might want to take the tape out of a blank cassette to use as the dummy.)

Recording a new Tape from MIDI

Put the MC-1 in Input from MIDI mode. Set the recorder Tempo adjustment to neutral (the 12 o'clock position.) Put a fresh cassette in the recorder and press Rec(ord). Wait a few seconds for the leader to pass. Now output MIDI from your sequencer program until the song is finished. Allow a few more seconds, and press Stop. Rewind the tape, change the MC-1 to Input from TAPE, and listen to the recording on your piano. If you feel you are not hearing enough expression range, decrease the Volume Convert number and make a new recording. If there is too much expression range, increase Volume Convert.

Section 5 - Using the Top Keys and LCD Display
Changing and Saving System Parameters

The 16 character LCD (Liquid Crystal Display) shows initialization messages, system parameters, and status messages.



The [+] key is used to increment or toggle displayed parameters and confirm parameter saves.

The [-] key decrements or toggles displayed parameters and resets certain status messages.

After the MC-1 has initialized, the [s] key is used to select various system parameters that may be displayed and, optionally, changed.

Each time [S]elect is pressed the display cycles through it's list of parameters. The list below shows the order of selection and, if applicable, the range of values, and the system defaults.

Parameter Selection	Range	System Defaults
1. Input from MIDI or TAPE	MIDI / TAPE	TAPE
2. Timer and System Status		
3. MIDI Channel Number	1 to 16	1
4. Omni ON or OFF	ON / OFF	ON
5. Volume Convert Number	1.0 to 4.0	2.5
6. Volume Shift	-40 to +40	0
7. Piano PLAY or MUTE	PLAY / MUTE	PLAY
8. MIDI Delay amount	5 to 150 ms	90 milliseconds
9. Save Setup to Memory		

(If [S] is pressed while at #9 then the parameter display goes back to # 1.)

1. Input from MIDI or TAPE

The user has two choices if input source. Pressing either [+] or [-] will toggle the MC-1 between MIDI or TAPE input. When TAPE input is selected, the MC-1 takes input from the Pianocorder Tape Recorder or (if installed) the Record Option keyswitches and converts this information to standard MIDI output. When MIDI input is selected, MIDI input is converted into signals that are used by the Pianocorder system to play the piano or record new tapes.

2. Timer and System Status

This is a "catch-all" display which has several uses. There is a simple timer which may be used to time music selections. Use [+] to start the timer. The timer will keep running even while other parameters are displayed. Pressing [+] again will stop and re-start the timer. Press [-] to reset the timer to 00:00.

While running the system, several system status or error "messages" may be displayed as two character symbols. These messages are very useful for identifying the source of problems. All of the messages, except "FT" stay on once they are displayed. You must press the [-] key to clear then if you wish to look for further occurrences. The 5 possible messages are:

"ME" stands for MIDI Error. When the system detects MIDI information that it does not understand, it will display "ME" Most of the time this will be caused by connecting or turning on another piece of MIDI equipment. The MC-1 may then only get a partial MIDI message. Broken or improperly inserted cables may be another cause. An occasional "ME" may be safely ignored. If you are repeatedly getting this error, then you need to give us a call. Remember that you must press [-] to clear the display to look for subsequent occurrences.

"OR" means note Out of Range. This means that the MIDI input attempted to play a note that is out of the range of the 80-note Pianocorder. If you are using a keyboard or computer MIDI to control your Pianocorder, you can attempt to turn on notes that are out of the range of your piano. When this happens, "OR" is displayed to ley you know you are "losing" some of your music.

"> #" means Greater then allowed number of notes on. The Pianocorder's power supply can only play a certain number of notes at the same time. Naturally, pre-recorded Pianocorder tapes observe this limit. However, when you are controlling the system with MIDI input, you might inadvertently try to have too many notes playing at the same time. The MC-1 limits the maximum of simultaneous notes to

16. If you attempt to turn on a 17th note, ">#" will be displayed to tell you that this note will not be accepted.

"FT" means Fine Tuning. The "FT" message is similar to the Fine Tuning light on your Pianocorder Tape Recorder. On the Pianocorder, the red Fine Tuning indicator goes on when it cannot reliably interpret the musical information from a tape. On the MC-1. when "FT" is displayed, it means that the MC-1 cannot correctly interpret a tape. Normally both the Pianocorder Fine Tuning light and the MC-1 "FT" message will come on at the same time. To correct the condition, simply adjust the Fine Tuning wheel on the tape recorder. "FT" is the one message that will automatically turn off after the error condition is corrected.

A summary:

Message	Indicates	Type Input	Press [-] to reset?
ME	MIDI data Error	MIDI	Yes
OR	attempt Note out of Range	MIDI	Yes
>#	attempt more than 16 notes	MIDI	Yes
FT	MC-1 "Fine Tuning" indicator	Tape	No (automatic)

3. MIDI Channel Number

MIDI consists of a series of musical event messages that may be sent over a MIDI cable. An event , for example, may indicate that a particular note is now being turned on or off. One additional piece of information, that is a part of these messages, is a MIDI channel number from 1 to 16. The use of channel numbers allows messages for different pieces of MIDI equipment to be sent over the same cable. This is done by giving each "instrument" its' own channel number and telling it to respond only to messages on its' channel.

The "MIDI Channel Number parameter lets you designate the input and output channel number that is used by the MC-1. During TAPE input, this channel number will be added to all MIDI note and control messages output by the MC-1. During MIDI input, if Omni is OFF (see #4 below), incoming MIDI note and control messages must match this channel number to be accepted for translation to Pianocorder output.

4. Omni ON or OFF

The Omni parameter only affects operation during MIDI input. When Omni is ON, all MIDI messages are accepted for playback on the Pianocorder. When Omni is OFF, the channel number attached to incoming MIDI messages must match your selected MC-1 channel number to be played. Press [+] or [-] to toggle this parameter between ON and OFF.

NOTE: During MIDI input, Omni and Channel Number settings have no affect on MIDI output. All incoming MIDI messages are (delayed and) re-transmitted at the MC-1 MIDI out.

5. Volume Convert Number

Press [+] to increment or [-] to decrement this number by .5. The number may range from 1.0 to 4.0. Both the Pianocorder, and the MIDI system of music, control volume by assigning numbers to represent different levels of loudness. The larger the number, the greater the volume. Pianocorder uses a volume numbering system from 0 (softest) to 31 (loudest). MIDI uses 1 to 127. The Volume Convert Number is a multiplication factor that is used to convert the numbers used by Pianocorder to those used by MIDI. (When converting from MIDI to Pianocorder, the inverse of the Volume Convert Number is used as a divisor.) For any particular input range, the smaller the Convert Number, the smaller the translated volume range. Conversely, if the Convert Number is larger, the converted output will sound "wilder", i.e., lower lows and higher highs. A Convert Number of 2 or 2.5 is about right for most listening tastes.

You don't have to understand the mechanics of this explanation to use this parameter. If the MIDI accompaniment volume levels are not smooth enough, reduce the Convert Number. If you feel that you are not hearing enough volume range in the MIDI output, increase the Convert Number.

6. Volume Shift

Press [+] to increment or [-] to decrement this number by 5. The number may range from -40 to +40. For TAPE input, this number would be added to the MIDI volume translated from Pianocorder values. For MIDI input, this number would adjust MIDI volume inputs before being used to translate them to Pianocorder values. Although this number can function as a MIDI volume control, except for special needs, it should be left at 0. It is easier to use your Pianocorder Pianissimo and Fortissimo controls to raise and lower piano volume; likewise use your final MIDI amplifier volume control to adjust the loudness of your instruments.

7. Piano PLAY or MUTE

Press either [+] or [-] to toggle between Piano PLAY and Piano MUTE. When set to PLAY, the piano plays whenever the tape is playing or there is MIDI input to the Pianocorder. When set to MUTE, all other functions will behave as usual, except that the piano will not play.

8. MIDI Delay Value

Press [+] to increment this number by 5; [-] to decrement. The number may range from 5 to 150 ms. (Ms. stands for milliseconds, which is 1/1000 of a second. 100 ms. is 1/10 second.) The MIDI information that is output from the MC-1 must be delayed for piano notes to "play" at the same time as notes played on your auxiliary instruments. Why is this? When the Pianocorder is asked to play a note, there is a perceptible delay because of the time it physically takes to operate the note solenoid. (If you are playing the piano, there would be a delay between thinking of a note and finally hearing the sound.) On the other hand, it takes almost no time for an electronic instrument to begin sounding a note. If both instruments are asked to play a note at the same time, the electronic instrument will always be heard before the Pianocorder. If, however, we slightly delay the message to the electronic instrument, we can get both instruments to sound simultaneously. The required delay is normally about 90-100 ms. You may adjust this number to taste.

9. Save Setup to Memory

All of the previous displays have allowed you to "customize" settings to your preferences. This choice allows you to save your current settings into a special memory in the MC-1. That way, they will be as you left them, the next time you turn your system on. If you don't want to save them now, press [-] or [S] to get to the next display. If you do, press [+] now. The display will ask for confirmation. Press [+] again. The display will now read "Setup Saved!". You may now press any key to get back to parameter selection #1.