PAiA MIDI ThumbDrum
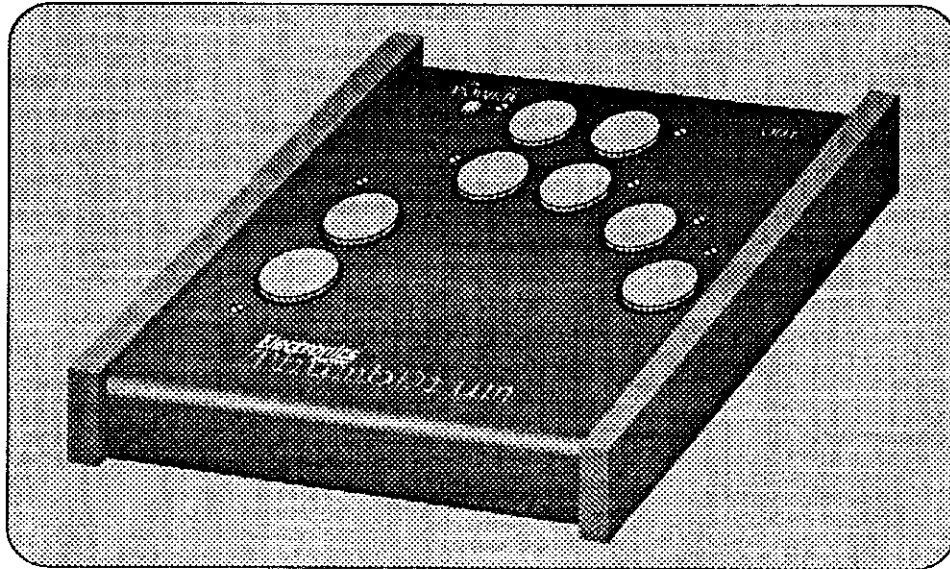
It's not easy to lay down a convincing drum part with a synth keyboard. And if you've ever tried your hand at real drums you found out it takes some practice to sound like a pro. On the other hand, you probably sound great when you finger-drum on a table top. That's the idea behind the ThumbDrum, a controller that converts finger drumming into drum sounds.

The Drum Brain Computer Board turns taps on the ThumDrum's foam percussion pads into MIDI Note On, Note Off and velocity data which can be used to control sounds from MIDI keyboards, sound modules and many MPC computers. Drum Brain firmware provides for pad remapping, MIDI data merging and several other features.

ABOUT THIS MANUAL...

This is the first manual in a set of three manuals.

They are:
      9300M Assembly and Using Manual (this one)
      9301 Sensor Board Assembly and Testing Manual
      9201DK MIDI Drum Computer Assembly and
         Testing Manual

You obviously have this manual, now check to make
sure that you have the other two. Take a good look at
them and notice these things:

This 9300M manual deals with combining an
assembled and tested 9301 Sensor Board and
9201MIDI Computer Board and installing the
combination in the ThumbDrum Case. It also has
some tips on using the completed unit. There is a
list of Case Components and Hardware Items on
the last page of this manual. Check the items
supplied with the case against this list.

Your assembly process should begin with the Sensor
Board as described in the 9301 Sensor Board
Assembly and Testing Manual. When you have
finished the Sensor Board and are satisfied that it
is working properly, assemble and test the MIDI
Computer Board as described in the 9201DK
Assembly and Testing Manual. This sequence of
Sensor Board first and then Computer Board is
recommended because the power supply for the
Computer Board is part of the Sensor Board.

The last page of each manual has a list of the parts
that should be supplied with that kit, check the
items in the parts bag against this list. Pages 2 and
3 of the 9301 and 9201 manuals tell a little about
assembling and soldering in general. These
sections are not identical between the two manu-
als, though at first glance they look that way.

When you have finished with these two sub-assem-
bly tasks, you will return to this manual to install the
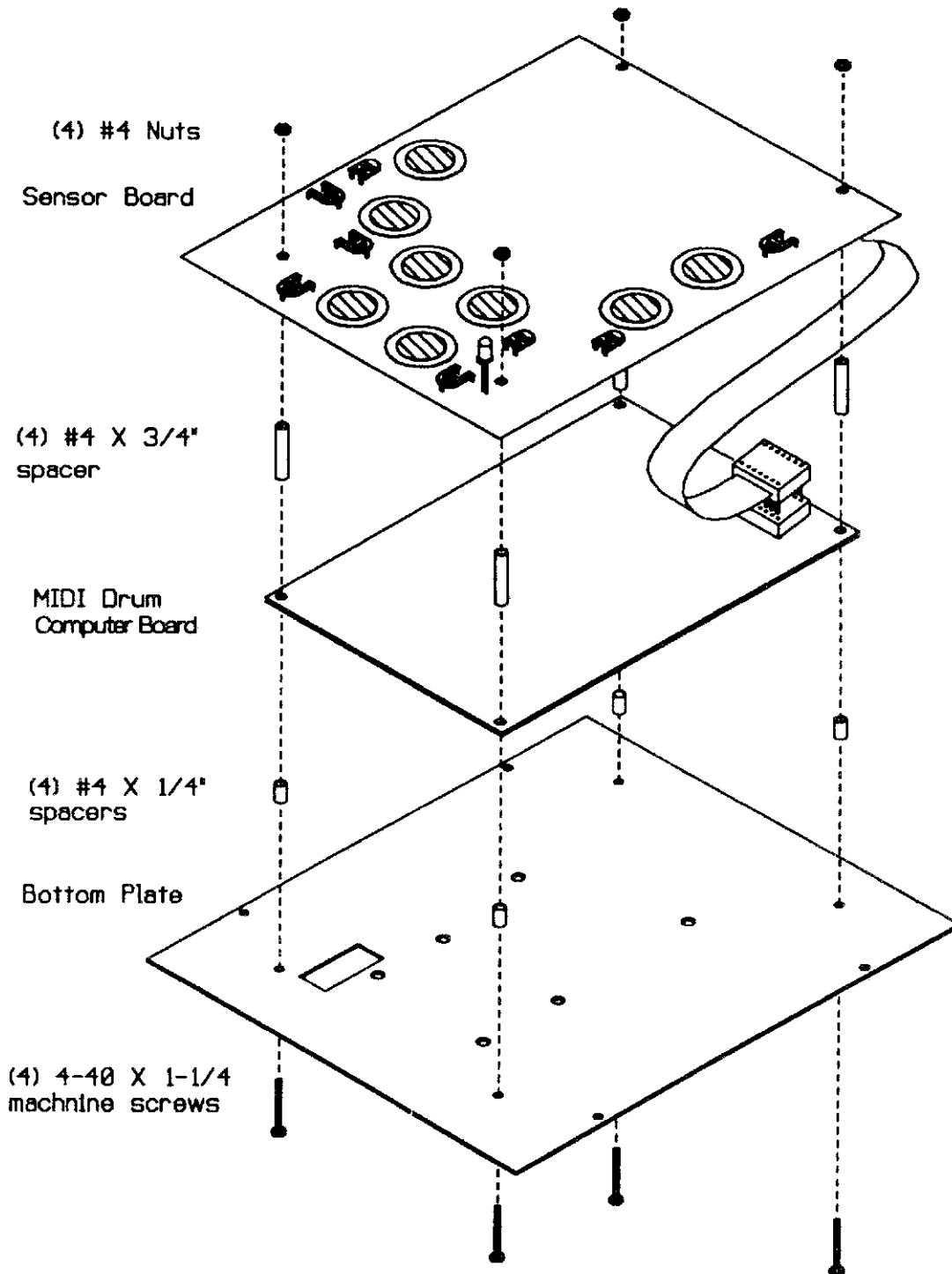units in the case.

See you back here when you finish the boards . . .
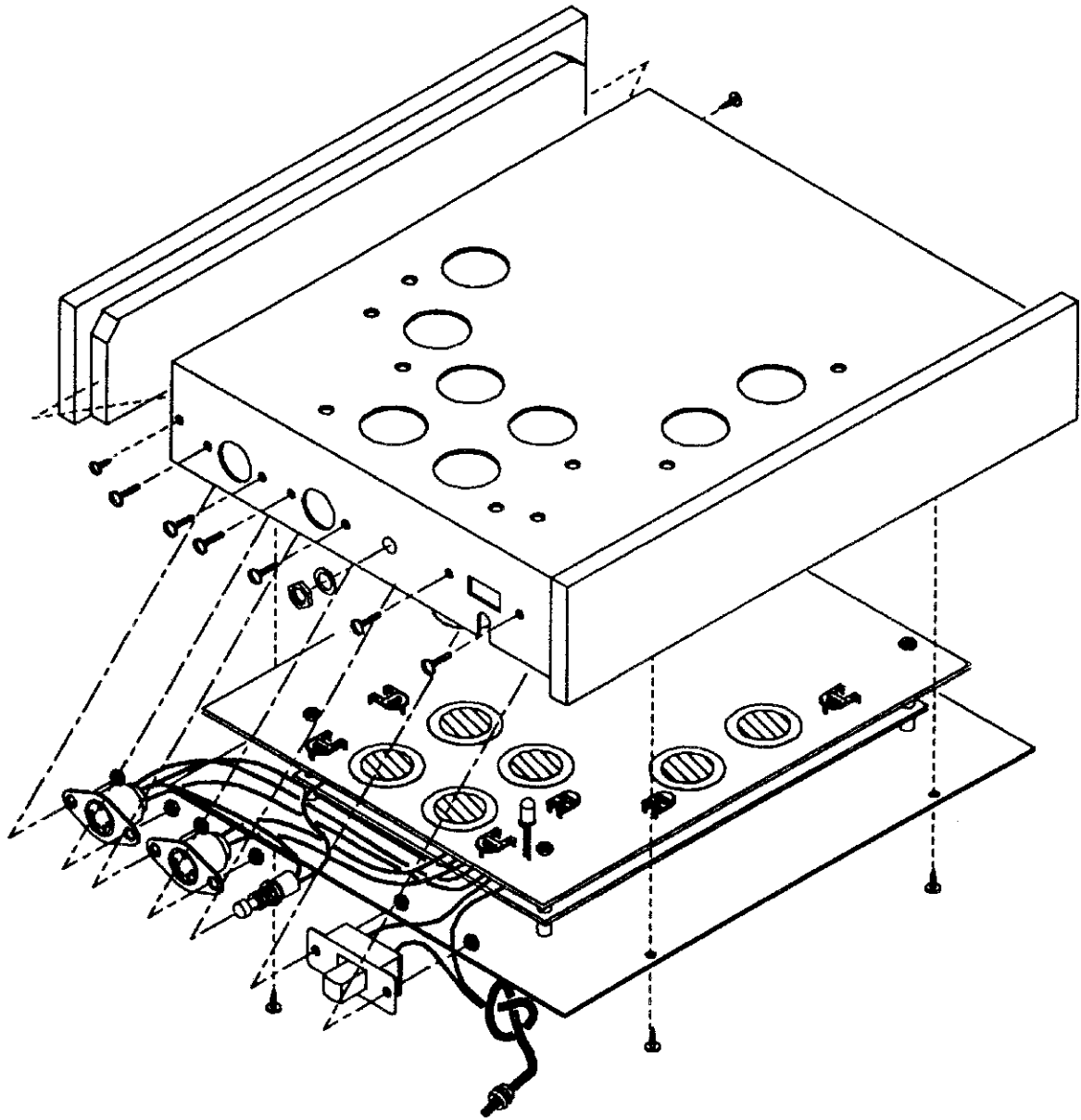
FINAL ASSEMBLY

In general terms, final assembly will consist of using long screws and aluminum spacers to form a stack consisting of the Case Bottom, the MIDI Computer Board and the Sensor Board. After installing the wood End Caps and attaching the Power Switch, MIDI Jacks and Remap Button to the Case Top, the stacked circuit boards and Case Bottom will slip into the Case Top and be secured. Finally, the foam Percussion Pads will be adhered to the Piezo Sensor Disks.

( ) Plug the Sensor Board and MIDI Computer Board together as shown in the illustration before beginning to stack them. Notice that the Ribbon Cable exits from the header away from the closest circuit board edge when the header is properly plugged into J5 on the MIDI Computer Board.

( ) Locate the Case Bottom plate and notice that it is not symmetrical. Pass one of the long (4-40 X 1-1/4") machine screws up through one of the stack mounting holes in the Case Bottom and slide one of the short (1/4") aluminum spacers onto it. Slide the corner of the Computer Board over the screw and be very careful that the board is oriented properly as shown in the illustration. Next slide the long (3/4") aluminum spacer and the corner of the Sensor Board over the screw and finally, finish with a 4-40 nut. Do not tighten this hardware yet, you'll need some slack to install the remaining hardware.

( ) Using the remaining long machine screws, short spacers, long spacers and three nuts, secure the last three corners of the stack. Fully tighten this hardware.

(4) #4 Nuts

Sensor Board

(4) #4 X 3/4"
spacer

MIDI Drum
Computer Board

(4) #4 X 1/4"
spacers

Bottom Plate

(4) 4-40 X 1-1/4
machnine screws

Use the Long Machine Screws to make a
drum sandwich of bottom plate, short spacer
Tone Board, long spacer and Sensor Board.
Secure this stack with nuts on each screw.

Put this assembly aside and trial fit the wooden End Caps into the open case ends as shown in the illustration. When fully assembled, the edges of the Case Bottom plate should be hidden by the front and rear aprons of the case top. If the End Caps do not fit far enough into the case for this to happen, it may be because the right angle cuts of the wood ends are not fitting into the slight radius of the bend in the case top. Use a sharp knife to remove the point of these right angles in the wood end.

( ) When you have assured proper fit, fasten the wood ends in place with the (4) #4 X 1/4" self-tap screws supplied. To keep the wood from splitting and provide a better fit, pilot holes for these screws should be predrilled with a 1/16" drill bit. If a drill is inconvenient, use a small finishing nail as a center punch to make this hole. Having a pilot hole is very important.
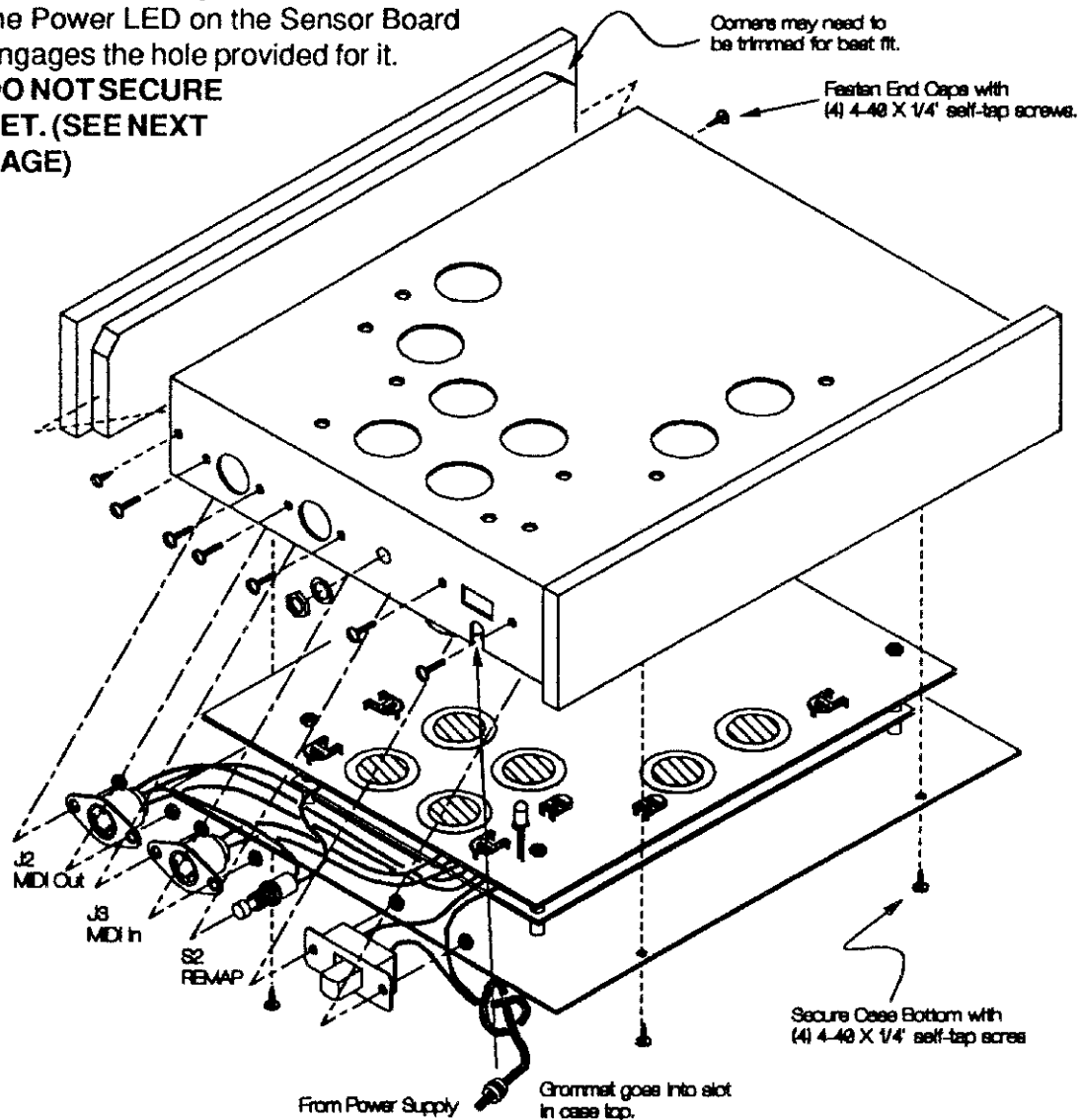
Now it's time to mount the Power Switch and other controls from the circuit board stack on the case top.

( ) Using two of the 4-40 X 1/4" machine screws and two of the #4 machine nuts supplied, Install the Power Switch S1 from the inside rear of the case top. The switch should be oriented with its Lug #1 (the end lug with the wire soldered to it) away from the closest edge of the case top.

( ) Using the four remaining 4-40 X 1/4" machine screws and #4 machine nuts supplied, mount the MIDI Out (J2) and MIDI In (J3) Jacks as shown in the illustration. Notice that J2 is the Jack with four wires and is mounted in the hole closest to the edge of the case. J3, with two wires, mounts in the remaining DIN Connector holes.

( ) Mount the REMAP Push Button (S2) by
    passing its threaded bushing through the
    hole in the middle of the rear lip of the Case
    Top and securing it with the Lock Washer
    and Nut provided.

( ) Slip the stack of Case Bottom plate and
    circuit boards into the Case Top. Tilt the end
    of the Sensor Board to slide it "under" the
    MIDI In and Out jacks. Be careful that
    the Power LED on the Sensor Board
    engages the hole provided for it.
    **DO NOT SECURE
    YET. (SEE NEXT
    PAGE)**

Corners may need to
be trimmed for best fit.

Fasten End Caps with
(4) 4-40 X 1/4" self-tap screws.

J2
MIDI Out

J3
MIDI In

S2
REMAP

From Power Supply

Grommet goes into slot
in case top.

Secure Case Bottom with
(4) 4-40 X 1/4" self-tap scres

The Case Bottom plate is slightly undersized compared to the Top so that it can move around for best-fit alignment with the holes in the top. When properly aligned, the holes for the percussion pads will be centered over the Piezo Disks and the adjusting holes for the Sensor Board sensitivity trimmers will be accessible through their holes.

It's fairly easy to hold the two halves together using one hand during this adjustment. When you are satisfied with the alignment, use a pencil to mark the locations of the Bottom plate holes over the end caps. Make sure the Rubber Grommet on the power cord is in the slot in the Case Top provided for it before permanently fastening the Bottom plate in place.

( ) Secure the Case Bottom plate to the End Caps with the four remaining #4 X 1/4" self-tap screws. As before, pilot holes in the End Caps are very important.

( ) Install the (4) self adhesive rubber feet by peeling their backing and placing them in the corners of the Case Bottom plate.

Flip the unit over and install the Percussion Pads using the Double Stick Foam tape supplied.


Sticky side down

Press pad into place

Do not cover solder joint

Peel away covering
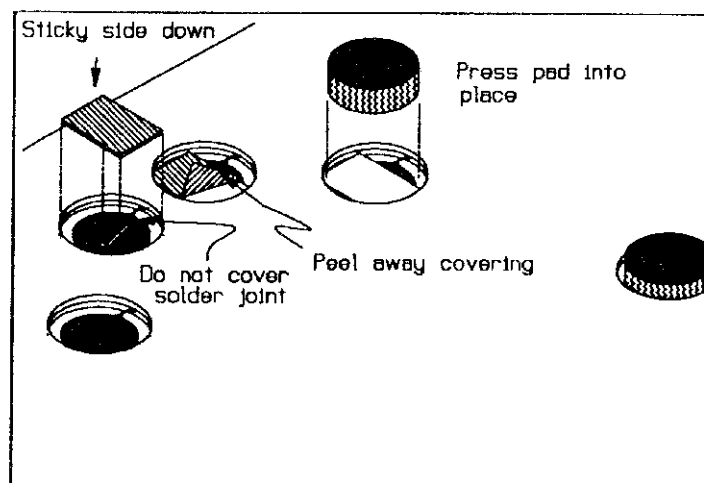
( ) Locate the 3/4" wide strip of double-stick
     foam tape, cut a 1/2" long piece and
     remove the paper backing from one side.
     Press the sticky side of the foam through
     the hole above the piezo sensor and press
     it in place. Do not cover the solder joint on
     the sensor with this tape, primarily
     because it will result in a tilted percussion
     pad.

( ) Remove the backing from the top of the tape
     to expose the sticky surface and press the
     percussion pad through the hole in the
     case. Center the pad so that it is not
     touching the case at any point.

( ) Similarly, mount the remaining seven foam
     pads.

USING THE MIDI ThumbDrum

Setting the Sensor Board's sensitivity trimmers is
very important. Trigger pulses greater than 5V
produce unpredictable results that will most
likely sound like all the drums going at once.
Remember, the POWER LED on the Sensor Board
provides an indication of this overload condition.
If the power LED glows brighter, briefly, when a
sensor is struck it's an indication that the
sensitivity is set too high.

The DEFAULT Switch is accessible through the
rectangular cut-out in the Case Bottom plate. The
eight rocker or slide switches sections of this
DIP switch set MIDI Transmit Channel, select one
of eight assignments of percussion pads to MIDI
Note Numbers and switch between a Linear or
Logarithmic response curve. The illustration shown
to the right has MIDI Channel set to 1, Map #8 is
is selected and the response is set to Linear.
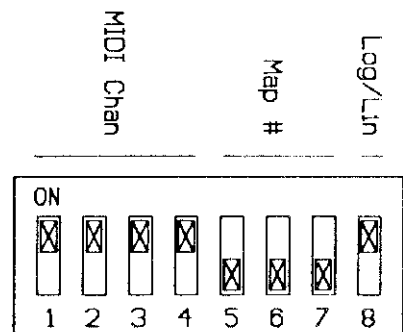
MIDI Channel

DEFAULT Switch sections s1-s4 set the
MIDI Channel that the ThumbDrum will be
transmitting on. The Receiving device must
also be set to receive MIDI on this Channel.
Since many instruments default to Channel 1,
this is a good general purpose setting (s1-s4
all On selects Channel 1).

In some situations, the ThumbDrum may be set
to send on some other channel. Most keyboards
and Sound Modules may be set to produce drum
sounds in response to messages on one channel
with other sounds assigned to other channels.

Correspondence of MIDI Channel and switch
settings is shown in the chart to the right.

Drum Maps

Switches s5-s7 select one of 8 "maps"
assigning different drum sounds to different
pads. It is not drum sounds that are sent out
on the MIDI buss of course, just Note On and Note Off
messages. In the receiving instrument the Note On
message will trigger a sound, and assuming that the
palette of sounds selected by the instrument's preset
are drums, they will be drum sounds. While most
instrument presets contain notes from a single
instrument, piano, guitar, organ and so on, drum
presets will be a collection of drum sounds. If
the instrument conforms to the General MIDI spec,
playing the lowest C (C1) key will produce the
sound of a bass drum, C#1 a rimshot, D1 a snare,
etc.

Musical instruments manufactured prior to the General
MIDI agreement may have drums assigned to notes in a
different sequence than that specified by General MIDI.
Some of the maps provided in EPROM are manufacturer
specific for Roland and E-Mu equipment.
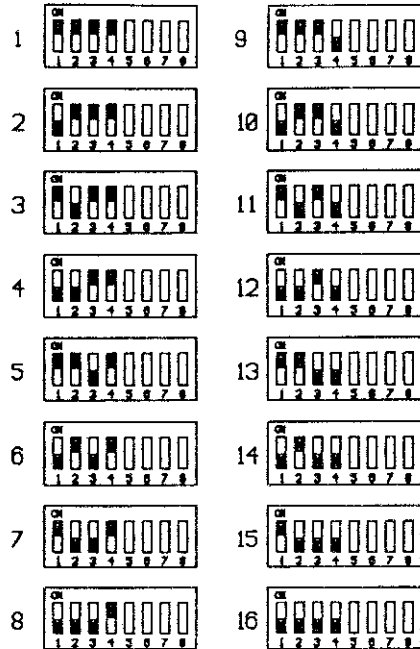
MAP 1:
BASIC KIT "A" (GENERAL MIDI)

Pad	Note	Drum Name
TL	C1	KICK
TH	D1	SNARE
FH	C2	HIGH-MID TOM
FL	A1	MID TOM
ML	F1	LOW TOM
MH	C#2	CRASH CYMBAL
RF	F#1	CLOSED HI-HAT
LF	A#1	OPEN HI-HAT

MAP 2:
BASIC KIT "B" (ROLAND STANDARD)

TL	C1	KICK DRUM
TH	D1	SNARE
FH	B1	TOM 1
FL	F1	TOM 2
ML	E3	RAP TOM
MH	C#2	CYMBAL
RF	F#1	CLOSED HI-HAT
LF	G#1	HI-HAT

MAP 3:
BASIC KIT "C" (E-MU DRUMS)

TL	C1	BASS DRUM
TH	D1	SNARE
FH	C2	TOM 1
FL	A1	TOM 2
ML	D#2	TAMBOURINE
MH	A2	CHOKE CYMBAL
RF	F#1	RAP HI-HAT
LF	C3	TABLA

MAP 4:
BALLAD KIT (GENERAL MIDI)

TL	C1	BASS DRUM
TH	C#1	RIMSHOT
FH	D1	SNARE
FL	A1	HI TOM
ML	F1	LO TOM
MH	D#2	RIDE CYMBAL
RF	F#1	CLOSED HI-HAT
LF	C#2	CRASH CYMBAL

MAP 5:
LATIN KIT "A" (GENERAL MIDI)

Pad	Note	Drum Name
TL	E3	LO CONGA
TH	D#3	OPEN HI CONGA
FH	D3	MUTED HI CONGA
FL	F3	HI TIMBALE
ML	C#3	LOW BONGO
MH	C3	HI BONGO
RF	A#3	MARACAS
LF	A3	CABASA (SHAKER)

MAP 6:
LATIN KIT "B" (GENERAL MIDI)

TL	C1	KICK DRUM
TH	D1	SNARE
FH	G3	AGOGO 1
FL	G#3	AGOGO 2
ML	F3	HI TIMBALE
MH	C3	LO WOODBLOCK
RF	D3	HI WOODBLOCK
LF	A3	CABASA (SHAKER)

MAP 7:
(PENTATONIC SCALE)

TL	C1
TH	D1
FH	D#1
FL	F1
ML	G1
MH	A#1
RF	C2
LF	D#2

MAP 8:
(C MAJOR SCALE)

TL	C3
TH	D3
FH	E3
FL	F3
ML	G3
MH	A3
RF	B3
LF	C4

s5-s7 select the drum map

1
2
3
4
5
6
7
8

Remapping

You're not stuck with just these eight drum maps,
the ThumbDrum allows for remapping; It requires
that a keyboard - or some other source of MIDI
note data - be plugged into the MIDI In jack. To
change the MIDI note assigned to a pad, push the
REMAP button and play a note on the keyboard.
Release the REMAP button and within five seconds
hit the pad that you want to assign the note to.
If you decide you don't want to make a change
after hitting the REMAP button, just release it
and wait five seconds.

While remapping, make sure only Note Data is sent
to the Thumdrum. The firmware can be confused by
System Common, System Exclusive and System
Real Time messages. Particularly, any controller
supplying Note Data for remapping purposes must have
Active Sensing disabled.

If you haven't installed any RAM on the MIDI
Computer Board you will only be able to change map
#8 and the change will be lost when power is
turned off. If you populated IC5 with a 6116, you
can change all maps but this data is volatile. If
you've installed an MK48Z02 all maps can be
altered and changes will not be lost when power is
turned off.

Logarithmic / Linear response curve

The Log/Lin switch (s8) selects a logarithmic or
linear response. If there seems to be a lack of
dynamic range (the sounds don't want to play
softly) try turning this switch off to select a
logarithmic response.

Merging

The ThumbDrum's MIDI In jack provides a "merging"
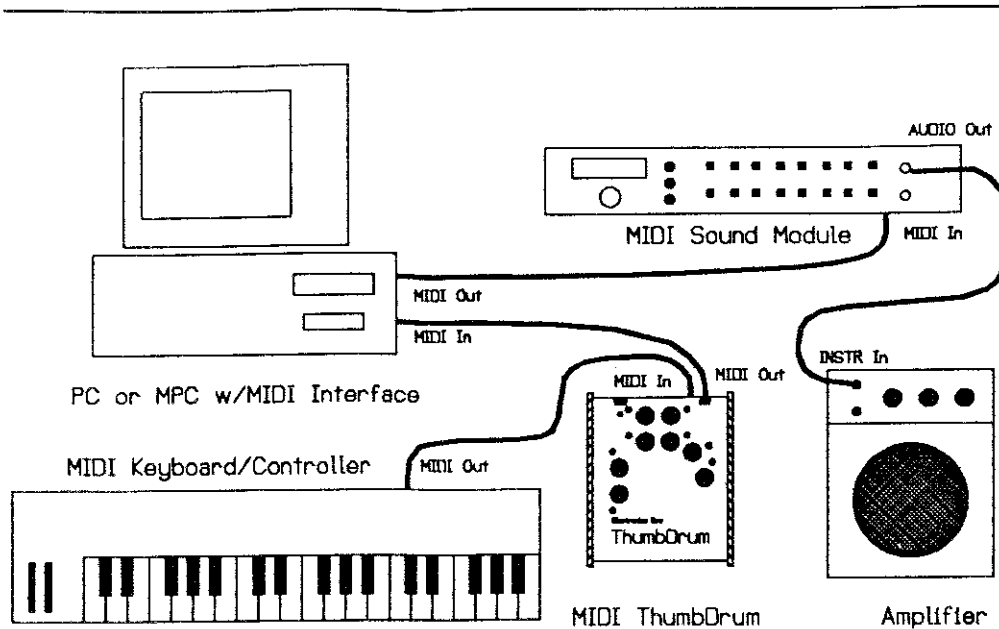function that allows data appearing here to be

combined with information from the sensors to form
the final MIDI Out. This allows keyboards and
other controllers (which like the ThumbDrum may
have no sound producing capabilities) to be daisy
chained into sound modules as shown in the
illustration. If, for example, eight percussion
pads don't seem like enough the "other controller"
can be another ThumbDrum. Thanks to MIDI's 16
Channels, one controller can handle one set of
sound while the other produces wholly different
sounds. Merging preserves the channel information
of the input J2.
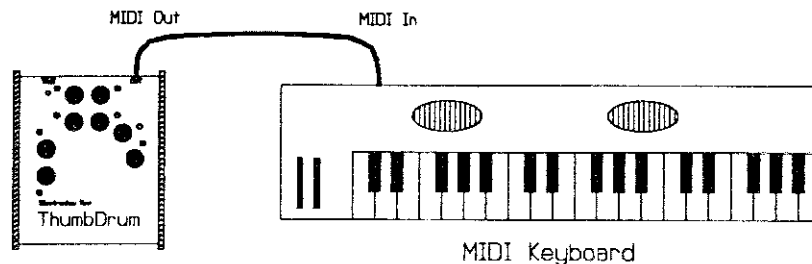
*In the simplest possible configuration the
ThumbDrum triggers sounds from a MIDI Keyboard.
Most instruments of this kind will allow the MIDI
channel transmitted by the ThumbDrum to produce
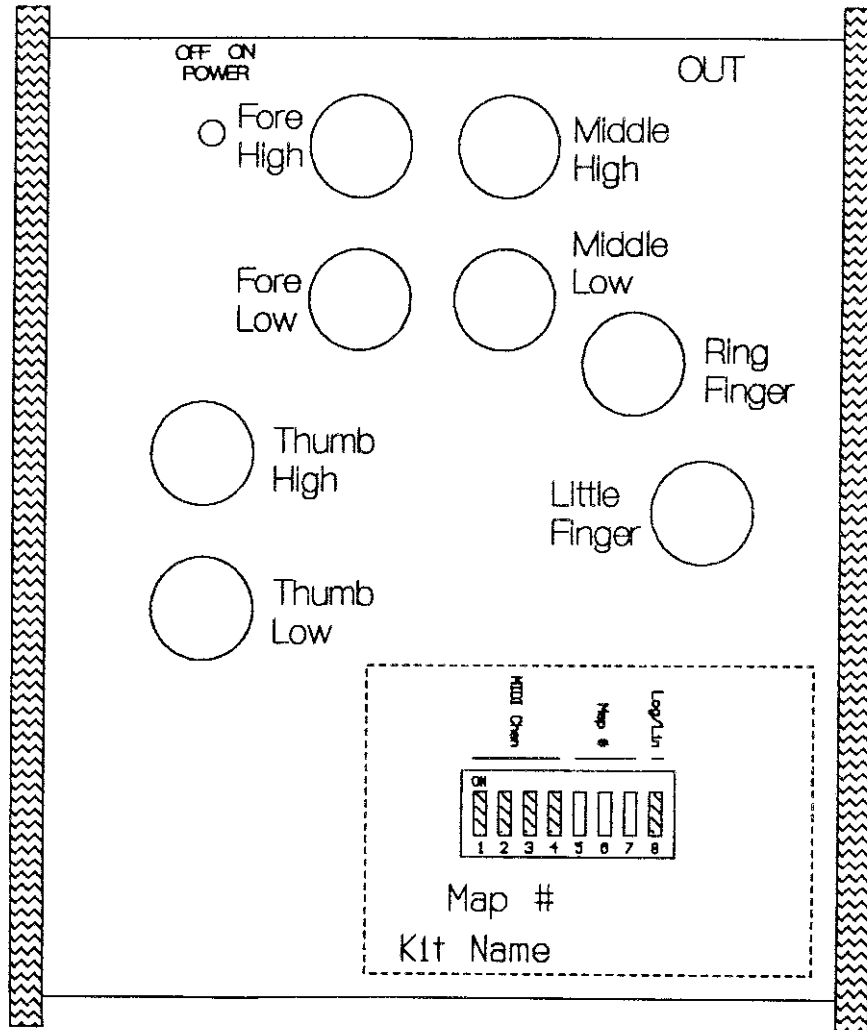different sounds than they keys do.*
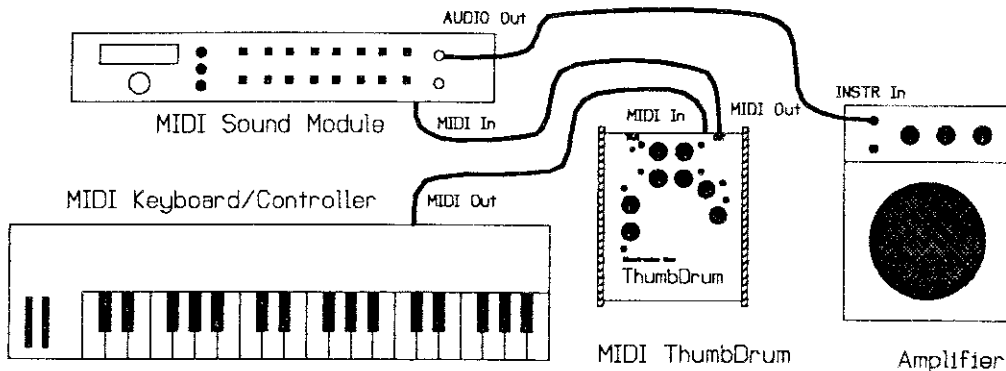
*More elaborate systems will use the ThumbDrum's
merging capabilities to daisy-chain multiple
controllers and MIDI sound modules. In this
configuration the Keyboard/Controller will also serve
as a source of Note Data when remapping.*

AUDIO Out

MIDI Sound Module   MIDI In

MIDI Out

MIDI In

PC or MPC w/MIDI Interface

INSTR In

MIDI In   MIDI Out

MIDI Keyboard/Controller   MIDI Out

ThumbDrum

MIDI ThumbDrum   Amplifier

*Typically, a computer will go in the MIDI line after all
controllers and before all Sound Modules, but the
biggest rule is that there are few rules. If the computer
has a Sound Card and MIDI Interface the Sound Module
and Amplifier may not be needed.*

To wrap it up, here's some advice about drums in
general: whether analog, digital or real, they all
want echo and reverb. Running the audio output of
even the most expensive sound modules through a
simple guitar amp reverb or electronic echo unit
will work magic.

OFF ON
POWER

OUT

○ Fore High

Middle High

Fore Low

Middle Low

Ring Finger

Thumb High

Little Finger

Thumb Low

MIDI Chan   Map #   Log/Lin

ON
1 2 3 4 5 6 7 8

Map #
Kit Name

Photocopies of this page may be used to record your mappings. Write Drum Names in open pads. Darken switch bats s5-s7 On or OFF and fill in Map# and Drum Kit Name as desired.

MIDI Thumbdrum Case
Packing List

1   Case Top
1   Case Bottom Plate
2   Wooden End Caps
8   #4 X 1/4" Self-Tap Screws
4   4-40 X 1-1/4" Machine Screws
2   4-40 X 1/4" Machine Screws
6   #4 Machine Nuts
4   #4 X 1/4" Rolled Aluminum Spacers
4   #4 X 3/4" Rolled Aluminum Spacers
4   Self Adhesive Rubber Feet

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