

SERVICE MANUAL

MIDI DIGITAL SAMPLER

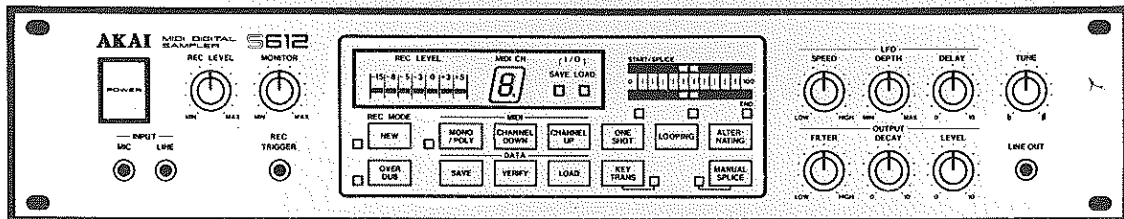
MODEL S612

SAMPLER DISK DRIVE

MODEL MD280

AKAI

AKAI SERVICE MANUAL



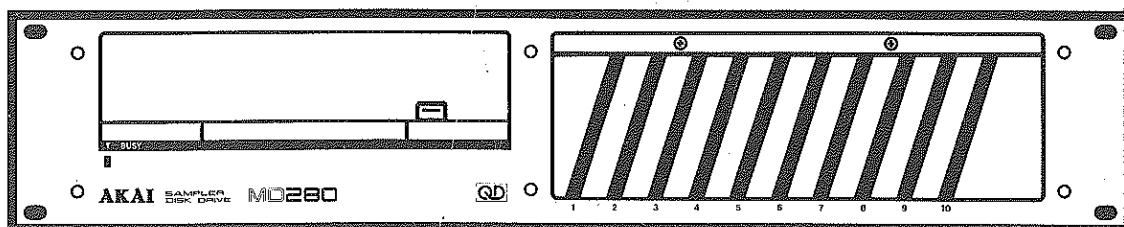
MODEL S612

MIDI DIGITAL SAMPLER

MODEL **S612**

SAMPLER DISK DRIVE

MODEL **MD280**



MODEL MD280

ABBREVIATION FOR SERVICE MANUAL

MODEL S612

ABBREVIATION	EXPLANATION	ABBREVIATION	EXPLANATION
ALTER	ALTERnating	MON	MONitor
BUSDIR	BUS DIRection	RFSH	ReFrESH
CASSR	CASSette Read	RXD	Receive Data
CASSW	CASSette Write	RD	RdaD
CH	CHannel	SHOT	one SHOT
CS	Chip Select	SIN	Signal INput
DUB	over DUB	SLTSL	SLoT SeLect
IORQ	I/O ReQuest	TRANS	TRANSPose
LOOP	LOOPing	TRIG	TRIGger
M1	Machin cycle 1	TXD	Transmit Data
MREQ	Memoly REQuest	V.REF	V.REFERENCE
MIDI	Musical instrument Digital Interface	WR	WRite

MODEL MD280

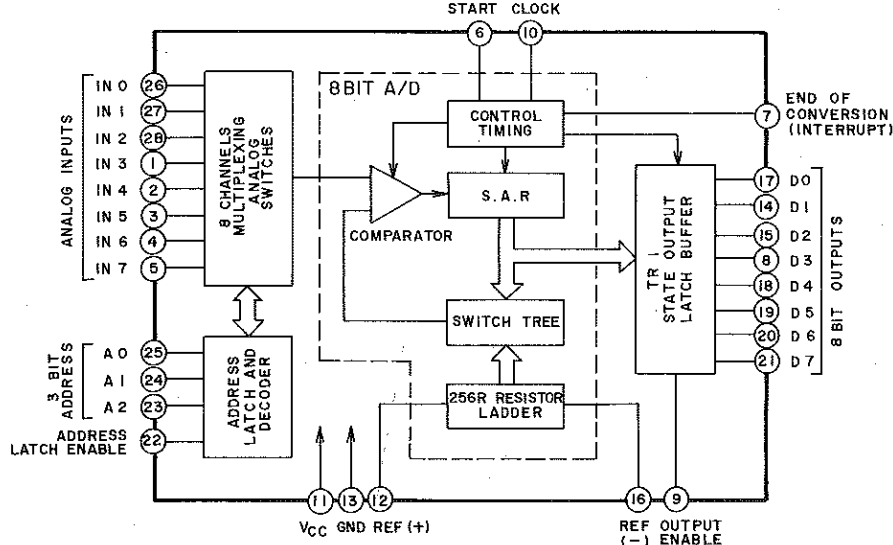
ABBREVIATION	EXPLANATION	ABBREVIATION	EXPLANATION
B/A	channel B/channel A	MTON	MoTor ON
C/D	Command/Data	QD	Quick Disk
CE	Chip Enable	RD	ReaD
CRC	Cyclic Redandancy Check Character	RDDT	ReaD DaTa
CS	Chip Select	RTSA	Request To Send A
CTSA	Clear To Send A	RTSB	Request To Send B
D	system Data bus	RXCA	Receive Clock A
DCDA	Data Carrier Detect A	RXDA	Receive Data A
DCDB	Data Carrier Detect B	SIO	Serial Input Output
DIR	DIRection	SLTSL	SLoT SeLect
DTRB	Data Terminal Ready B	TXCA	Transmit Clock A
IEI	Interrupt Enable In	TXDA	Transmit Data A
IORQ	Input/Output ReQuest	WR	WRite
M1	Machine cycle 1	WRDT	WRite DaTa
MDST	Media SeT	WRGA	WRite Gate
MERQ	MEmory ReQuest	WRPR	WRite PRotect
MFM	Modified Frequency Modulation	ϕ	system clock

(ADDITIONAL)

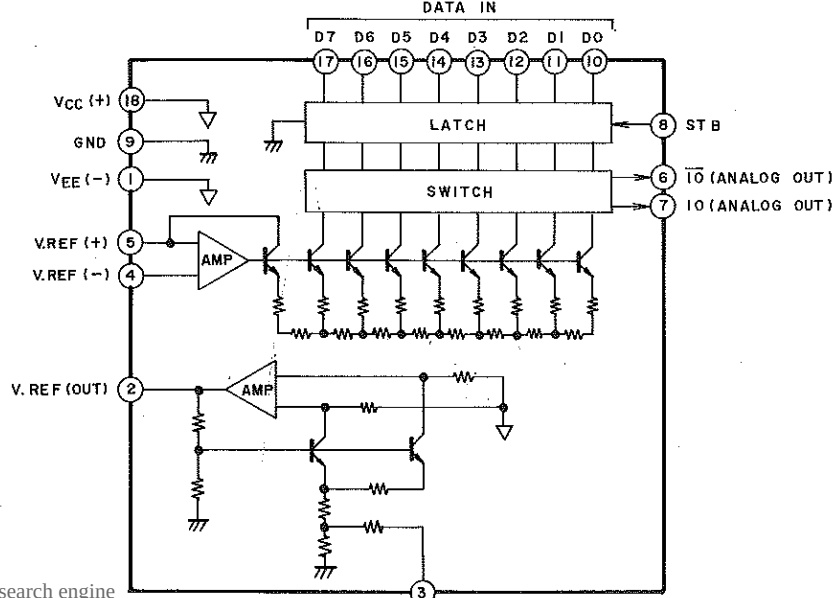
Use this additional Schematic Diagram with the model S612 Service Manual which published previously.

MODEL S612

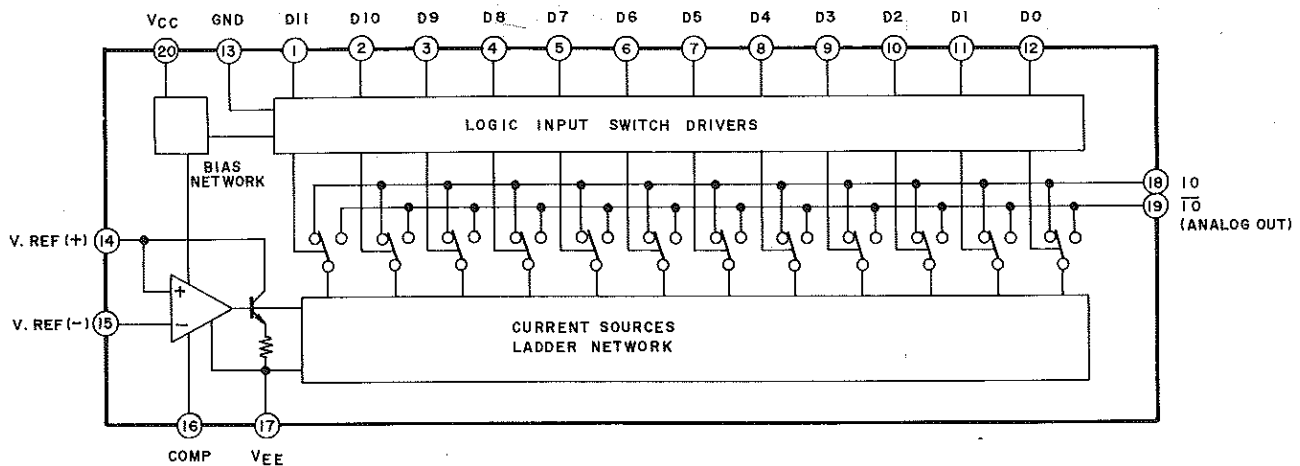
(IC58)



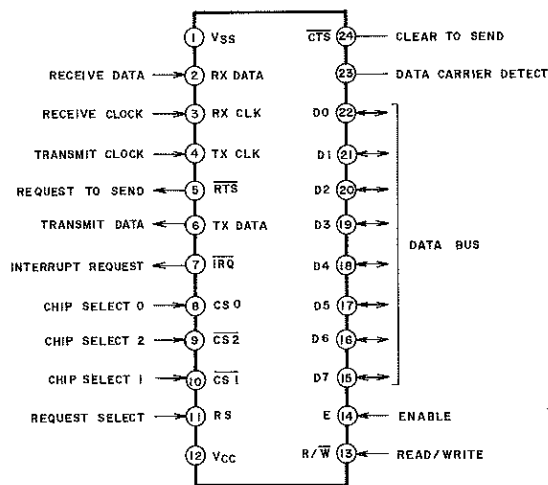
(IC90 to 95)



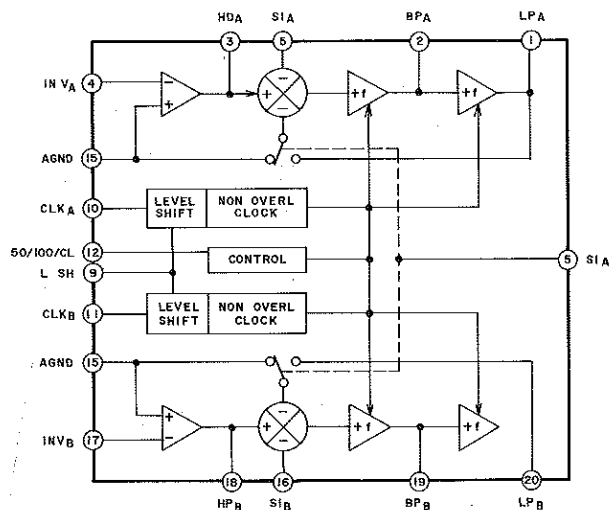
BA9221 [12BIT D/A CONVERTER] (IC57/67)



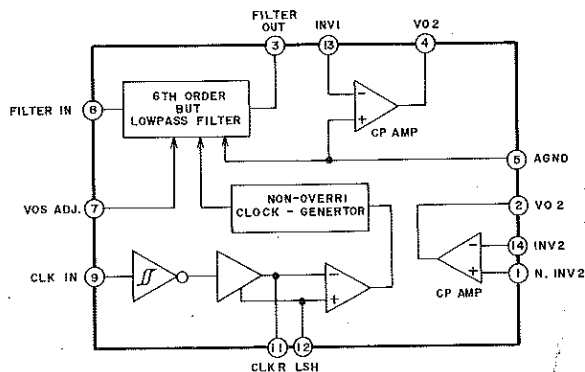
HD6850P (IC4) **[COMMUNICATION INTERFACE ADAPTER]**



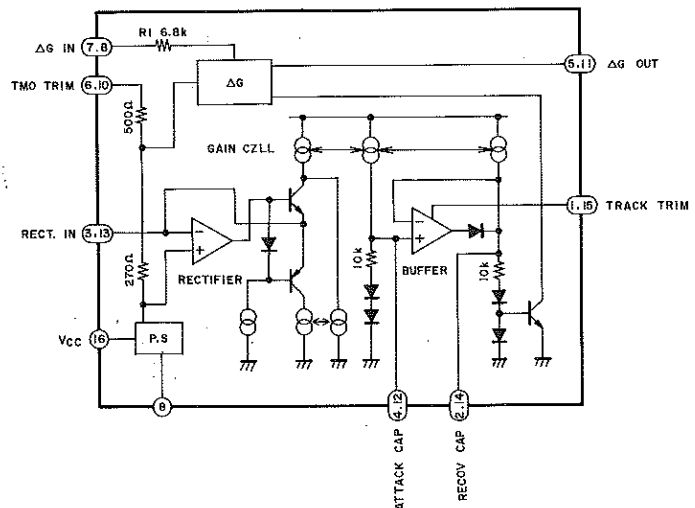
MF10CN (IC52) **[DUAL SWITCHED CAPACITOR FILTER]**



MF6CN-50 [LOWPASS FILTER] (IC77 to 82)



NE572S [ANALOG COMPANDOR] (IC83,84,85)



[illegible]

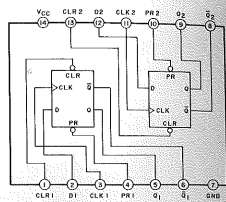
INPUTS			OUTPUTS			
ENABLE	SELECT					
G	B	A	Y0	Y1	Y2	Y3
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

INPUTS		OUTPUT Y
Select	Strobe G	
X	H	L
L	L	A
H	L	B

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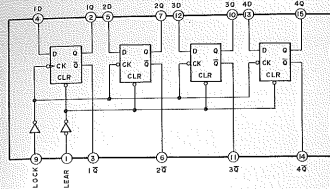


TC74HC74 [DUAL D FLIP-FLOP]
(IC17 to 19)



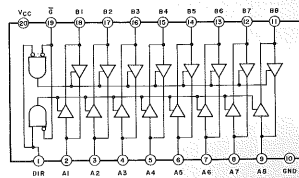
INPUTS		OUTPUTS	
PR	CLR	Q	Q̄
L	H	X	X
H	L	X	X
L	L	X	X
H	H	1	0
H	H	0	1

TC74HC175P [QUAD D-FFs]
(IC60)



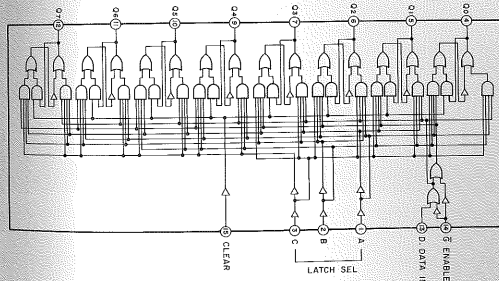
INPUTS		OUTPUTS	
Clear	Clock	D	Q
L	X	X	L
H	1	H	H
H	1	L	L
H	L	X	Q _n

TC74HC245P [QUANTAL 3 STATE TRANSCEIVER]
(IC25)

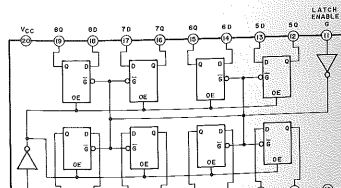


Control Inputs		Operation	
Q	DIR		
L	L	B data to A bus	
L	H	A data to B bus	
H	X	Isolation	

TC74HC259P [8 BIT ADDRESSABLE LATCHES] (IC42, 43)

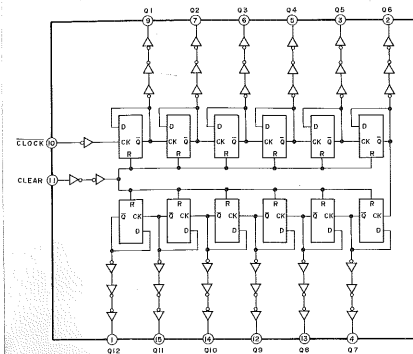


TC74HC373 [3 STATE OCTAL D-TYPE LATCH]
(IC21)



INPUTS		OUTPUTS	
Output Control	Latch Enable	Data	373 Output
L	H	H	H
L	H	L	L
L	L	X	X
L	L	X	Z

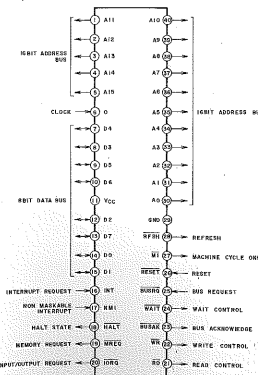
TC74HC4040P [12-STAGE BINARY COUNTER]
(IC23, 24)



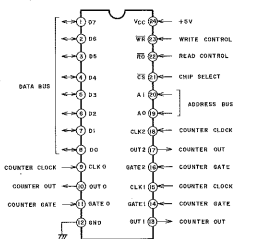
CLOCK	CLEAR	OUTPUT STATE
X	H	ALL OUTPUTS = "L"
1	L	NO CHANGE
1	L	ADVANCE TO NEXT STATE

X: DON'T CARE

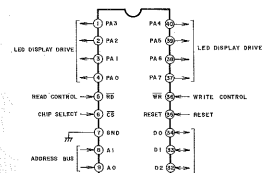
μPD780C [8 BIT CPU]
(IC1)



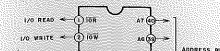
μPD710540P [PROGRAMMABLE
INTERVAL TIMER]
(IC5, 6, 7, 8)



μPD8255 AC-2 [INTER FACE]
(IC41)

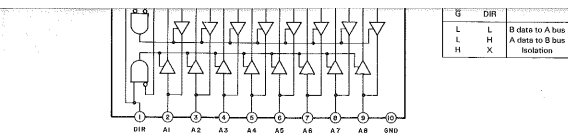


μPD8237 AC-5 (IC9, 10)
[PROGRAMMABLE DMA CONTROLLER]

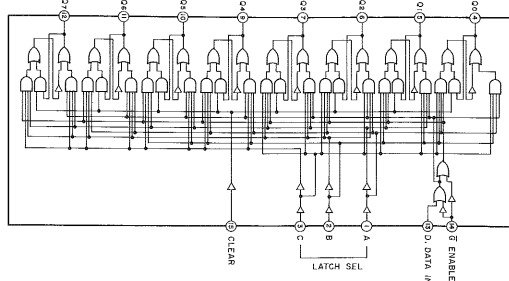


INPUTS		OUTPUTS	
Select	Strobe	Y	
X	H	L	A
L	L	A	
H	L	B	

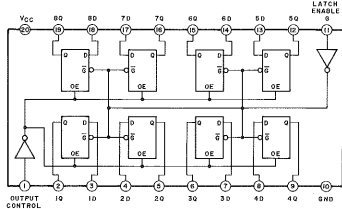
FUNCTION TABLE														
INPUTS						OUTPUTS								
ENABLE		SELECT												
G1	G2*	C	B	A		Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	
X	L	X	X	X	X	H	H	H	H	H	H	H	H	
L	X	X	X	X	X	L	H	H	H	H	H	H	H	
H	L	L	L	L	L	H	L	H	H	H	H	H	H	
H	L	L	L	L	L	H	L	L	H	H	H	H	H	
H	L	L	L	L	L	H	H	L	H	H	H	H	H	
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H	L	L	L	L	L	H								

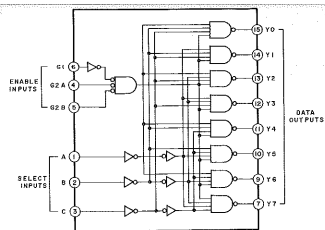


TC74HC259P [8 BIT ADDRESSABLE LATCHES] (IC42, 43)



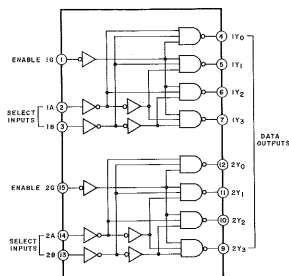
TC74HC373 [3 STATE OCTAL D-TYPE LATCH] (IC21)





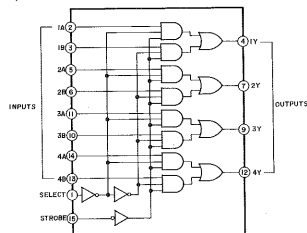
TC74HC139P [DUAL 2 to 4 DEMULTIPLEXERS] (IC2)

FUNCTION TABLE												
INPUTS					OUTPUTS							
ENABLE		SELECT										
G1	G2*	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	H	L	H	H	H	H	H	H
H	L	L	H	L	H	L	H	H	H	H	H	H
H	L	L	H	H	H	H	L	H	H	H	H	H
H	L	H	L	L	H	H	H	L	H	H	H	H
H	L	H	L	H	H	H	H	H	L	H	H	H
H	L	H	H	L	H	H	H	H	H	L	H	H
H	L	H	H	H	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L



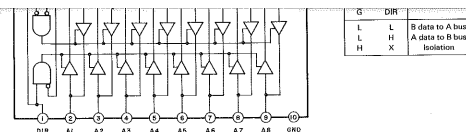
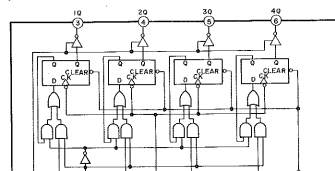
TC74HC157P [2 to 1 DATA SELECTORS] (IC32, 33)

FUNCTION TABLE							
INPUTS			OUTPUTS				
ENABLE	SELECT						
G	B	A	Y0	Y1	Y2	Y3	
H	X	X	H	H	H	H	
L	X	L	L	H	H	H	
L	L	H	H	L	H	H	
L	H	L	H	H	L	H	
L	H	H	H	H	H	L	

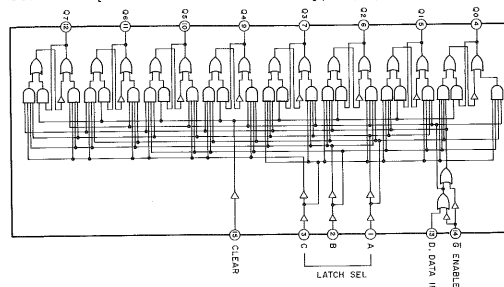


TC74HC173P [4BIT REGISTER 3-STATE] (IC55)

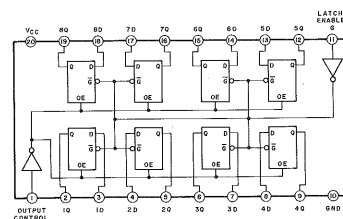
INPUT		Output control		OUTPUTS QA ~ QD
Clear	CK	Enable G1 G2	M N	
L		L L	-	1D ~ 4D
L		H X	-	-
H	X	X X	-	LLLL
-			H X X H	Z



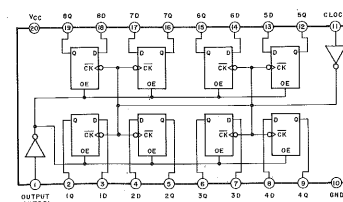
TC74HC259P [8 BIT ADDRESSABLE LATCHES] (IC42, 43)



TC74HC373 [3 STATE OCTAL D-TYPE LATCH] (IC21)

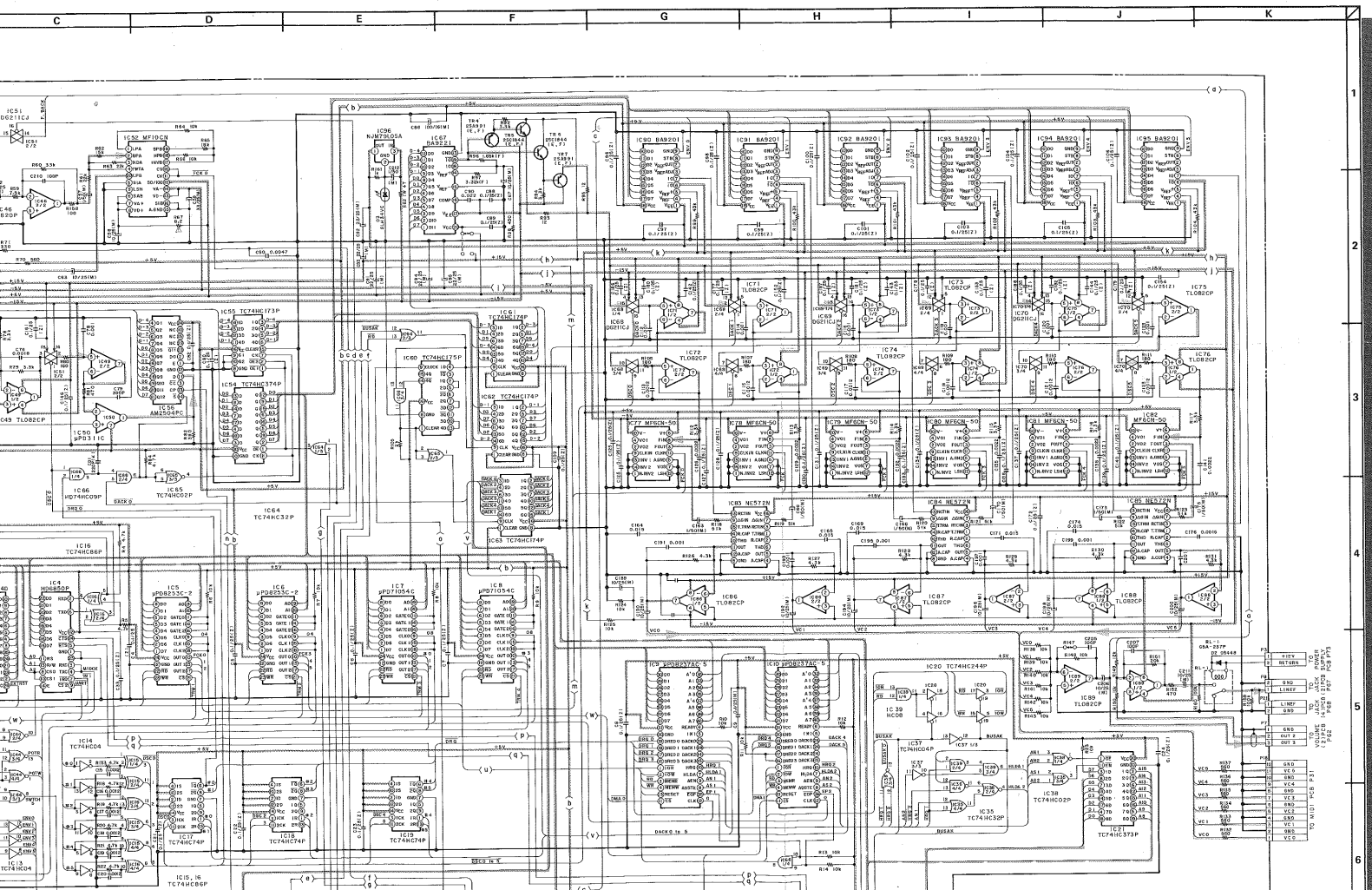


TC74HC374 [3 STATE OCTAL D-TYPE FLIP-FLOP] (IC54)



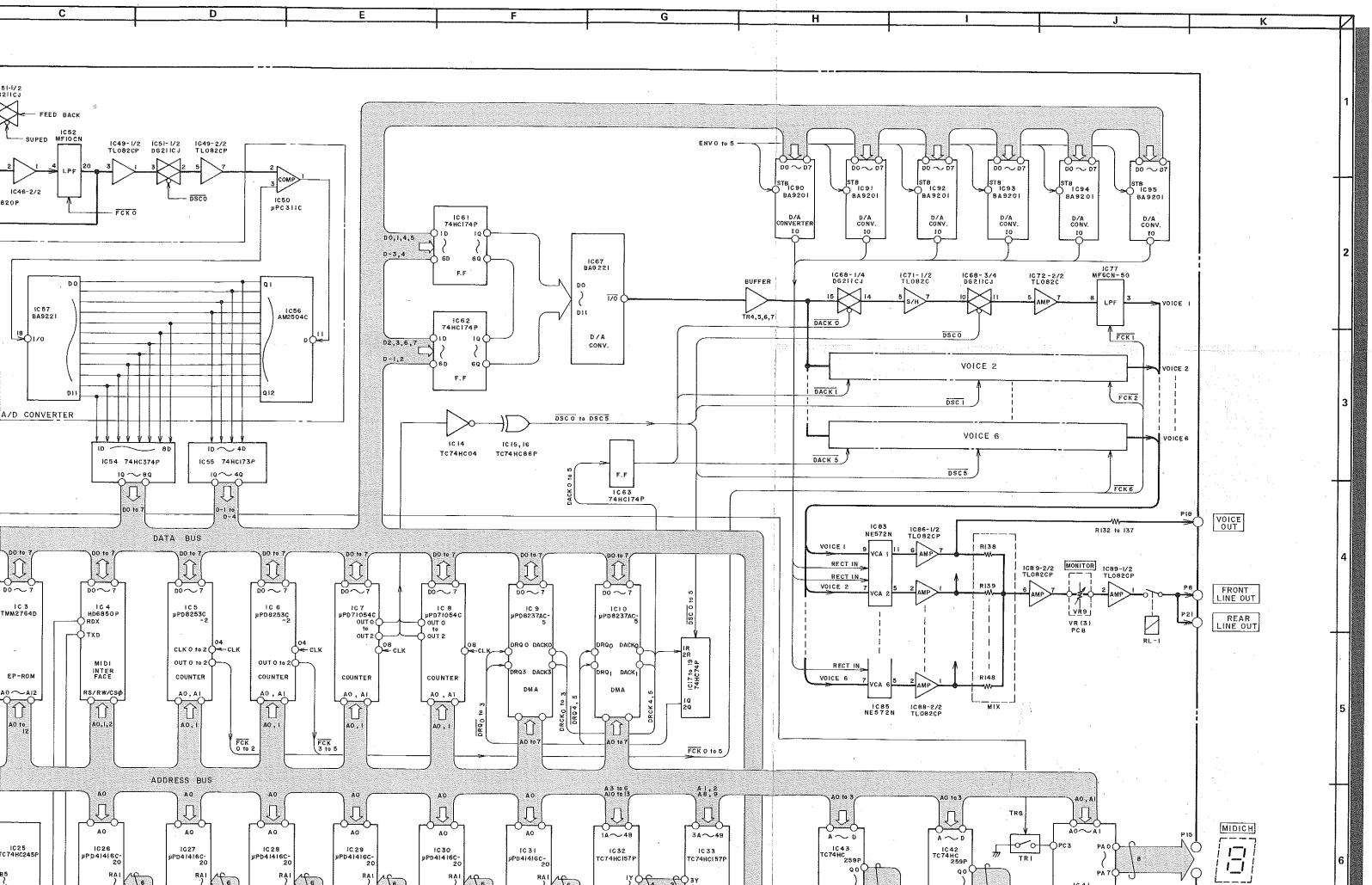
FUNCTION TABLE			
Output Control	Latch Enable G	Data	373 Output
L	H	H	H
L	H	L	H
L	L	X	Qs
H	X	X	Z

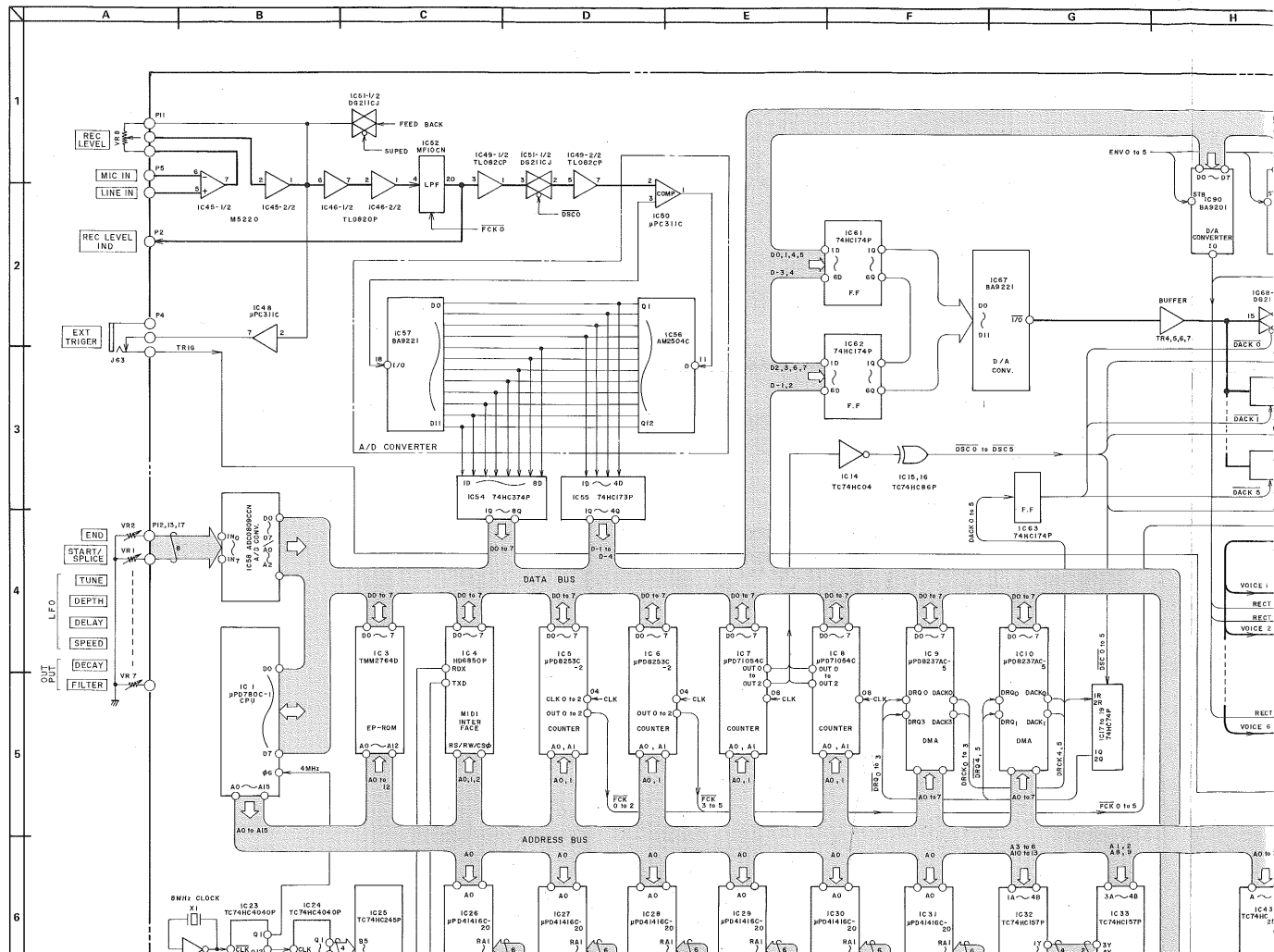
Output Control	Clock	Data	Output
L	↑	H	H
L	↑	L	L
L	L	X	Q ₀
H	X	X	Z

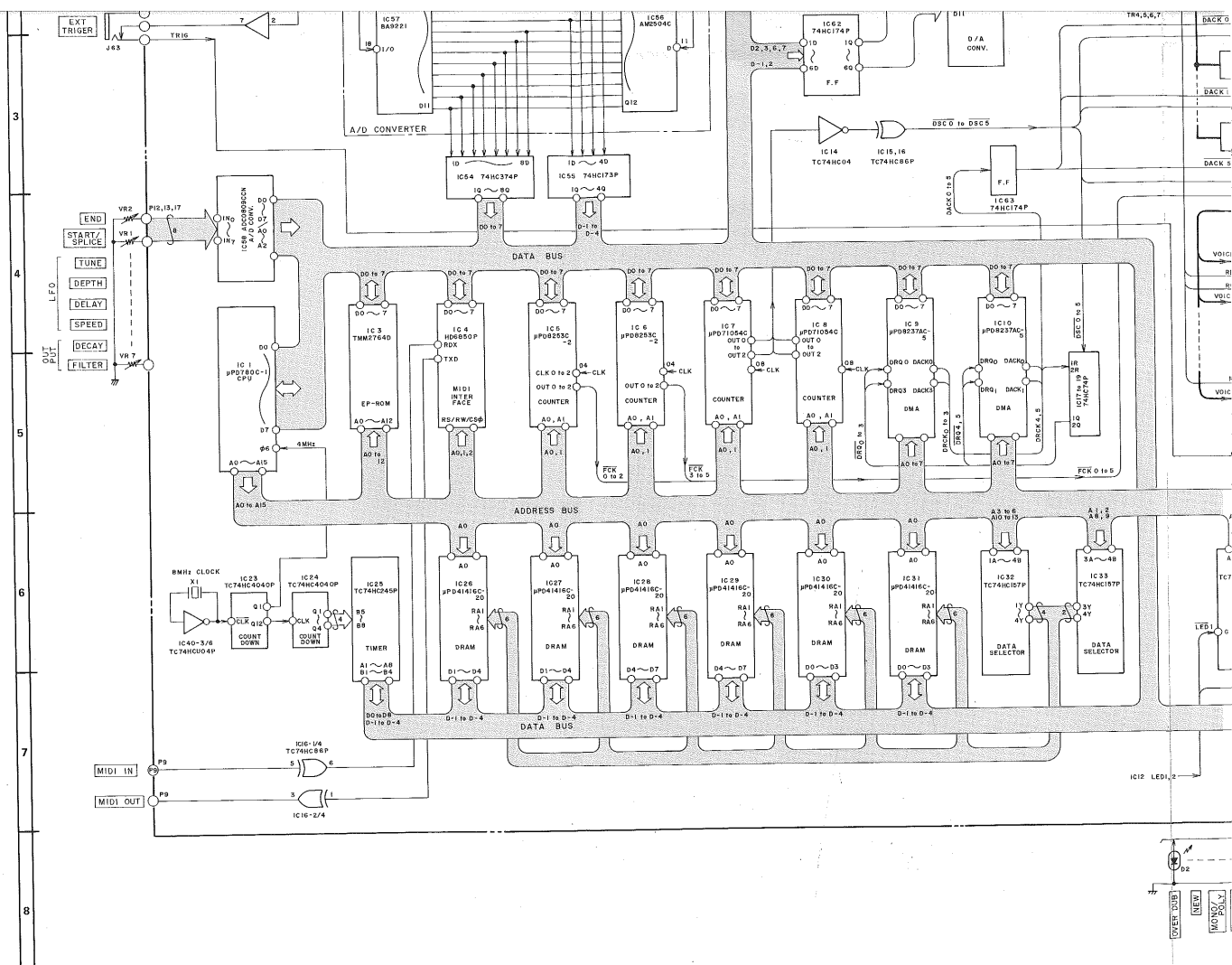


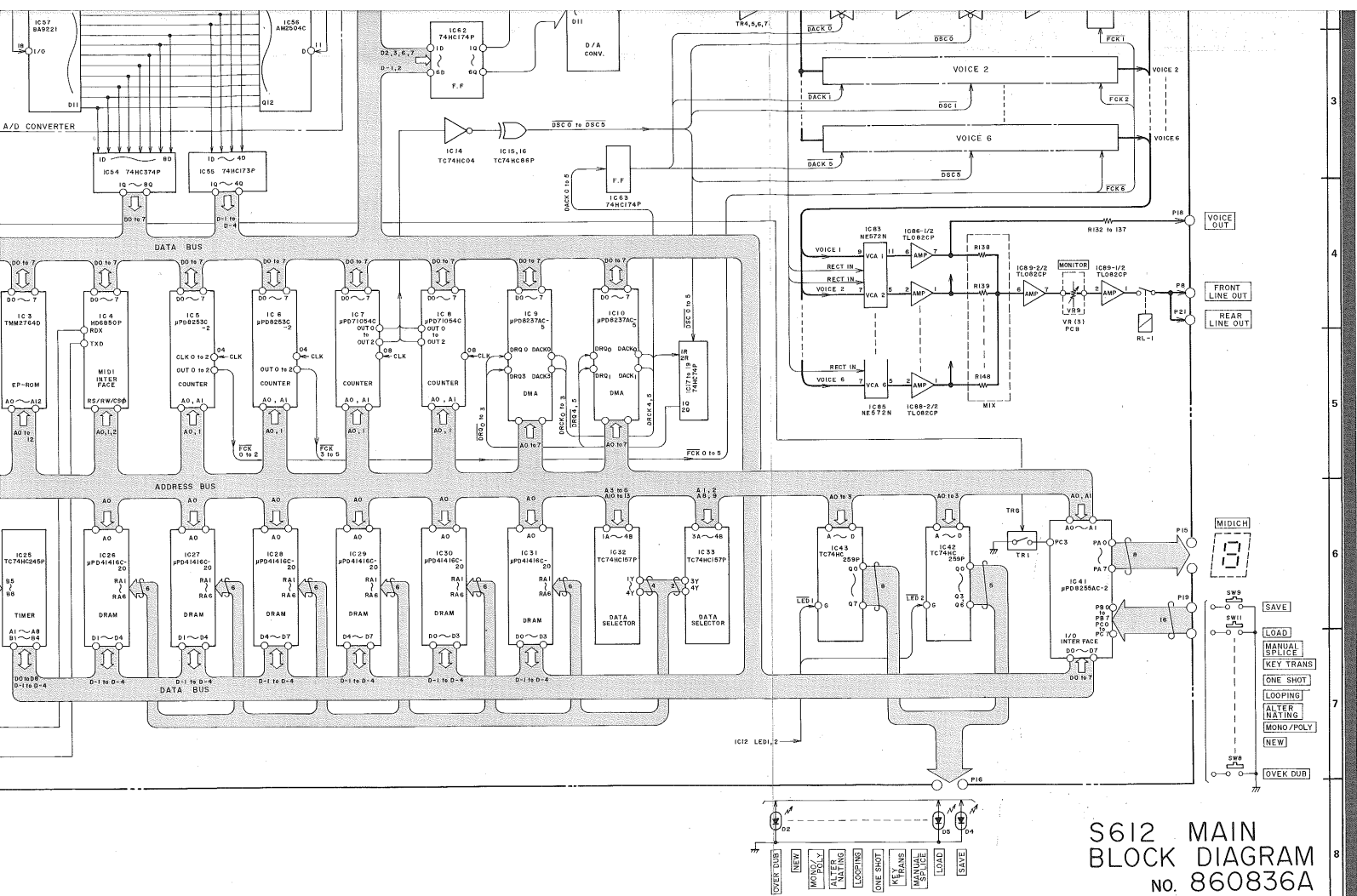














MIDI DIGITAL SAMPLER

MODEL **S612**

SECTION 1 OPERATING MANUAL.....	3
SECTION 2 SERVICE MANUAL	27
SECTION 3 PARTS LIST	41
SECTION 4 SCHEMATIC DIAGRAM AND PC BOARDS	
SECTION 5 SERVICE BULLETIN	

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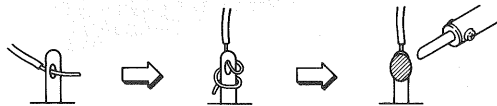
SAFETY INSTRUCTIONS

SAFETY CHECK AFTER SERVICING

Confirm the specified insulation resistance between power cord plug prongs and externally exposed parts of the set is greater than 10 Mohms, but for equipment with external antenna terminals (tuner, receiver, etc.) and is intended for **C** or **A**, specified insulation resistance should be more than 2.2 Mohms (ground terminals, microphone jacks, headphone jacks, line-in/out jacks etc.)

PRECAUTIONS DURING SERVICING

1. Parts identified by the **Δ** symbol parts are critical for safety. Replace only with parts number specified.
2. In addition to safety, other parts and assemblies are specified for conformance with such regulations as those applying to spurious radiation. These must also be replaced only with specified replacements.
Examples: RF converters, tuner units, antenna selector switches, RF cables, noise blocking capacitors, noise blocking filters, etc.
3. Use specified internal wiring. Note especially:
 - 1) Wires covered with PVC tubing
 - 2) Double insulated wires
 - 3) High voltage leads
4. Use specified insulating materials for hazardous live parts. Note especially:
 - 1) Insulation Tape
 - 2) PVC tubing
 - 3) Spacers (Insulating Barriers)
 - 4) Insulation sheets for transistors
 - 5) Plastic screws for fixing microswitch (especially in turntable)
5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.), wrap ends of wires securely about the terminals before soldering.

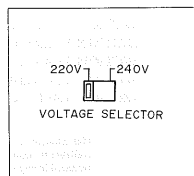


6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.).
7. Check that replaced wires do not contact sharp edged or pointed parts.
8. Also check areas surrounding repaired locations.
9. Use care that foreign objects (screws, solder droplets, etc.) do not remain inside the set.

Voltage conversion

Models for Canada, USA, and Japan are not equipped with this facility. Each machine is preset at the factory according to its destination, but some machines can be set to 110V, 120V, 220V or 240V as required.

If your machine's voltage can be converted:
Before connecting the power cord, turn the VOLTAGE SELECTOR located on the bottom panel with a screwdriver until the correct voltage is indicated.



SECTION 1 OPERATING MANUAL

TABLE OF CONTENTS

CONTROLS	4
CONNECTIONS	7
SAMPLING	8
OVERDUBBING	10
SAMPLING BY REC TRIGGER	11
EDIT	12
SCANNING	13
LFO	17
OUTPUT	18
TRANSPOSE	19
TUNING	20
MIDI	21
MIDI MODE	22
SAVE, VERIFY AND LOAD	23

Controls

MONITOR Control
This control adjusts the monitor level while sampling a live sound. The monitor level is not affected by the output LEVEL control. When sampling by microphone and the monitor level is too high, "howling" may result.

REC LEVEL Control
This control adjusts the recording level of the incoming signal.

MIDI CH. Display
Normally, this will indicate the MIDI reception channel. However, the display will light up to confirm proper operation when saving, verifying and loading tone data.
* When the power is on, the display will show "0" (omni on). When the unit receives MIDI signals, such as key-on, key-off, etc., the display will brighten momentarily.

REC LEVEL Indicator
Shows the recording level which can be adjusted by the REC LEVEL control.

LOOPING Button
Press this button to set the scanning mode to looping. The LED indicator will light.

ONE SHOT Button
Press this button to set the scanning mode to one-shot. The LED indicator will light.

Save Load Indicator
The SAVE, LOAD LED will light when the respective function has been selected.

END Point lever
This lever sets the end-point of the sampled sound.

START/SPICE Lever
This lever sets the start/splice point of the sampled sound.
Note: Normally, this lever sets the starting point. However, when the MANUAL SPICE button is pressed, it will set the splicing point.

ALTERNATING Button
Press this button to set the scanning mode to alternating. The LED indicator will light.

MANUAL SPICE Button
Press this button to set a splicing point manually. The LED indicator will light.

LFO, SPEED, DEPTH, DELAY controls
A vibrato effect can be added to the sampled sound by using the LFO.

SPEED — Adjusts the speed of the vibrato.

DEPTH — Adjusts the depth of the vibrato.

DELAY — Adjusts the delay time of the vibrato.

TUNE Control
The sampled sound can be fine tuned using this control. It will also serve as a pitch control when replaying sampled sound.

LINE OUT Jack
The monitor/output signal of the S612 appears at this LINE OUT jack, which can be connected to the line input of mixers or amplifiers.
* Connect a standard 6.3 mm φ phono plug to this jack.
Note: This jack is connected in parallel with the LINE OUT jack on the rear panel.

POWER Switch
Use the POWER switch to turn the power on and off.
Note: Do not attempt to connect the sampler disk drive MD260 after the S612 has been turned on.

MIC INPUT Jack
This jack is used for sampling from a microphone or a electric guitar. The input sensitivity is -63 dB. Connect a standard 6.3 mm φ phono plug to this jack.

LINE INPUT Jack
This jack is used for sampling the line out from keyboards or audio equipment, etc. The input sensitivity is -27 dB. Connect a standard 6.3 mm φ phono plug to this jack.

Note: When both MIC and LINE input jacks are used, the MIC input has priority.

REC TRIGGER Jack
This jack allows the use of a foot switch to trigger the sampling process.
Note: Connect a standard 6.3 mm φ phono plug to this jack. Use the Akai PS-X80 or the circuit it is opened when the connected switch is pushed down.

NEW Button
Press this button when you make a new sample.
* The previous sample will be erased.

OVERDUB Button
Press this button when you wish to overdub one or more sounds.
* You can overdub many times.

SAVE Button
Press this button to save the sound data in the S612 onto disk or tape.

MIDI MONO/POLY Mode Select Button
This button is used to switch between the MIDI mono and poly modes. The indicator lights when the mono mode is set.

MIDI CHANNEL DOWN Button
Press this button to lower the MIDI channel number.
* Pressing once decreases the channel by one. Pressing the button while "0" is displayed on the MIDI CH. display will revert the display to "9".

VERIFY Button
Press this button to verify the sound data saved on disk or tape.

KEY TRANS Button
Press this button to transpose the sampled sound. The LED indicator will light.

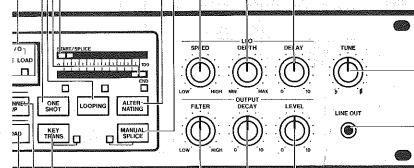
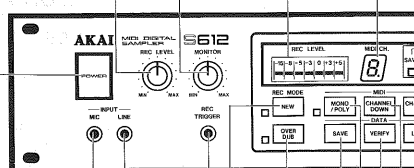
MIDI CHANNEL UP Button
Press this button to increment the MIDI channel number.
* Pressing once increases the channel by one. Pressing the button while "9" is displayed on the MIDI CH. display will forward the display to "0".

LOAD Button
Press this button to load the sound data, saved on disk or tape, into the S612.

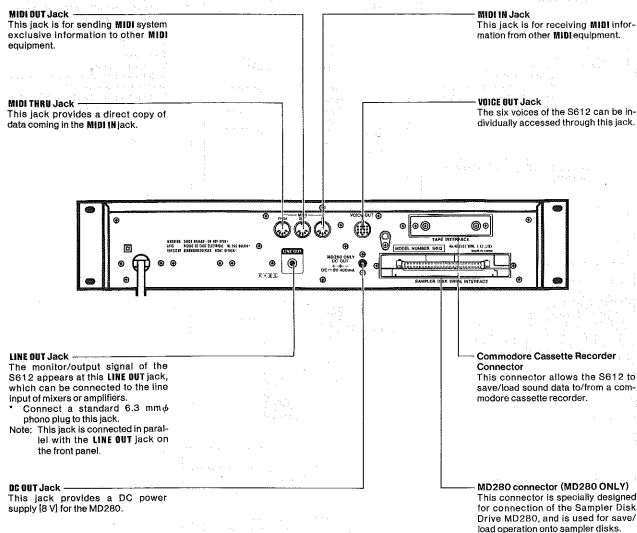
LEVEL Control
This control adjusts the output level of the sampled sound. The monitor level is not affected by the output LEVEL control.

DECAY Control
This control adjusts the decay effect of the sampled sound. Turning the knob clockwise will increase the decay time after key-off.

FILTER Control
This control adjusts the low-pass filtering on the sampled sound. The played sampled sound will become mellower as the control is turned towards the LOW position.

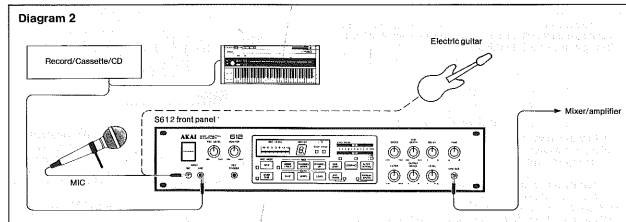
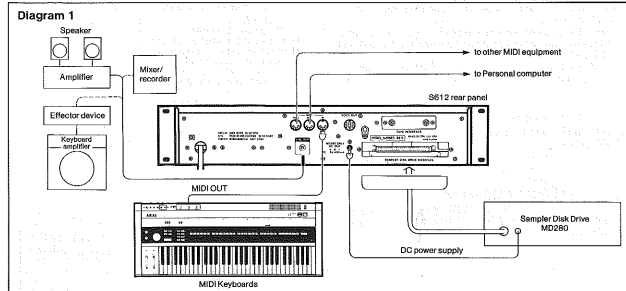


Connections



The S612 is a MIDI digital sampler which will function only if input information is received at MIDI-IN. Ensure that all the correct connections have been made between the MIDI-IN and MIDI-OUT of the S612 and any keyboards (such as the Akai

AX80) or sequencers. Obviously, unless a sound is being input or a sample has been loaded into the S612, it will not reproduce any sounds. The S612 will not "remember" any data after it has been switched off.



Sampler Disk Drive MD280

The Sampler Disk Drive MD280 (optional) is the device which quickly and accurately saves the sound data. The format of 2.8" disk makes the filing space very compact.

Note: If the MD280 is to be used, it should be connected with the S612 before switching on the S612. Any sampled data in the S612 will be lost if the MD280 is plugged in or unplugged while the S612 is switched on.

Sampling

PREPARATIONS

Before Turning the Power On

Make sure the various connections with **MIDI** and audio equipment have been completed before turning the power of the S612 on. (Refer to the chapter concerning connection with external equipment on page 6.)

When using the specially designed MD280 Sampler Disk Drive, ensure that the correct connections between the MD280 and the S612 have been made.

Note: Connecting the MD280 while the S612 is switched on will result in the loss of sound data sampled in the S612.

Connections to Input

Connect the sound source that you want to sample to the **MIC** or **LINE INPUT** jacks.

Adjustment of Recording Level

Set the recording level by the **REC LEVEL** control. To obtain the best results in sampling, bring the level close to "+3" on the **REC LEVEL** indicator.

Monitor Level

Use the **MONITOR** level control when monitoring the sound source to be sampled. When using a microphone, feedback may occur if the monitor level is too high.

Designation of the Sampling Frequency

This brief outline may help to clarify some different aspects of sampling technique:

Are you trying to reproduce (a) high or (b) low frequency sounds?

(a) To faithfully reproduce high frequency sounds, a faster (therefore, shorter) sampling time will be required.

The S612 can be "instructed" to accept a wider bandwidth sample by pressing a higher note on the **MIDI** keyboard prior to making the sample; see Table #1.

(b) The reproduction of lower frequency sounds, typically much longer in duration, will require a longer sampling time.

The S612 can be "instructed" to accept a long sample by pressing a lower note on the **MIDI** keyboard prior to making the sample; see Table #1.

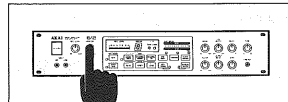
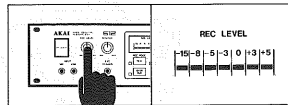
(c) For accurate reproduction (pitch) of a sampled sound it is necessary to first press the same note on the **MIDI** keyboard as that being sampled.

This process can be extended to allow for pitch transposition if required.

Table 1

Equipment to be connected.	Input.	Input Sensitivity.
Equipment or devices, such as guitars or microphones, have low output levels.	MIC	-63 dB
Audio equipment, such as televisions, cassette tape decks, CD players, tuners or preamplifiers, or musical instruments, such as synthesizers or electric keyboards have higher output levels (line level).	LINE	-27 dB

Note: When both the **MIC** and **LINE INPUT** jacks are connected, the **MIC** jack overrides **LINE** jack.



Example: Press A2 (lowest A) on the **MIDI** keyboard, then play (sample) A3 (A string) on a guitar. Now when A3 is played on the **MIDI** keyboard the actual pitch of the reproduced note will be A4. The pitch has been transposed up by one octave.

This technique can be used to transpose from 1/2 steps through to several octaves if required.

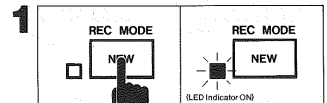
Note: If the **MIDI** keyboard or the S612 have just been switched on and no key has been pressed before sampling, the S612 will automatically designate C4 as the desired pitch.

Key No.	C2	C3	C4	C5
MIDI Note No.	36	48	60	72
Sampling Frequency	4 kHz	8 kHz	16 kHz	32 kHz
Sampling Time	8 sec.	4 sec.	2 sec.	1 sec.

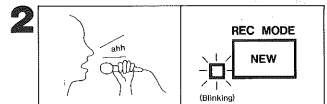
Note: Although only four (4) keys are depicted, other keys may be selected if intermediate frequencies are desired.

Sampling

1. Once you have adjusted the recording level and designated the desired sampling frequency, you are ready to sample. Press the **NEW** button. The LED indicator will light. This indicates that the unit is standby for sampling.



2. Using a microphone, make a sample. Say "ahh..." for example. The LED indicator should start blinking from the moment you begin speaking into the microphone. After blinking for the length of time of the designated sampling frequency, the LED indicator will go out automatically. This indicates the completion of the sampling process.



Automatic Trigger

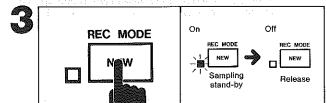
Because the S612 contains an automatic trigger circuit, it will automatically start the sampling process when the sound level reaches a certain preset level. You will notice that the unit may start off the process prematurely by picking up surrounding noise when the sampling is done through a microphone. On the other hand, when the recording level is too low,

the sampling process may not begin because the sound level is not high enough to trigger the circuit. In which case, after increasing the recording level, reset the unit by pressing the **NEW** button again to get it into the standby mode, then start sampling.

Cancelling the Sampling Standby Mode

To cancel the sampling standby mode, press the **NEW** button again. The **LED** will go out.

3. Thus, sampling has been completed. This sampled sound data will be maintained until either the power is turned off, the process is repeated for another sampling or other sampled data is loaded from the disk (tape).
• If necessary, save the sound data for later use with the specially designed Sampler Disk Drive MD280 (optional). Refer to page 22.



4. You should now be able to enjoy six-voice polyphonic, velocity touch sensitive sounds, from the S612, by playing **MIDI** keyboard instruments.

Note: All six voices may not be able to be heard when music is played mostly on the keys around the fifth octave (the highest octave range for the AX80). This is not a defect in the unit.

5. After connecting the **MIDI** keyboards, if sampling is done without any keys being pressed down, the sampling frequency will be set at 16 kHz with a sample time of 2 seconds.

Cautions when Designating the Sample Frequency

1. Because the last key to be pressed down will determine the sampling frequency, if connected with **MIDI** keyboards, make sure to press down the key to designate the frequency before going through the sampling process.

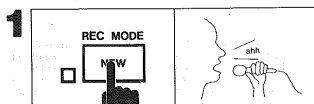
2. The range of the keys to which a sampling frequency can be designated is between **MIDI** key number 36 (C2) and 72 (C5). The keys out of this range are invalid.

Overdubbing

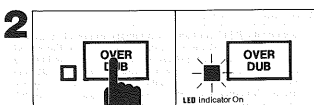
By means of pressing the **OVERDUB** button instead of the **NEW** button for the above mentioned sampling process, you are able to overdub a newly sampled sound without erasing the previously sampled sound.

Let's try to overdub (ohh...) as a second sound over the first sound (ahh...). The setting-up process is identical to the previous chapter for sampling (Refer to page 6).

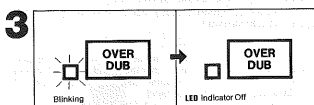
1. After adjusting the recording level and designating the sampling frequency, press the **NEW** button. Sample your voice (ahh...).



2. You are about to overdub (ohh...) on (ahh...), which you have just sampled. (It is possible to designate the sound to a different frequency.) Press the **OVERDUB** button. The **LED** next to the button will light. This indicates the unit is in standby for overdubbing.



3. Say (ohh...) into the microphone. From the moment you started to say (ohh...), the LED should start blinking. This blinking indicates overdubbing is in progress. After blinking for the length of time equivalent to the designated frequency, the LED will go out automatically.



4. Thus, the overdubbing process has been completed. When you play the **MIDI** keyboard, you should be able to hear the combined sounds of (ahh...) and (ohh...).

Note: Once the overdubbing is done, there is no way to single out the individually sampled sounds. We, therefore, recommend that you store and save the individual sounds on disk if they are needed for later use.

OVERDUB SOUND LEVEL

As with any overdubbing process, there will be some attenuation (reduction) of previously recorded material (approximately -6 dB) for each "take". If it is desired that the combined sounds are to be of equal level when replayed, then, the last sound to be sampled should be recorded at a lower level to compensate for the attenuation of previous samples.

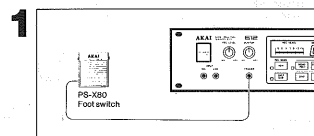
Sampling by Rec Trigger

Although the S612 contains an automatic trigger system, it is possible to start sampling at any desired time by connecting a foot switch to the **REC TRIGGER** jack. (It can be used for overdubbing as well.)

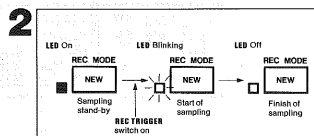
This **REC TRIGGER** feature becomes especially useful and effective in situations where the sound is slow in reaching the required trigger level, and therefore, "its" initial attack may not be sampled.

1. Connect the Akai PS-X80 foot switch to the **REC TRIGGER** jack.
 - In this case, the automatic trigger system will be overridden.
 - Use a foot switch of the type shown below, if you do not use the Akai PS-X80 foot switch.

Normal (closed)
Press Down (open)



2. The setting-up process is identical to the chapter for sampling (Refer to page 7). After adjusting the recording level and designating the sampling frequency, press down the **NEW** button (or **OVERDUB** button). The **LED** next to the button (either **NEW** or **OVERDUB**, depending on the process you are using), should light. This indicates the unit is ready for sampling (or overdubbing).



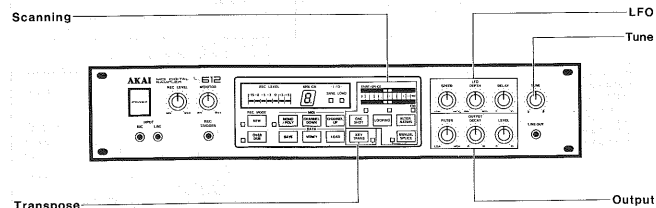
3. Sampling (or overdubbing) is initiated by pressing the foot switch connected to the **REC TRIGGER** jack.

EDIT

Edit

The S612 contains various editing functions so that sampled sounds can be applied more effectively for your musical expressions. These functions include the following:

- Scanning
- LFO
- Output
- Transpose
- Tune



1. SCANNING

This is the function that is controlled by the "START POINT" and "END POINT" levers, in conjunction with the "ONE SHOT", "LOOPING" and "ALTERNATING" mode buttons, that enables you to decide how the sample will be replayed.

2. LFO

It is possible to add a vibrato effect to sampled sounds.

3. OUTPUT

It is possible to control the degree of mellowness of the sampled sound (FILTER). It is also possible to adjust the length of time the note sounds after the key-off (DECAY).

4. TRANSPOSE

It is possible to transpose the samples.

5. Tune

It is possible to tune the samples up or down within the range of ± 100 cents.

When saving to disk, the editing parameters will also be stored along with the sampled data, therefore, when the sampled data is retrieved (loaded) from disk, it is ready for playing in its original, edited form, until/unless the editing control(s) is/are readjusted. For example, if a sound, which has been edited, using the LFO, to contain a very deep vibrato, is saved to disk and then, at some later date is loaded back into the sampler, even though, in the meantime, the LFO controls may have been reset to minimum, that sound will still contain a deep vibrato. However, if any of the LFO controls are adjusted after the sample has been loaded, they will again affect the character of the sound. This superior feature enhances the "usability" of the S612 Digital Sampler.

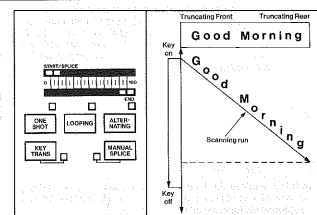
Note: The output LEVEL control is not a programmable parameter.

Scanning

The S612 stores sampled sounds in memory IC's in digital data form and reconstructs the pitch by altering the speed at which the memory data is read. It works on the same principle as a tape recorder. The pitch changes according to the tape speed. However, because sounds are recorded differently in memory IC's than on tapes, it is possible for us, using the internal computer of the S612, to control the ways in which the data in the memory IC's is read. In other words, it is possible to designate the point at which the S612 starts reading or stops reading the data in the memory IC's; to make a loop, or to reproduce a reverse version. We call these functions "Scanning".

Normal Setting

In order for the scanning functions to be easily understood, let's suppose a situation where we have sampled a phrase "Good Morning". Picture also the situation where the phrase "Good Morning" is stored in digital data form in the memory IC's of the S612, as seen in the diagram. In the normal setting, scanning is done from truncating front to the truncating rear all the way through. This means that with a key-on, the sampled phrase "Good Morning" will be played, and there will be no more sound. In this case, even if the key is held down, there will be no sound after the phrase "Good Morning" is played once.



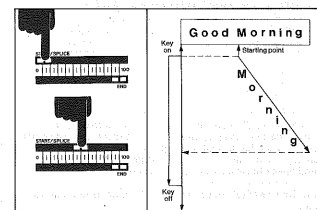
Starting Point and Ending Point

Starting Point

By adjusting the START/SPICE lever, it is possible to set a starting point (the point where the S612 starts replaying from the memory IC's) at any desired point.

For example, if you choose "Morning" to be the starting point, after the lever to the appropriate position, the "Morning" portion of the phrase will be replayed when a key is pressed, as seen in the diagram.

Note: Re-trigger a key each time the lever is moved to determine (hear) the new starting point.



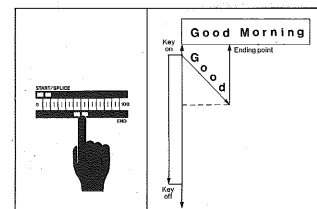
The START/SPICE lever has two (2) functions.

Normally (if the MANUAL SPLICE button has not been pressed), the START/SPICE lever has the function of setting a starting point. On the other hand, when the S612 is in the manual splicing mode (the MANUAL SPLICE button having been pressed), the lever has the function of setting splicing point. (See Page 15)

Ending point

By adjusting the END POINT control, it is possible to set an ending point (the point where the S612 stops replaying from the memory IC's) at any desired point.

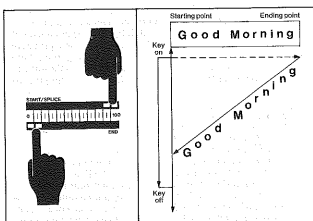
For example, as seen in the diagram, by adjusting the control to the appropriate point, only "Good" will be played when a key is pressed.



Playback of Reverse Version

If you set the two levers so that the **END** point lever is positioned before the **START** point lever, the playback will be reversed. For example, as seen in the diagram, when the set up is done with the start point at the truncating rear and with the end point at the truncating front, the reverse version "gninroM dooG" will be played when a key is pressed. It follows, therefore, that it is possible to replay any desired portion of the sample in reverse.

Note: Although the **START** and **END** point levers may be reversed, it is not possible to **SAMPLE** in reverse. A sound can only be recorded as it occurs naturally (in its original form) even though, once sampled, it can be reproduced in reverse.



Scanning Mode

The S612 employs the latest computer technology so that it is not only able to play sampled sounds, but can also be used very extensively for musical application.

The following are three special scanning modes:

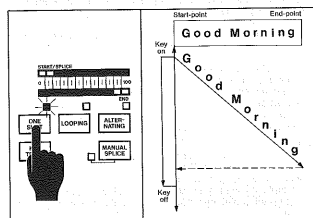
- One-Shot
- Looping
- Alternating

One-Shot mode

In the "One-Shot" mode, the S612 functions as an ordinary sampling device. For example, when it is set as shown in the diagram (the same as the normal setting), the sampled sound "Good Morning" will be played when a key is pressed. There will be no sound thereafter, even if the key is held down.

With the one-shot mode, scanning is done in the following order.

Starting point — Ending point



Looping Mode

In the **LOOPING** mode, the setting up of a loop automatically (automatic splicing system) or manually (manual splice mode) within the S612's memory IC's makes it possible for the sampled sound to be played continuously. With this mode, playing the continuous sounds of strings, brasses, chorus, etc., becomes possible. (The sound starts when a key is pressed and will play continually until the key is released.) This makes the application of the S612 very extensive by opening up more paths for your musical expression.

Automatic Splicing System

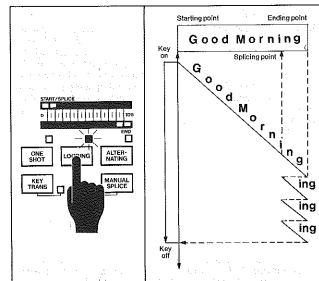
The S612's looping function makes it feasible, by fully applying today's computer technology, to search out and automatically "Splice" any point ("Splicing Point") of the sample instantaneously. This has been said to be very difficult and time consuming without the aid of the computer.

The term "Splicing" is used when joining two audio tapes together with a special adhesive tape to make one continuous tape when editing is necessary. Similarly, we call the restarting point of a scanning loop a "Splicing Point".

The moment the **LOOPING** button is pressed, the automatic splicing system of the S612 finds the most appropriate splicing point of the sampled sound. For example, as seen in the diagram, when the **LOOPING** button is pressed, with the **START/END** point levers in the normal position, the key-on (when a key is pressed) will start the sampled phrase "Good Morning". After "Good Morning" is played once, "ing" will repeat continuously until the key-off (the key is released). This means that the S612's computer selected "O" as the best splicing point.

In the **LOOPING** mode, the scanning is done in the following order:

Starting point — Ending point — Splicing point —



Note: The automatic splicing point is referenced to the position of the **END POINT** lever. Therefore, if the sampled sound does not utilize all of the available memory the computer will be attempting to replay (loop) an "empty" memory; = no sound! This situation can be remedied by repositioning the **END POINT** lever, making a longer sample or, shortening the sample time. Some sound will not loop well. Sounds which are not produced by musical instruments (human voices, effects and so on) or, with erratic or staccato-like sounds which contain much variation, some noise (splicing noise) may be heard. This is not a defect. Experimentation may be necessary with some sounds. The automatic splicing system will be overridden if the **MANUAL SPICE** mode is selected.

Alternating Mode

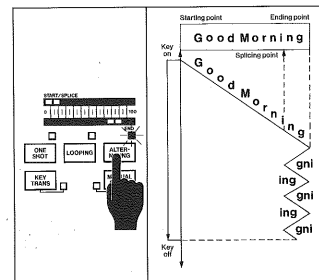
The **ALTERNATING** mode is based on the same idea as the **LOOPING** mode where a loop is built by scanning. But it is different from the **LOOPING** mode in the way the loop is built. For example, as seen in the diagram, when the **ALTERNATING** button is pressed, with the **START/END** point levers in the normal position, the key-on will start the sampled phrase "Good Morning". After "Good Morning" is played once, "gni" then "ing" will be replayed continually until the key-off. The scanning simply reverses direction between the end point and the splicing point.

In the **LOOPING** mode the scanning "jumps" back to the splicing point; scans only from the splicing point to the end point; does not scan from the end point to the splicing point. This difference in scanning should be comprehended more easily in the next chapter for "Manual Splice".

In the **ALTERNATING** mode, scanning is done in the following order:

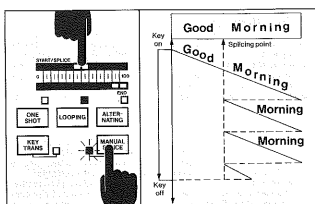
(Reverse)
Starting point — Ending point — Splicing point —

Note: The **ALTERNATING** mode is very useful, especially when it comes to building the continuous sounds of strings. But there are some instances where the sound produced by the looping mode is more acceptable. Compare the **LOOPING** mode and the **ALTERNATING** mode when editing and select the continuous tone which sounds better.



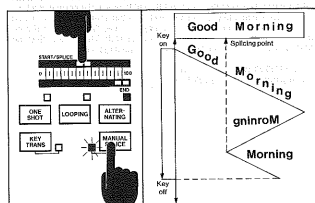
Manual Splice Mode

The S612 normally sets up a splicing point by using the automatic splicing system. However, by pressing the **MANUAL SPLICE** button, the automatic splicing system will be overridden, which makes it possible for you to set a splicing point manually. In this situation, the **START SPLICE** lever's function is to set a splicing point and by adjusting this lever, a different splicing point may be set. For example, in the **LOOPING** mode, when the **MANUAL SPLICE** button is pressed and the splicing point is set at "Morning" by the lever, a key-on starts the phrase "Good Morning". After the phrase is played once, "Morning" will be repeated until the key-off.



In the **ALTERNATING** mode however, a key-on starts the phrase "Good Morning". After the phrase is played once, "gninrom-Morning-gninrom" will be repeated until the key-off.

Note: The **MANUAL SPLICE** button will not function in the one-shot mode.

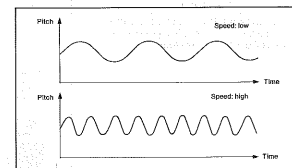
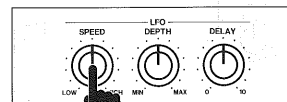


LFO

Because the S612 contains an **LFO** (Low Frequency Oscillator) circuit, it is possible to add vibrato effects to sampled sounds. The waveform of the **LFO** is ~.

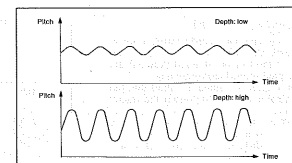
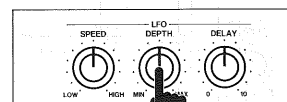
SPEED Control

This control sets the modulation rate of the LFO.



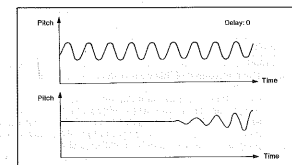
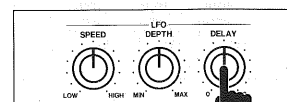
DEPTH Control

This control sets the depth of the modulation.



DELAY Control

This control sets the delay time of the vibrato.



Note: The three controls for the **LFO** (**SPEED**, **DEPTH** and **DELAY**) are programmable parameters. When sounds are to be saved on disks, these data will be saved along with the sampling data.

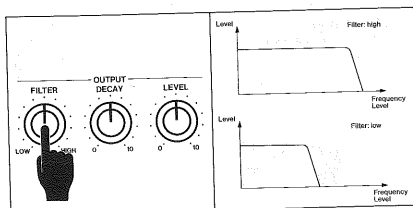
Note: It is possible to add a vibrato effect not only with the **LFO**, but also by operating the modulation wheel on external **MIDI** keyboards. (Refer to **MIDI** on page 20.)

OUTPUT

The S612 has three **OUTPUT** controls, **FILTER**, **DECAY** and **LEVEL**.

FILTER Control

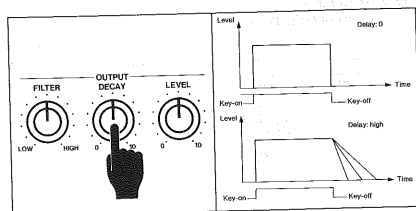
By processing the sampled sound through a low-pass filter, it is possible to give it a milder or a mellow tone.



DECAY Control

By adjusting the **DECAY** control, a decay (reverb-like) effect can be added, so that when the key is released (key-off) the sampled sound fades gradually. The higher the value (number) that the control is set at, the longer the decay effect.

NOTE: The S612 can receive decay effect by "Sustain Pedal On" data from external **MIDI** keyboards.

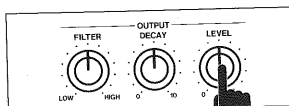


LEVEL Control

This control is for adjusting the output level of sampled sounds.

Note: The adjustment of this control does not affect the monitor level.

Of the three **OUTPUT** controls, the **FILTER** and **DECAY** are programmable parameters. When the sound data is saved on disks, they will be saved along with the sampled data. However, because the **LEVEL** data is not programmable, it cannot be saved on disks.



TRANPOSE

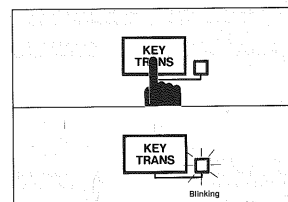
The S612 is able to transpose sampled sounds by a half-step interval through to several octaves, so that they can be played at any desired pitch. The transposition is enabled by the **MIDI** keyboard. For example, let's transpose the sampled sound up by one octave.

Transposition

For example, let's transpose the sampled sound up by one octave.

Note: All transpositions are made relative to middle C.

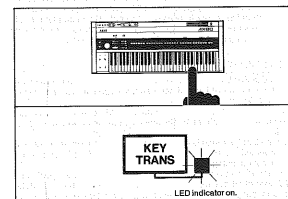
- Listen to the sampled sound of C4, (Middle C)
- Press the **KEY TRANS** button. The LED indicator will start blinking.



- To move the pitch of the sound by one octave, press down the key of **MIDI** note No. 72 (C5 for AX80). The S612 does not produce any sound in this case.

Upon completion of the key-on process, the LED indicator will stop blinking and stays lit, indicating the completion of the transposition. At this time when you press down the key of **MIDI** note No. 60, you will get the C5 sound. The transposition for one octave up has now been completed.

If you wish to transpose to the fifth interval up, press down the key of **MIDI** note No. 67 (G4 for AX80).



When you wish to go back to the original sampled pitch, depress the **KEY TRANS** button while the **KEY TRANS** LED blinking. The transposition mode will be cancelled.

Note: The S612 must be connected to **MIDI** keyboards in order to use the transposing function. The transposing function is programmable. When you wish to save a sound onto disk, the transposition will be saved along with the other data.

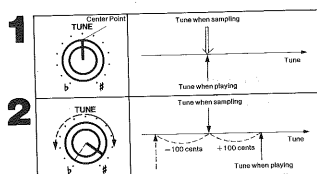
TUNING

With the S612's "Tuning" function, it is possible to freely tune a sampled sound within a range of ± 100 cents (a half step), and to save the tuning parameters along with the sampled data. In other words, the data for the **TUNE** control are programmable.

Tuning when Sampling

When sampling, the tuning is based on the center position of the **TUNE** control.

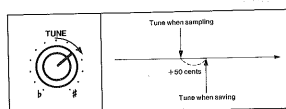
1. When the sampled sound is played and the **TUNE** control points to the center, as shown in the diagram, the sound will be reproduced with the same pitch.
2. When the sampled sound is played, and the **TUNE** control is turned fully right (left) as shown in the diagram, the pitch will be a half step higher (lower).



Tuning when Saving

Because the **TUNE** control is programmable, the data to be saved on disks (tapes) will correspond to how much to the right (or left) the control is turned.

Example: If the note A is sampled and then retuned, using the **TUNE** control, by +100 cents and saved to disk, when the A key is pressed the note A# will be played. However, provided that the **TUNE** control is not reset, once the save is verified the tuning will again move by +100 cents. This means that now, when the A key is pressed, the note B will be played. It is possible to achieve the previously desired note of A# by resetting the **TUNE** control to the center position.

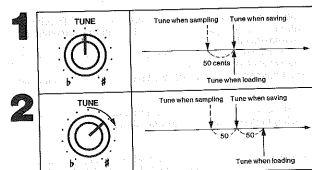


Tuning when Loading

When sound is loaded from disk (tape) the tuning will be either higher or lower than the tuning which had been saved, depending on the present position of the control.

1. When the loaded sound is played and the **TUNE** control is positioned in the center, the pitch will be the same as the tuning which has been saved.
2. When the loaded sound is played and the **TUNE** control is set at +50 cents from the center position, the sound is played +50 cents higher than the saved tuning.

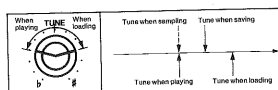
When the sound data is loaded from disk (tapes), the present position of the **TUNE** control will add to, or subtract from, the pitch of the saved data. For example, suppose that the sample was saved 50 cents higher than the originally sampled sound and that the loaded sound is played with the **TUNE** control set at +50 cents. In this case, the pitch will be (+50) cents + (+50) cents = +100 cents, which is a half step higher than the original sound.



Tuning when Playing after Loading

As stated earlier, after the sound data is loaded, the pitch of the replayed sound will depend on the present setting of the **TUNE** control (regardless of where the **TUNE** control was set during loading).

Example: Suppose that a sample is returned to +50 cents and then saved to disk (tape). When that sample is loaded from disk (tape), if the **TUNE** control is still set at +50 cents, then the replayed sound will now be at (+50) cents + (+50) cents = +100 cents; a half step higher than the original sample. However, if the **TUNE** control is reset to the center position, the replayed sound will now be at only +50 cents higher than the original sample. Therefore, the pitch at which the sample was saved. It follows, therefore, that if the **TUNE** control were to be set at -50 cents, the replayed sound will be (+50) cents + (-50) cents = 0 cents; zero change, which means that the sound will now be the same pitch as the original sample.



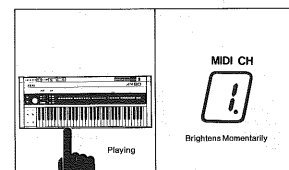
MIDI

MIDI (Musical Instrument Digital Interface)

This is the internationally recognized standard for electronic musical instruments. It is possible for these instruments to exchange any kind of information needed for musical performance, by utilizing their **MIDI** connections. The S612 is able to receive the following **MIDI** information through midi cables:

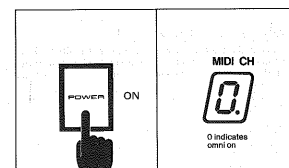
- Note No., Key-On, Key-Off and Key Velocity
- Sustain pedal
- Pitch bend
- Modulation wheel (vibrato)
- Mode change for Mono/Poly
- System exclusive

When the S612 receives the **MIDI** information, its **MIDI CH** display, which indicates the **MIDI** channel numbers, will brighten momentarily to let you know that information has been received. (If the **MIDI** reception channel does not match, the display shows no change.)

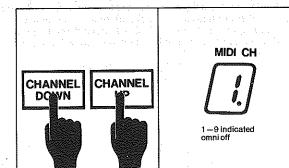


How to set the MIDI Reception Channel

1. When the power is turned on, the S612 initiates to the **POLY** mode of omni on. In this case, it will receive any channel and play according to the information. The digit "0" on the **MIDI CH** displays shows omni on.



2. When you want to reselect the **MIDI** reception channel (1-9), press either the **CHANNEL DOWN** or **CHANNEL UP** button until you reach the desired number. In this case, the S612 receives information only on the designated **MIDI** channel.

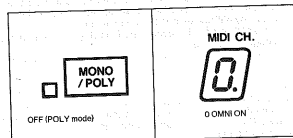


MIDI Mode

There are four **MIDI** modes possible, from combinations of the **MONO/POLY** mode and the **OMNI ON/OFF** mode.

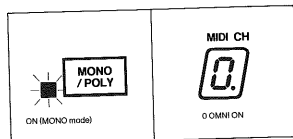
OMNI ON, POLY mode

With this mode, the S612 will receive the **MIDI** information from any channel, and 6-voice polyphonic sound can be played simultaneously on a channel. The **OMNI ON, POLY** mode is selected automatically when the S612 is turned on. (The **MIDI CH** display shows "0" during this mode.)



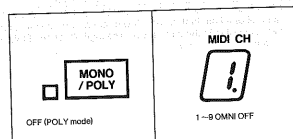
OMNI ON, MONO mode

With this mode, the S612 will receive the **MIDI** information from any channel. However, only one sound can be played at a time on any channel. Press down the **MONO/POLY** button once. (The **LED** indicator will light.)



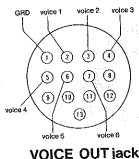
OMNI OFF, POLY mode

With this mode, the S612 will receive the **MIDI** information only from the channel which has been designated as the reception channel, and 6-voice polyphonic sound can be played simultaneously on a channel. When the **MIDI CH** display numbers 1-9 are selected, the S612 is in the **OMNI OFF** mode.



OMNI OFF, MONO mode

With this mode, the S612 will receive the **MIDI** information only from the channel which has been designated as the reception channel. When numbers 1-9 are selected, the One-voice sound corresponding to the designated channel can be played. Also the designated channel voice can go thru the **VOICE OUT** jack.



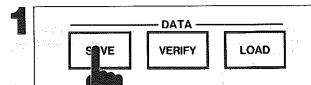
SAVE, VERIFY and LOAD

The sampled sound data can be saved, verified or loaded by the specially designed sampler disk drive MD280 (optional) or a Commodore cassette recorder. The time it takes to save, verify or load with the MD280 is approximately 8 seconds. The Commodore cassette recorder takes approximately 120 seconds.

* The sound data is a combination of sampled and edited data. The operation of the sampler disk drive MD280 or the Commodore cassette recorder, will be controlled by the S612.
Note: Make sure the power switch of the S612 is turned off before plugging or unplugging the connection cord of the MD280.

Saving

1. Edit the sampled sound of the S612, as required, before saving. Place the disk into the MD280 sampler disk drive. (Make sure the tab has not been broken.)
• Press the **SAVE** button on the S612. The letter **d** will appear on the **MIDI channel** display and start blinking.

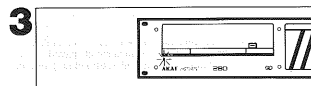


2. Press the **SAVE** button again, while the display is blinking. The **d** display remain lit and the **SAVE** LED lit, indicating that the save function is in progress.
Note: The **d** display will only blink for several seconds. The **SAVE** button must be pressed a second time while the display is blinking to activate the save function, otherwise, the **SAVE** mode will be cancelled.



3. The **BUSY** LED on the MD280 will light indicating that a save function is in progress.

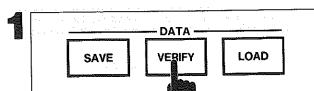
It takes approximately 8 seconds to accomplish the save. Once saving is completed, the **SAVE** LED of the S612 and the **BUSY** LED of the MD280 will go out. After save function, verify that the data has been properly saved.



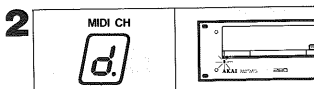
Note: If you encounter any difficulty when trying to save, check the following, and try saving again.
• The anti-record tab has been broken from the disk.
• You are trying to save without inserting a disk in the MD280.
• The power cord of the MD280 is not connected.
• There is no sample in the S612.

Verifying

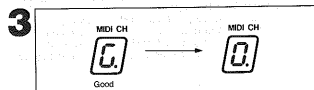
1. After the save process has been completed,
 - Press the **VERIFY** button.



2. The letter **d** will appear on the **MIDI CH** display. At the same time, the **BUSY** LED of the MD280 will light, indicating that it is in the verifying process.

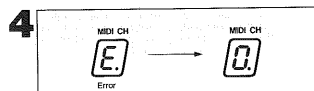


3. The verifying process takes approximately 8 seconds. If the data has been correctly saved, the letter **G** on the **MIDI CH** display will blink for several seconds. The display will return to its previous condition after a few seconds.



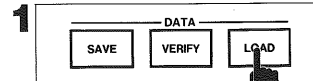
4. If the **MIDI CH** display will indicate the letter **E** and blink for several seconds the data has not been correctly saved. (After a few seconds, the **MIDI CH** display will return to its previous condition.)

Try to save function once more time.
Note: If several unsuccessful attempts have been made to save and verify, the head may need cleaning or the felt may need changing on the MD280 or the sampler disk may need change. Consult your MD280 Operator's Manual for details.

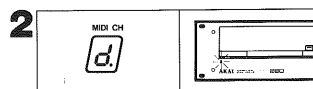


Loading

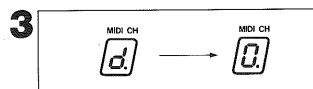
1. Set the sampler disk with sound data into the MD280.
 - Press the **LOAD** button of the S612.



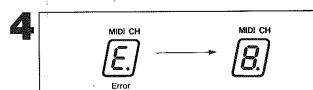
2. The **LOAD** LED will light and loading will begin. At the same time, the letter **d** on the **MIDI CH** display will appear to let you know the S612 is being loaded from the disk. Also, the **BUSY** LED of the MD280 will light, indicating that loading is in progress.



3. Loading will take approximately 8 seconds. If the data has been loaded correctly, the **MIDI CH** display will return to its previous condition.



4. If the data has not been loaded correctly, **E** will appear and blink for few seconds before the **MIDI CH** display returns to normal. If this happens, check the following:
 - Has the disk been inserted correctly?
 - Is the disk blank?
 - Has the disk been close to a strong magnetic field?
 - Are the power and interface cables connected properly?



MEMO

SECTION 2 SERVICE MANUAL

TABLE OF CONTENTS

I. SPECIFICATIONS	28
II. DISMANTLING OF UNIT	29
III. PRINCIPAL PARTS LOCATION	30
IV. OPERATIONAL CHECKS	31
1. POWER-ON CHECKS	31
2. B POWER SUPPLY VOLTAGE CHECKS	31
3. MIDI SIGNAL RECEPTION CHECKS	32
4. OPERATIONALLY CHECKS ON OPERATING BUTTON	33
5. OPERATIONALLY CHECK ON VR (CONTROL) INPUTS	33
6. OPERATIONALLY CHECKS ON IN/OUTPUT CIRCUITS	34
7. OPERATIONALLY CHECKS ON INPUT, OUTPUT AND DIGIT CIRCUITS	35
8. RECORD/PLAYBACK LEVEL CHECKS	39

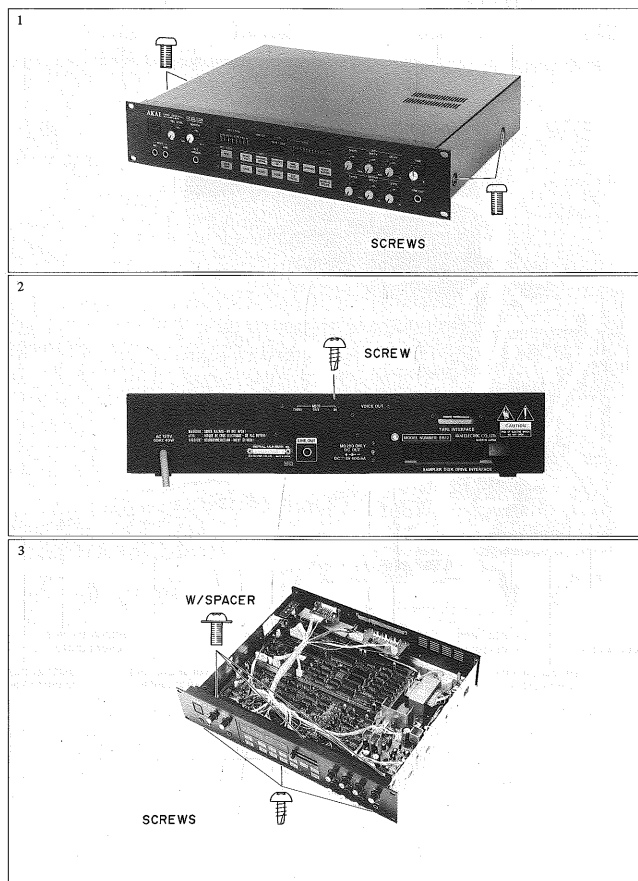
I. SPECIFICATIONS

FORMAT	12 bit Sampling
Sampling Frequency	4 kHz ~ 32 kHz (Min ~ Max)
Sampling Time	8 seconds ~ 1 seconds (Max ~ Min)
Frequency Response	Sampling: 25 Hz ~ 12.5 kHz (~3 dB band width) Playback: 25 Hz ~ 20 kHz (~3 dB band width)
Voice	6 voice
Range	5 octave
FUNCTION CONTROL	Power ON/OFF Recording Level Monitor Level Recording Mode New/Overdub Memory Start (0 ~ 100) Memory End (0 ~ 100) Scanning Mode One Shot, Looping Alternating, Manual Splice (0 ~ 100) Half-Step ± 100 cent Speed (Min ~ Max) Depth (Min ~ Max) Delay (0 ~ 10) Filter (Low ~ High) Decay (0 ~ 10) Level (0 ~ 10) Mono/Poly Channel Up/Down Save/Verify/Load Rec level MIDI ch 0 : Omni on 1 ~ 9 : Omni off I/O : Save/Load
INPUT (Sensitivity/Impedance)	
Mic	-63 dBm/5.6 kohms
Line	-27 dBm/47 kohms
OUTPUT	
Line	6-voice Mix out x 2 output level 42 dBm/2.8 Vp-p 13p/DIN (6-voice separate) level -4 dBm/1.4 Vp-p for the MD280 Sampler Disc Drive
Voice Out	
DC/8V Out	
MIDI	MIDI IN (5P/DIN) MIDI THRU (5P/DIN) MIDI OUT (5P/DIN)
INTERFACE	for the MD280 Sampler Disc Drive
POWER REQUIREMENTS	100V 50/60 Hz for Japan 120V 60 Hz for USA & Canada 220/240V 50 Hz Convertible for other contries.
DIMENSIONS	483 (W) x 90 (H) x 379 (D) mm
WEIGHT	6.0 kg (13.2 lbs)

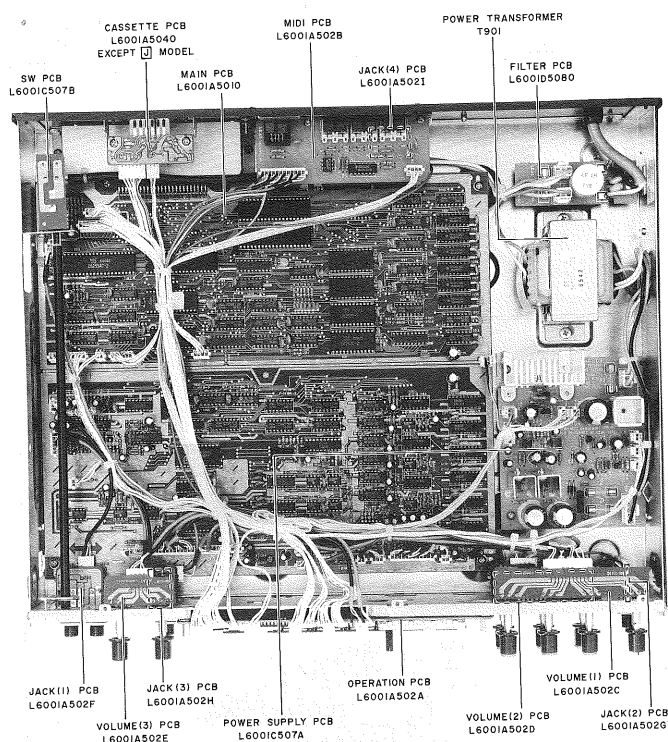
* For improvement purpose, specifications and design are subject to change without notice.

II. DISMANTLING OF UNIT

In case of trouble, etc. necessitating dismantling, please dismantle in the order shown in the photographs. Reassemble in reverse order.



III. PRINCIPAL PARTS LOCATION



IV. OPERATIONAL CHECKS

For operational checks on Sampler "S612", make connections as illustrated below.

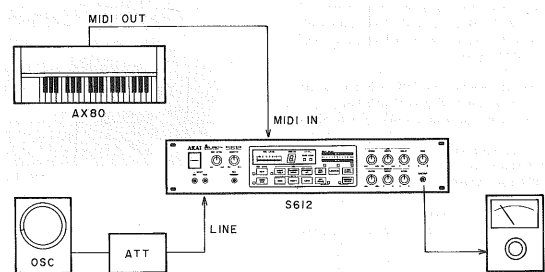


Fig. 4-1

4-1. Power-On Checks

By switching power on, check to assure MIDI-CH to display "0" and the [LOOPING] lamp to glow.

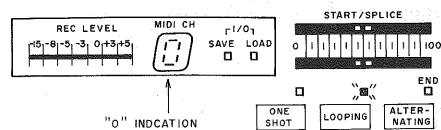


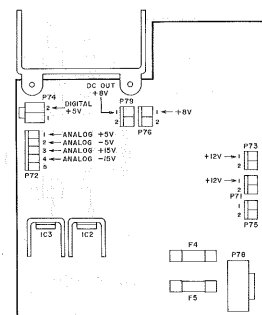
Fig. 4-2 Display of Frontpanel

4-2. B Power Supply Voltage Checks

After switching power on, check to assure the B voltages to be supplied normally.

Check Item	Check Point	Result
ANALOG + 5V	P72-1	+ 5V $\pm$ 0.5V
ANALOG - 5V	P72-2	- 5V $\pm$ 0.5V
ANALOG +15V	P72-3	+15V $\pm$ 1.5V
ANALOG -15V	P72-4	-15V $\pm$ 1.5V
DIGITAL + 5V	P74-2	+ 5V $\pm$ 0.5V
DC OUT + 8V	P79-1	+ 8V $\pm$ 0.5V
DC + 12V	P73-1	+12V $\pm$ 1.2V
DC +12V	P71-1	+12V $\pm$ 1.2V

Chart-1



POWER SUPPLY PCB L600IC507A

Fig. 4-3 Check point of Power Supply PCB

4-3. MIDI Signal Reception Checks

By operating the keyboard of an AX80 (or another MIDI accommodating synthesizer) that has been connected onto Sampler "S612", check to assure the channel indicator LED for MIDI-CH to glow more brightly as Sampler receives a MIDI signal.

When the channel indicator for MIDI-CH fails to be made brighter, check by following the steps below.

- 1) Connect an oscilloscope onto IC4 pin 2 within Main PCB.
- 2) IC4 pin 2 should normally be at an "H" level.
- 3) Push the AX80 keyboard keys, and observe the received MIDI signal waveforms. (See Fig. 4-4)

A. When no MIDI Signal is observed:
Check IC1 and PH1 in the MIDI signal receiver (MIDI PCB).

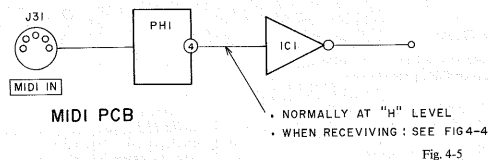


Fig. 4-5

B. When MIDI Signal is observed but MIDI Indicator fails to glow more brightly:
Check the MIDI-CH indicator driving circuit. (See Fig. 4-6)

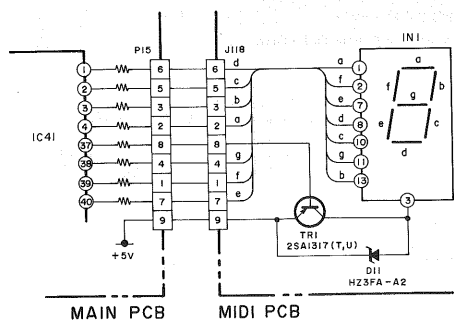


Fig. 4-6 Indicator Driving Circuit

4-4. Operation Checks on Operating Buttons. (See Fig. 4-7)

Check to assure IC41 pins 12 to 25 on Main PCB to be at an "H" level (5 VDC) in a normal mode.

- 1) When Sampler fails to operate despite IC41 pins 12 to 25 at an "H" level in a normal mode, replace IC41.

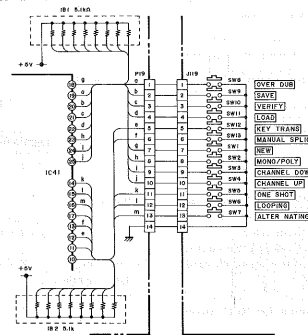


Fig. 4-7 Operation Button Input Circuit

4-5. Operation Check on VR (Control) Inputs

- 1) When all the VRs have been set at their minimum positions, IC58 pins 1 to 5 and 26 to 28 within Main PCB should be at an "L" level (0 VDC).

- 2) By operating the VRs, check to assure the DC levels at IC58 pins 1 to 5 and 26 to 28 to rise in correspondence with the VR positions, and to reach an "H" level (5 VDC) as the VRs have been set at their maximum positions. (See Fig. 4-8)

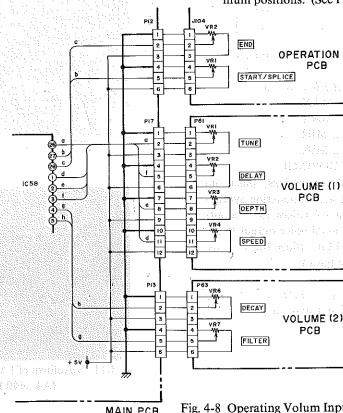


Fig. 4-8 Operating Volum Input Circuit

4-6. Operationally Checks on In/Output Circuits (Refer to Fig. 4-9)

The audio signal circuit may broadly be broken down into three blocks, the input circuit (analog), the digital circuit (digital), and the output circuit (analog).

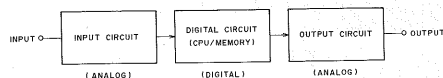


Fig. 4-9 Block Diagram of Main PCB

4-6-1.

When no sound emission or any other trouble due to the audio signal circuit failure has occurred, follow the steps below to localize the trouble to a specific block. For this job, test signals have already been programmed for. By-block performance should therefore be checked by using these test signals.

- 1) While holding the [NEW] button for REC Mode down, switch power on.
By the above operation, MIDI-CH should display 8CH, and the indicator LEDs for [NEW] and [OVERDUB] flash on and off for about 25 to 30 seconds.

- 2) As the flashing of LEDs ceases, MIDI-CH should return to "0".

- 3) In this state, a 440 Hz sine wave test signal (key A4 of the synthesizer) should be recorded, irrespective of the input circuit status.

- a) In the above state, connect a millivoltmeter onto LINE OUT.

- b) Set the individual VRs of the S612 as shown below.
 OUTPUT VR..... MAX
 FILTER VR..... MAX
 DECAY VR..... MIN
 Other VRs..... MIN

- c) Set the scanning mode at [LOOPING].

- d) Upon concluding the above settings, push the AX80 (or another MIDI accommodating synthesizer) key board keys to have 6 voices of tones output, and check each individual voice output to assure its being at $+2 \pm 2$ dBm. (Since the keys are touch sensitive, push them hard.)

* When individual voice outputs have been checked valid at LINE OUT, the digital and output circuits may be judged to have been trouble-free.

- When individual voice outputs cannot be checked:

- 1) Connect an oscilloscope onto pin 19 or D/A converter IC67 in the digital circuit.

- 2) Keep holding an AX80 (or another MIDI accommodating synthesizer) keyboard key down, and observe the waveform of a time-shared audio signal emerging at IC67 pin 19. (See Fig. 4-10, 11)

- * When an audio signal has been observed there:
The output circuit will have been defective.
- * When no audio signal has been observed there:
The digital circuit will have been defective.

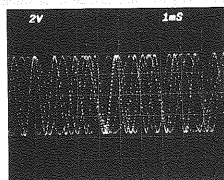


Fig. 4-10 Waveform of 6 Voice Time-Sharing

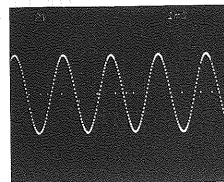


Fig. 4-11 Waveform of 1 Voice Time-Sharing (A4...440 Hz)

4-7. Operationally Checks on Input, Output, and Digital Circuits

- Check each individual block by observing waveforms at its various locations and checking them against reference waveforms.
- When checking waveforms in the digital circuit, be sure to use a 10 : 1 probe.

4-7-1. Input Circuit (Refer to Fig. 4-13)

- 1) Input a 400 Hz signal at -29 dBm to LINE IN from an audio signal generator.
- 2) Set the REC level VR at its maximum position.
- 3) The voltage waveforms at various locations of the input circuit are shown in Fig. 4-13.

4-7-2. Output Circuit (Refer to Fig. 4-14)

- 1) By the same procedure as 6-1, record test signals.
- 2) Disconnect any external input circuit that may have been connected onto LINE IN of the input circuit.
- 3) Push an AX80 (or another MIDI accommodating synthesizer) keyboard key. In this process, due caution will be required, since the output level varies by the force applied to the key.
- 4) The voltage waveforms at various locations are shown in Fig. 4-14 to which reference is directed.

The various waveforms shown apply to the keys for 6 voices that have steadily been held down.

VOICE 1.....	A4 (440 Hz)
VOICE 2.....	C4 (261 Hz)
VOICE 3.....	C5 (523 Hz)
VOICE 4.....	E5 (659 Hz)
VOICE 5.....	G5 (783 Hz)
VOICE 6.....	C6 (1046 Hz)

The voice numbers will be assigned by the key pushing sequence.

4-7-3. Digital Circuit (Refer to Fig. 4-15)

When observing digital circuit signal waveforms, be sure to use a 10 : 1 probe for the oscilloscope.

- 1) Clock Generator Performance Checks (See Fig. 4.12)
Connect an oscilloscope onto IC40 pin 1, and check to assure an 8 MHz signal to have been generated.

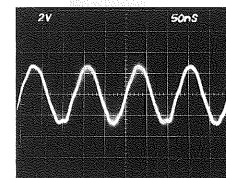


Fig. 4-12

- 2) The system clock signal input waveforms for the various ICs are shown in Fig. 4-15.
- 3) If a short-circuit or equivalent occurs while checking the digital circuit, IC(s) may run away, so that in such an event, switch power off and then back on again to kill the runaway.

Input Waveform of Input Diagram

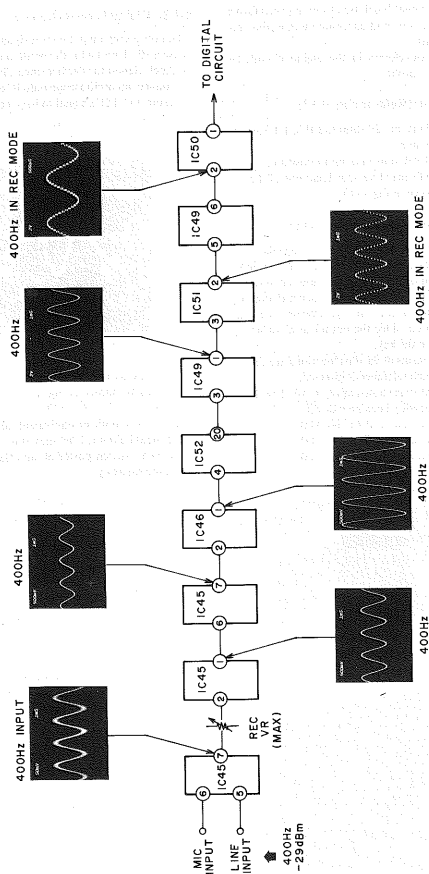


Fig. 4-13 Input Waveform of Input Diagram

Output Waveform of Output Diagram

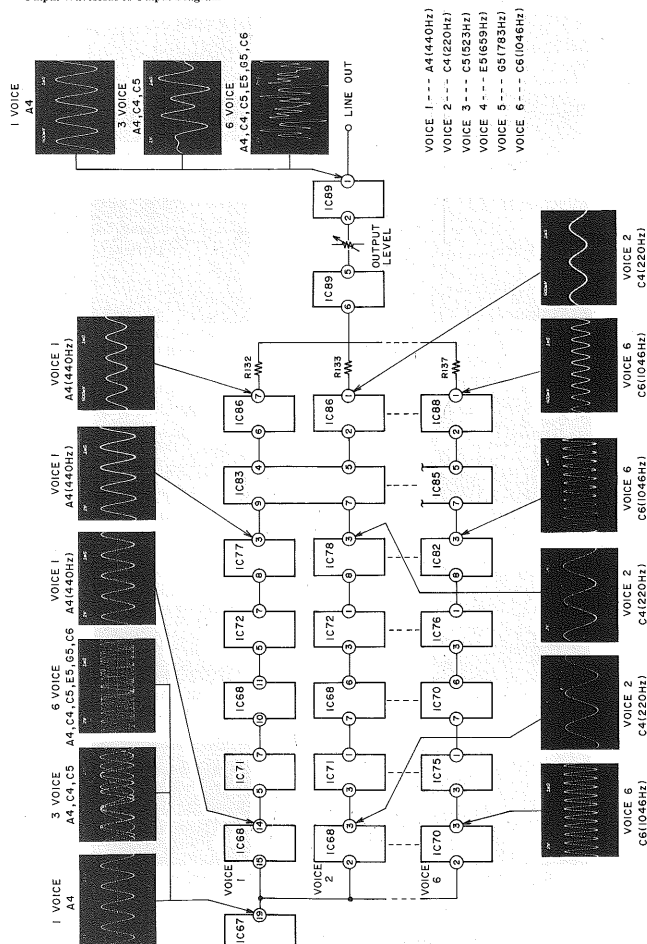
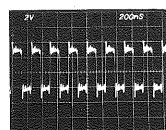
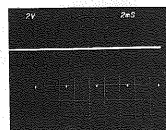


Fig. 4-14 Output Waveform of Output Diagram

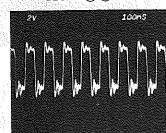
System clock signal Waveform for the various ICs



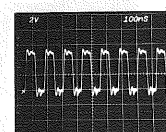
IC5 - ① ⑤ ⑩ PIN
IC6 - ① ⑤ ⑩ PIN



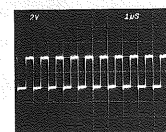
IC17 - ③ ⑩ PIN
IC18 - ③ ⑩ PIN
IC19 - ③ ⑩ PIN



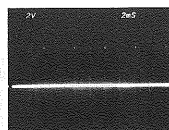
IC7 - ① ⑤ ⑩ PIN
IC8 - ① ⑤ ⑩ PIN



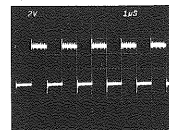
IC23 - ⑩ PIN



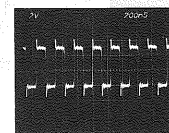
IC52 - ⑩ PINS



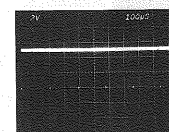
IC54 - ⑩ PIN
IC55 - ⑦ PIN



IC4 - ③ ④ PIN
IC58 - ⑩ PIN
IC59 - ⑩ PIN



IC60 - ⑦ PIN



IC61 - ⑦ PIN
IC62 - ⑦ PIN



IC63 - ⑦ PIN

Fig. 4-15 System clock signal Waveform for the various ICs

4-8. RECOd/PlaybaCk Level Checks

- 1) Input to LINE IN a 400 Hz signal at -29 dBm from an audio signal generator.
- 2) Set the REC Level VR at its maximum position.
- 3) Set the other VRs as shown below.

OUTPUT LEVEL VR	MAX
FILTER VR	MAX
MONITOR VR	MAX
Other VRs	MIN
- 4) At this point in time, check to assure the indication of a millivoltmeter connected to LINE OUT to have been at 0 dBm.
- 5) Similarly check to assure the REC Level meter indication to have been at 0 dB (with all the green LEDs glowing).
- 6) In the above state, after pushing key A4 of the AX80, push the [NEW] button for REC Mode, and start recording. (The 400 Hz signal may be played back by pushing key A4 of the AX80.)
- 7) Upon concluding the recording operation, set the scanning mode at "LOOPING" by pushing the [LOOPING] button. Also disconnect the audio signal generator that has been connected onto LINE IN.
- 8) Push keyboard keys of the AX80 (or another MIDI accommodating synthesizer), and check to assure the output level at LINE OUT to have been made 0 dB.
 - When pushing the AX80 keyboard keys, the output level will vary in accordance with a force applied to the key, so that push the keys hard. A sound will be emitted while the key is held down.

V. PC BOARD TITLE AND IDENTIFICATION NUMBERS

P.C. Board Title		P.C. Board Number	Remarks
MAIN	P.C Board	L6001A5010	
OPERATION	P.C Board	L6001A502A	
MIDI	P.C Board	L6001A502B	
VOLUME (1)	P.C Board	L6001A502C	
VOLUME (2)	P.C Board	L6001A502D	
VOLUME (3)	P.C Board	L6001A502E	
JACK (1)	P.C Board	L6001A502F	
JACK (2)	P.C Board	L6001A502G	
JACK (3)	P.C Board	L6001A502H	
JACK (4)	P.C Board	L6001A502I	
SW	P.C Board	L6001C507B	
CASSETTE	P.C Board	L6001D5040	EXCLUDE
FILTER	P.C Board	L6001D5080	

SECTION 3 PARTS LIST

TABLE OF CONTENTS

RECOMMENDED SPARE PARTS	43
1. PC BOARD BLOCK	44
2. MAIN PC BOARD	44
3. OPERATION PC BOARD	44
4. CASSETTE PC BOARD	44
5. POWER SUPPLY PC BOARD	45
6. FILTER PC BOARD	45
7. MIDI PC BOARD	45
8. VOLUME PC BOARD (1)	45
9. VOLUME PC BOARD (2)	45
10. VOLUME PC BOARD (3)	45
11. JACK PC BOARD (1)	45
12. JACK PC BOARD (2)	45
13. JACK PC BOARD (3)	45
14. JACK PC BOARD (4)	45
15. SW PC BOARD	45
16. ASSEMBLY BLOCK	47
17. FINAL ASSEMBLY BLOCK	48
INDEX	49

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ATTENTION

- When placing an order for parts, be sure to list the parts no., model no., and description of each part. If any of this information is omitted, there are instances in which parts cannot be shipped or the wrong parts will be delivered.
- Please be careful not to make a mistake in the parts no. If the parts no. is in error, a part different from the one ordered may be delivered.
- Because part numbers and part definitions and supply in the Preliminary Parts List may have been the subject of changes, please use this parts list for all future reference.

HOW TO USE THIS PARTS LIST

- This Parts List shows those parts which are considered necessary for repairs. Other parts, such as resistors and capacitors, are shown in the "Common List for Service Parts" from which these parts should be selected and parts.
- The Recommended Spare Parts List shows those parts in the Parts List which are considered particularly important for service.
- Parts not shown in the Parts List and "Common List for Service Parts" will not in principle be supplied.
- How to read the parts list
 - Mechanism Block
 - P.C Board Block

2. HEAD BASE BLOCK

REF. NO.	PART NO.	DESCRIPTION
2-1x	BH-T2033A320A	HEAD BASE BLOCK GX-F66R
2-2	HP-H2206A010A	HEAD R/P PR-4-FU C
2-3	ZS-477876	PAN20x03STL CMT
2-4	ZS-536488	BID20x08STL CMT
2-5	ZG-402895	CS ANGLE ADJUST SPRING

SP (Service Parts) Classification

A small "x" indicates the inability to show that particular part in the Photo or Illustration.

This number corresponds with the individual parts index number in that figure

This number corresponds with the Figure Number

6. SYS. CON. P.C BOARD BLOCK

REF. NO.	PART NO.	DESCRIPTION
6-1	BA-T2034A070A	PC SYS CON BLK GX-F44R
6-1C1	EL-324536	IC HD14049BP
6-1C2	EL-336801	IC MB841-564M
6-1C3	EL-331661	IC SN7405N
6-1C4	EL-336725	IC M54527P
6-TR104	ET-200985	TR 28C2603 F.G
6-TR51028	ET-354657	TR 2SA733A P.O
6-D1	ED-318292	D SILICON H IS2473T-77 T26
6-D2to4	ED-308952	D GERMA V 1K34A-LR F07
6-D5to10	ED-318292	D SILICON H IS2473T-77 T26
6-X1	EL-318384	OSC X-TAL NC-18C 3.579545MHZ

SP (Service Parts) Classification

These reference symbols correspond with component symbols in the Schematic Diagrams.

- The kind of part and its installation position can both be determined by the Part Number. To determine where a part number is listed, utilize the Parts Index at the end of the Parts List. It is necessary first of all to find the Part Number. This can be accomplished by using the Reference Number listed at the right of the part number in the Parts Index.

WARNING

△ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURE'S RECOMMENDED PARTS

AVERTISSEMENT

△ IL INDIQUE LES COMPOSANTS CRITIQUES DE SÉCURITÉ. POUR MAINTENIR LE DEGRÉ DE SÉCURITÉ DE L'APPAREIL, NE REMPLACER QUE DES PIÈCES RECOMMANDÉES PAR LE FABRICANT

RECOMMENDED SPARE PARTS

Because, if the parts listed below are on hand, almost any repair can be accomplished, we suggest that you stock these Recommended Spare Parts Items.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1 N	BT-360649	△ TRANS POWER S612 T-10 (J)	71	EQ-348929	RELAY SIG G5A-232P 2TR 12V
2 N	BT-360650	△ TRANS POWER S612 T-30 (C,A)	72	ES-344270	△ SW PUSH SDLD1P003 01-1
3 N	BT-360653	△ TRANS POWER S612 T-50 (E,V,B,S)	73	ES-306430	△ SW SLIDE J-54013 01 01-2
4 N	ED-359534	D LED SLH34VC3F-R RED	74	ES-354115	SW TACT SKJHCAC21A
5	ED-330319	△ D SILICON DBA100B 100/1.0A	75 N	ET-360687	△ TR 2SB1015 Y, GR
6	ED-200213	△ D SILICON DBA40C-K15 200/2.6A	76 N	ET-356817	△ TR 2SB891 Q, R
7	ED-357754	△ D SILICON DS135D 200/1.0A	77	ET-349883	△ TR28C3243 D, E
8	ED-301911	D SILICON H DS448	78	ET-354083	△ TR 2SD1189 Q, R
9	ED-343996	D ZENER H HZ12 B1	79	ET-354167	PHOTO SENSOR PC900
10	ED-346592	D ZENER H HZ12 A2	80	ET-349882	TR 2SA1283 D, E
11	ED-331626	D ZENER H HZ12 B2	81	ET-355216	TR 2SA1117 T, U
12	EF-359225	△ FUSE BET T 3.15A 250V (B)	82	ET-338447	TR 2SA991 E, F
13	EF-355374	△ FUSE BET T 500MA 250V (B)	83	ET-316523	TR 28C1844 F
14	EF-691007	△ FUSE SEMKO T 3.15A 250V (E,V,S)	84	ET-353898	TR 28C3330
15	EF-593706	△ FUSE SEMKO T 500MA 250V (E,V,S)	85 N	ET-360067	TR 28C3330 T, U
16	EF-306124	△ FUSE TSC A 250V 0.63A (J)	87 N	EV-359549	VR ROTARY 16P10 A502
17	EF-306949	△ FUSE TSC A 250V 1.25A (J)	88 N	EV-361200	VR ROTARY 16P10 B502
18	EF-306952	△ FUSE TSC A 250V 4.00A (J)	89 N	EV-359547	VR ROTARY 16P10
19	EF-305703	△ FUSE TSC 125V 0.63A (C,A)	90 N	EV-360751	VR SLIDE RSGA1 (W/CENTER CLICK) B103
20	EF-308847	△ FUSE TSC 125V 1.60A (C,A)			
21	EF-306957	△ FUSE TSC 125V 4.00A (C,A)			
22 N	EL-359552	△ IC M5236L			
23 N	EL-359626	△ IC NM78M15A			
24 N	EL-359628	△ IC NM79M15A			
25 N	EL-360051	IC ADC0809CN			
26 N	EL-360049	IC AM2504PC			
27 N	EL-390606	IC BA9201			
28 N	EL-360050	IC BA9211			
29 N	EL-360045	IC DG211CP			
30 N	EL-360021	IC HD68850P			
31 N	EL-360763	IC HD74HC09P			
32 N	EL-360052	IC IR2E02			
33 N	EL-360046	IC MF10CN			
34 N	EL-360058	IC MFCN-50			
35 N	EL-360043	IC MS220P			
36 N	EL-360059	IC NES72N			
37 N	EL-360772	IC NM79L05A			
38 N	EL-360023	IC PR254			
39 N	EL-310044	IC SN74LS05N			
40 N	EL-360029	IC S612A			
41 N	EL-360030	IC S612B			
42 N	EL-360032	IC S612C			
43 N	EL-360038	IC S612D			
44 N	EL-360047	IC S612E			
45 N	EL-360040	IC TC74HC00P			
46 N	EL-360037	IC TC74HC00P			
47 N	EL-360026	IC TC74HC04P			
48 N	EL-360039	IC TC74HC08P			
49 N	EL-360025	IC TC74HC13P			
50 N	EL-356049	IC TC74HC139P			
51 N	EL-360035	IC TC74HC157P			
52 N	EL-360048	IC TC74HC173P			
53 N	EL-360054	IC TC74HC174P			
54 N	EL-360053	IC TC74HC175P			
55 N	EL-360042	IC TC74HC259P			
56 N	EL-360036	IC TC74HC32P			
57 N	EL-360051	IC TC74HC4040P			
58 N	EL-360028	IC TC74HC74P			
59 N	EL-360027	IC TC74HC86P			
60 N	EL-324255	IC TL082CP			
61 N	EL-359608	IC TLM22764D			
62	EL-354197	IC µPC311C			
63 N	EL-359609	IC µPD41416C-20			
64 N	EL-354186	IC µPD780C-1			
65 N	EL-360024	IC µPD8237AC-5			
66 N	EL-354146	IC µPD8255AC-2			
67	EL-354149	IC µPD8255AC-2			
68 N	EL-359563	OSC CE CSA8.00MS40			
69 N	EM-359536	IND LE GL-107512			
70 N	EM-359535	IND LE SL-1179			

"NOTE" N: New Parts

SYMBOL FOR DESTINATION

- [A] : AAL (U.S.A)
- [B] : UK (ENGLAND)
- [C] : CSA (CANADA)
- [E] : CEE (EUROPE)
- [J] : JPN (JAPAN)
- [S] : SAA (AUSTRALIA)
- [V] : VDE (WEST GERMANY)

1. PC BOARD BLOCK

REF. NO.	PART NO.	DESCRIPTION
1-1	BA-L6001A060A	PC MAIN BLK S612
1-2	BA-L6001A080A	PC OPERATION BLK S612
1-3	BA-L6001A080A	PC CASSETTE BLK S612 (C,A,E,V,B,S) [EXCEPT J]
1-4	BA-L6001A040A	PC POWER BLK S612

NOTE: PC OPERATION BLK CONSISTS OF FOLLOWING PC BOARDS.

- OPERATION PC BOARD
- MIDI PC BOARD
- VOLUME PC BOARD (1)
- VOLUME PC BOARD (2)
- VOLUME PC BOARD (3)
- JACK PC BOARD (1)
- JACK PC BOARD (2)
- JACK PC BOARD (3)
- JACK PC BOARD (4)

PC POWER BLK CONSISTS OF FOLLOWING PC BOARDS.

- POWER SUPPLY PC BOARD
- SW PC BOARD

2. MAIN PC BOARD

REF. NO.	PART NO.	DESCRIPTION
2-IC1	EL-354186	IC PD780C-1
2-IC2	EL-356049	IC TC74HC139P
2-IC3	EL-359608	IC TMM2764D
2-IC4	EL-360021	IC HD6850P
2-IC5,6	EL-354146	IC PD8253C-2
2-IC7,8	EL-360023	IC PD8254
2-IC9,10	EL-360024	IC PD8237AC-5
2-IC11,12	EL-360025	IC TC74HC138P
2-IC13,14	EL-360026	IC TC74HC04P
2-IC15,16	EL-360027	IC TC74HC36P
2-IC17 to 19	EL-360028	IC TC74HC74P
2-IC20	EL-360029	IC S612A
2-IC21	EL-360030	IC S612B
2-IC23,24	EL-360031	IC TC74HC4040P
2-IC25	EL-360032	IC S612C
2-IC26 to 31	EL-359609	IC PD41416C-20
2-IC32,33	EL-360035	IC TC74HC157P
2-IC34,35	EL-360036	IC TC74HC32P
2-IC36	EL-360037	IC TC74HC00P
2-IC37	EL-360026	IC TC74HC04P
2-IC38	EL-360038	IC S612D
2-IC39	EL-360039	IC TC74HC08P
2-IC40	EL-360040	IC TC74HC04P
2-IC41	EL-354149	IC PD8255AC-2
2-IC42,43	EL-360042	IC TC74HC259P
2-IC44	EL-360038	IC S612D
2-IC45	EL-360043	IC MS220P
2-IC46	EL-354255	IC TLO82CP
2-IC48	EL-354197	IC PC311C
2-IC49	EL-354255	IC TLO82CP
2-IC50	EL-354197	IC PC311C
2-IC51	EL-360045	IC DG211CJ
2-IC52	EL-360046	IC MF10CN
2-IC54	EL-360047	IC S612E
2-IC55	EL-360048	IC TC74HC173P
2-IC56	EL-360049	IC AM2504PC
2-IC57	EL-360050	IC BA9221

REF. NO.	PART NO.	DESCRIPTION
2-IC58	EL-360051	IC ADC0809CCN
2-IC60	EL-360053	IC TC74HC175P
2-IC61 to 63	EL-360054	IC TC74HC174P
2-IC64	EL-360036	IC TC74HC32P
2-IC65	EL-360038	IC S612D
2-IC66	EL-360063	IC HD74HC09P
2-IC67	EL-360050	IC BA9221
2-IC68 to 70	EL-360045	IC DG211CJ
2-IC71 to 76	EL-354255	IC TLO82CP
2-IC77 to 82	EL-360058	IC MF10CN
2-IC83 to 85	EL-360059	IC NE572N
2-IC86 to 89	EL-354255	IC TLO82CP
2-IC90 to 95	EL-360060	IC BA9201
2-IC96	EL-360072	IC NM479105A
2-TR1	ET-353898	TR 29C330
2-TR4	ET-338447	TR 2SA991 E, F
2-TR5,6	ET-316253	TR 29C1844 F
2-TR7	ET-338447	TR 2SA991 E, F
2-D1,2	ED-301911	D SILICON H D8448
2-D3	ED-359534	D LED SLH34VC3F-R RED
2-X1	EL-359563	OSC CE CSA8-00 MS40
2-RL1	RQ44829	RELAY SIG G5A-233P 2TR 12V
2-IB1,2	ER-360201	R COMP RKC1/R88 512J
2-R67	ER-331188	R FUSE E RD2PC S10 1/4W 8R2J
2-R76	ER-359556	R MF H F10 1/4W 5111F
2-R77	ER-359555	R MF H F10 1/4W 2551F
2-R86	ER-359557	R MF H F10 1/4W 1651F
2-R97	ER-359558	R MF H F20 1/4W 3321F
2-R162	ER-360773	R OMF H S12 FS 1W 470J
2-C45	EC-360719	C PP V S05 CQMF592 101J 50DC
2-C50	EC-360717	C PP V S05 CQMF592 471J 50DC
2-C51	EC-360717	C PP V S05 CQMF592 471J 50DC
2-C79	EC-360716	C PP V S05 CQMF592 391J 50DC
2-C205,207	EC-360719	C PP V S05 CQMF592 101J 50DC
2-10		
2-J1	EJ-359564	SOCKET CONNECT. CB478-25-30-432
2-1	EJ-358691	SOCKET IC DILB28P-8J

3. OPERATION PC BOARD

REF. NO.	PART NO.	DESCRIPTION
3-IC1	EL-360052	-ICIR2E02
3-TR1	ET-355216	TR 2SA1317 T, U
3-D1 to 10	ED-359534	D LED SLH34VC3F-R RED
3-D11	ED-346592	D ZENER H HZ12 BI
3-SW1 to 13	ES-354115	SW TACT SKHCAC021A
3-VRL,2	EV-360751	VR SLDR R83A1
3-IN1	EM-359535	IND LE SL-1179
3-IN2	EM-359536	IND LE GL-107812

4. CASSETTE PC BOARD

REF. NO.	PART NO.	DESCRIPTION
4-IC1	EL-359552	IC MS326L
4-TR1	ET-349882	TR 2SA1283 D, E
4-TR2	ET-355216	TR 2SA1317 T, U
4-R1	ER-360725	R OMF H S12 FS 1W 221J

5. POWER SUPPLY PC BOARD

REF. NO.	PART NO.	DESCRIPTION
5-IC1	EL-359552	IC MS326L
5-IC2	EL-359626	IC NM79M15A
5-IC3	EL-359628	IC NM79M15A
5-TR1	ET-360687	TR 2SB1015 Y, GR
5-TR2	ET-349883	TR 2SC3243 D, E
5-TR3	ET-354083	TR 2SD1189 Q, R
5-TR4	ET-360687	TR 2SC330 T, U
5-TR5	ET-355216	TR 2SA1317 T, U
5-TR6	ET-356817	TR 2SB891 Q, R
5-TR7 to 9	ET-360687	TR 2SC330 T, U
5-D1	ED-200213	D SILICON DBA40C-K15 200/2.6A
5-D2	ED-357754	D SILICON DBA10B 100/1.0A
5-D4	ED-330319	D ZENER H HZ12 BI
5-D5	ED-331626	D ZENER H HZ12 BI
5-D6	ED-343996	D SILICON H D8448
5-D7	ED-301911	D SILICON DB135D 200/1.0A
5-D8 to 11	ED-357754	D SILICON DBA10B 100/1.0A
5-R1	ER-360725	R OMF H S12 FS 1W 221J
5-R2	ER-356113	R MF H F10 1/4W 1302G
5-R3	ER-360732	R MF H F10 1/4W 4101G
5-R6	ER-355400	R MF H F10 1/4W 1101G
5-R7	ER-359644	R MF H F10 1/4W 3901G
5-R8	ER-357831	R MF H F10 1/4W 5101G
5-R9	ER-359644	R MF H F10 1/4W 3901G
5-C2	EC-322804	C EC V CUT SM 472M 16.0DC
5-C3	EC-313825	C SA V F05 R33K 25DC
5-C6,7	EC-316188	C EC V CUT SM 102M 25DC
5-1	EZ-200473	SILICON RUBBER SHEET TC-30
5-2	ZW-632226	WASHER INSULATOR (BUSH M)

ASSEMBLY BLOCK

REF. NO.	PART NO.	DESCRIPTION
5-F3A	EF-306952	Δ FUSE TSC A 250V 4.00A [J]
5-F3B	EF-306957	Δ FUSE TSC 125V 4.00A [C, A]
5-F3C	EF-691007	Δ FUSE SEMKO T 3.15A 250V [E, V, S]
5-F3D	EF-359225	Δ FUSE BET T 3.15A 250V [B]
5-F4A	EF-306124	Δ FUSE TSC A 250V 0.63A [J]
5-F4B	EF-305703	Δ FUSE TSC 125V 0.63A [C, A]
5-F4C	EF-593706	Δ FUSE SEMKO T 500MA 250V [E, V, S]
5-F4D	EF-355374	Δ FUSE BET T 500MA 250V [B]
5-F5A	EF-306124	Δ FUSE TSC A 250V 0.63A [J]
5-F5B	EF-305703	Δ FUSE TSC 125V 0.63A [C, A]
5-F5C	EF-593706	Δ FUSE SEMKO T 500MA 250V [E, V, S]
5-F5D	EF-355374	Δ FUSE BET T 500MA 250V [B]

6. FILTER PC BOARD

REF. NO.	PART NO.	DESCRIPTION
6-FL1	ED-360068	COIL LF LF-2 B
6-C2,3	EC-358450	Δ C CE V B 102M 400AC
6-F1A	EF-306949	Δ FUSE TSC A 250V 1.25A [J]
6-F1B	EF-308847	Δ FUSE TSC 125V 1.60A [C, A]
6-F1C	EF-593706	Δ FUSE SEMKO T 500MA 250V [E, V, S]
6-F1D	EF-355374	Δ FUSE BET T 500MA 250V [B]

7. MIDI PC BOARD

REF. NO.	PART NO.	DESCRIPTION
7-IC1	EL-310044	IC SN74LS05N
7-D1	ED-301911	D SILICON H D8448
7-331 to 33	EJ-360770	DIN J TCS450-601-1111 5P
7-334	EJ-360771	DIN J TCS5037-01-241 11P

8. VOLUME PC BOARD (1)

REF. NO.	PART NO.	DESCRIPTION
8-VR1	EV-359547	VR ROTARY 16P10 (W/CENTER CLACK) B103
8-VR2 to 4	EV-359549	VR ROTARY 16P10 B103

9. VOLUME PC BOARD (2)

REF. NO.	PART NO.	DESCRIPTION
9-VR5	EV-359551	VR ROTARY 16P10 A502
9-VR6,7	EV-359549	VR ROTARY 16P10 B103

10. VOLUME PC BOARD (3)

REF. NO.	PART NO.	DESCRIPTION
10-VR8	EV-361200	VR ROTARY 16P10 B502
10-VR9	EV-359551	VR ROTARY 16P10 A502

11. JACK PC BOARD (1)

REF. NO.	PART NO.	DESCRIPTION
11-J61	EJ-359642	PHONE J 3P HLJ4307-01-3060
11-J62	EJ-354269	PHONE J 3P HLJ0540-110 6.3

12. JACK PC BOARD (2)

REF. NO.	PART NO.	DESCRIPTION
12-J64	EJ-354269	PHONE J 3P HLJ0540-110 6.3
12-L1,2	ED-345909	COIL FIX 1 LAL03KH 4R7K

13. JACK PC BOARD (3)

REF. NO.	PART NO.	DESCRIPTION
13-J63	EJ-354269	PHONE J 3P HLJ0540-110 6.3

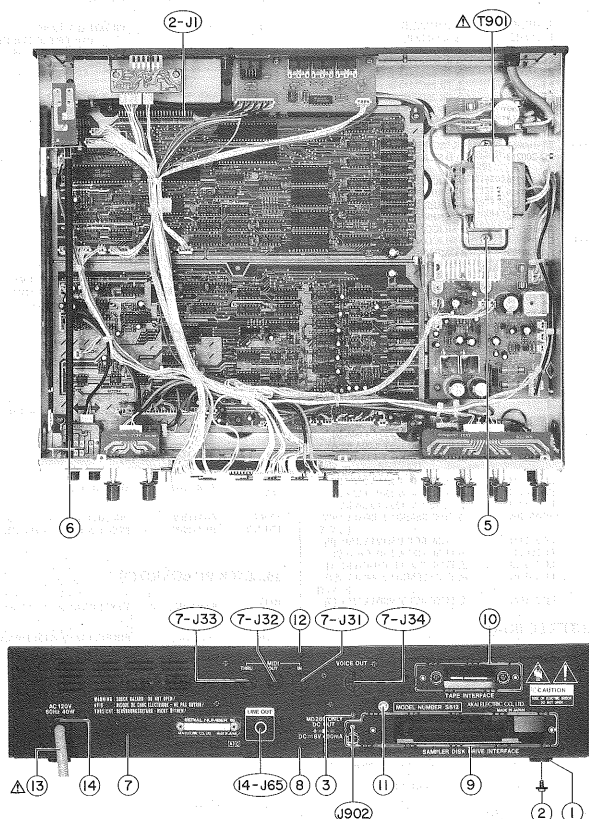
14. JACK PC BOARD (4)

REF. NO.	PART NO.	DESCRIPTION
14-J65	EJ-354269	PHONE J 3P HLJ0540-110 6.3
14-L3,4	ED-345909	COIL FIX 1 LAL03KH 4R7K

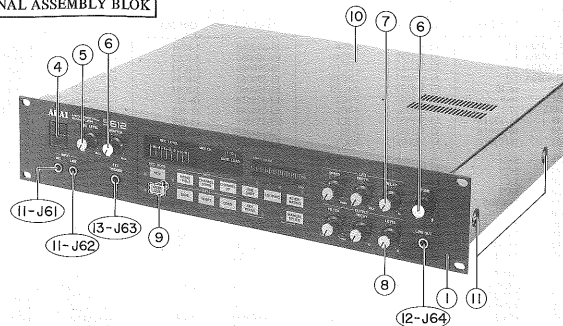
15. SW PC BOARD

REF. NO.	PART NO.	DESCRIPTION
15-SW1	ES-344270	Δ SW PUSH SLDL1P003 01-1
15-C1	EC-361942	Δ C CE V V 103Z 400AC

ASSEMBLY BLOCK



FINAL ASSEMBLY BLOK



16. ASSEMBLY BLOCK

REF. NO.	PART NO.	DESCRIPTION
ASSEMBLY BLOCK		
16-1	SA-324129	FOOT
16-2	ZS-344754	ST PAN30x06STL CMT C080
16-3	ZS-350934	PT BR30x08STL BNI [902 FIX]
16-4x	TC-516598	TRANS. RETAINER
		(POWER TRANS FIX)
16-5	ZS-361996	ST BID40x10STL CMT TW
		(POWER TRANS FIX)
16-6	SZ-360712	JOINT POWER
16-7A	SP-355494C	PANEL REAR S612D
16-7B	SP-355494B	PANEL REAR S612C, A)
16-7C	SP-355494D	PANEL REAR S612E, V, B, S)
16-8	ZS-447761	T2BR30x06STL BNI
16-9	BC-355501	COVER REAR
16-10	BC-355499	COVER CASSETTE
16-11	EJ-329610	TERMINAL W/SCREW UB-0067
		L 1P
16-12	ZS-447761	T2BR30x06STL BNI
		(COVER UPPER FIX)
16-13A	EW-524845	△ AC CORD 2 CORES VM1165B,
		VFF J [I]
16-13B	EW-358858	△ AC CORD 2 CORES KP-11
		STWAG18 [C, A]
16-13C	EW-359641	△ AC CORD 2 CORES
		KP-419C/KS-17 [E, V]
16-13D	EW-358631	△ AC CORD 2 CORES KS-17
		L TBSZF BS [B]
16-13E	EW-358630	△ AC CORD 2 CORES KP560
		L TBAZF KS17 S [S]
16-14A	EZ-631945	STRAIN RELIEF SR-4N-4 [I]
16-14B	EZ-302906	STRAIN RELIEF SR-4N-4 [C, A]
16-T901A	BT-360649	△ TRANS POWER S612 T-10 [I]
16-T901B	BT-360650	△ TRANS POWER S612 T-30
		[C, A]
16-T901C	BT-360653	△ TRANS POWER S612 T-50
		[E, V, B, S]
16-S901	ES-106430	△ SW SLIDE J-S4013 #01 01-2
16-J901	EJ-358633	△ SOCKET INLET SOTO17 2P
		[E, V, B, S]
16-J902	EJ-359643	SOCKET INLET HEC 1757-01-030
16-C901	EC-347832	△ C CE V F 104Z 25DC
MAIN PC BOARD		
2-J1	EJ-359364	SOCKET CONNECT

17. FINAL ASSEMBLY BLOCK

REF. NO.	PART NO.	DESCRIPTION
MIDI PC BOARD		
7-J31	EJ-360770	DIN J TCS4450-01-1111 5P
7-J32	EJ-360770	DIN J TCS4450-01-1111 5P
7-J33	EJ-360770	DIN J TCS4450-01-1111 5P
7-J34	EJ-360771	DIN J TCS5037-01-241 13P
JACK PC BOARD (4)		
14-J65	EJ-354269	PHONE J 3P HLJ0540-110 6.3
FINAL ASSEMBLY BLOCK		
17-1	BD-3555492	PANEL FRONT PART S612
17-2x	ZW-330423	UW40x130x025SUP CMT
		(PANEL FRONT FIX)
17-3x	ZS-344754	ST PAN30x06STL CMT C080
		(PANEL FRONT FIX)
17-4	SK-343017F	KNOB POWER-B
17-5	SK-B352952X2	KNOB MONITOR RED PART
17-6	SK-B352952X4	KNOB MONITOR WHITE PART
17-7	SK-B352952X1	KNOB MONITOR GREEN PART
17-8	SK-B352952X5	KNOB MONITOR BLUE PART
17-9	SE-357978	BASE KNOB (C)
17-10	SP-355493B	COVER UPPER-B
17-11	ZS-341960	ST BID40x06STL BNI
		(COVER UPPER FIX)
JACK PC BOARD (1)		
11-J61	EJ-359642	PHONE J 3P HLJ4307-01-3060
11-J62	EJ-354269	PHONE J 3P HLJ0540-110 6.3
JACK PC BOARD (2)		
12-J64	EJ-354269	PHONE J 3P HLJ0540-110 6.3
JACK PC BOARD (3)		
13-J63	EJ-354269	PHONE J 3P HLJ0540-110 6.3

INDEX

S612

PART NO.	REF. NO.	PART NO.	REF. NO.	PART NO.	REF. NO.	PART NO.	REF. NO.
BA-L6001A020A	1-2	EI-354146	2-IC6	EI-390060	2-IC91	EV-359549	9-VR6
BA-L6001A040A	1-4	EI-354149	2-IC41	EI-390060	2-IC92	EV-359549	9-VR7
BA-L6001A060A	1-1	EI-354186	2-IC1	EI-390060	2-IC93	EV-359551	9-VR5
BA-L6001A080A	1-3	EI-354197	2-IC48	EI-390060	2-IC94	EV-359551	10-VR9
BC-355499	16-10	EI-354197	2-IC50	EI-390060	2-IC95	EV-360751	3-VR1
BC-355501	16-9	EI-356049	2-IC2	EJ-329610	16-11	EV-360751	3-VR2
BD-B355492	17-1	EI-359552	4-IC1	EJ-354269	11-J62	EV-361200	10-VR8
BT-360649	16-T901A	EI-359552	5-IC1	EJ-354269	12-J64	EW-358630	16-13E
BT-360650	16-T901B	EI-359563	2-X1	EJ-354269	13-J63	EW-358631	16-13D
BT-360653	16-T901C	EI-359608	2-IC3	EJ-354269	14-J65	EW-358858	16-13B
EC-313825	5-C3	EI-359609	2-IC26	EJ-358633	16-J901x	EW-359641	16-13C
EC-316188	5-C6	EI-359609	2-IC27	EJ-358691	2-1	EW-524845	16-13A
EC-316188	5-C7	EI-359609	2-IC28	EJ-359564	2-J1	EZ-200473	5-1
EC-322804	5-C2	EI-359609	2-IC29	EJ-359642	11-J61	EZ-302906	16-14B
EC-347832	16-C901	EI-359609	2-IC30	EJ-359643	16-J902	EZ-631945	16-14A
EC-358450	6-C2	EI-359609	2-IC31	EJ-360770	7-J31	SA-324129	16-1
EC-358450	6-C3	EI-359626	5-IC2	EJ-360770	7-J32	SE-357978	17-9
EC-360716	2-C79	EI-359628	5-IC3	EJ-360770	7-J33	SK-B352952X1	17-7
EC-360717	2-C50	EI-360021	2-IC4	EJ-360771	7-J34	SK-B352952X2	17-5
EC-360717	2-C51	EI-360023	2-IC7	EM-359535	3-IN1	SK-B352952X4	17-6
EC-360719	2-C45	EI-360023	2-IC8	EM-359536	3-IN2	SK-B352952X5	17-8
EC-360719	2-C205	EI-360024	2-IC9	EO-345909	12-L1	SK-343017F	17-4
EC-360719	2-C207	EI-360024	2-IC10	EO-345909	12-L2	SP-355493B	17-10
EC-360719	2-C210	EI-360025	2-IC11	EO-345909	14-L3	SP-355494B	16-7B
EC-361942	15-C1	EI-360025	2-IC12	EO-345909	14-L4	SP-355494C	16-7A
ED-200213	5-D1	EI-360026	2-IC13	EO-360068	6-FL1	SP-355494D	16-7C
ED-301911	2-D1	EI-360026	2-IC14	EQ-348929	2-RL1	SZ-360712	16-6
ED-301911	2-D2	EI-360026	2-IC37	ER-331188	2-R67	TC-516598	16-4x
ED-301911	5-D7	EI-360027	2-IC15	ER-355400	5-R6	ZS-341960	17-11
ED-301911	7-D1	EI-360027	2-IC16	EI-356113	5-R2	ZS-447761	16-12
ED-330319	5-D4	EI-360028	2-IC17	ER-357831	5-R8	ZS-344754	16-2
ED-331626	5-D5	EI-360028	2-IC18	ER-359555	2-R77	ZS-344754	17-3x
ED-343996	5-D6	EI-360028	2-IC19	ER-359556	2-R76	ZS-350934	16-3
ED-346592	3-D11	EI-360029	2-IC20	ER-359557	2-R96	ZS-361996	16-5
ED-357754	5-D2	EI-360030	2-IC21	ER-359558	2-R97	ZS-447761	16-8
ED-357754	5-D8	EI-360031	2-IC23	ER-359644	5-R7	ZW-330423	17-2x
ED-357754	5-D9	EI-360031	2-IC24	ER-359644	5-R9	ZW-632226	5-2
ED-357754	5-D10	EI-360032	2-IC25	ER-360201	2-IB1		
ED-357754	5-D11	EI-360035	2-IC32	ER-360201	2-IB2		
ED-359534	2-D3	EI-360035	2-IC33	ER-360725	4-R1		
ED-359534	3-D1	EI-360036	2-IC34	ER-360725	5-R1		
ED-359534	3-D2	EI-360036	2-IC35	ER-360732	5-R3		
ED-359534	3-D3	EI-360036	2-IC64	ER-360773	2-R162		
ED-359534	3-D4	EI-360037	2-IC36	ES-306430	16-S901		
ED-359534	3-D5	EI-360038	2-IC38	ES-344270	15-SW1		
ED-359534	3-D6	EI-360038	2-IC44	ES-354115	3-SW1		
ED-359534	3-D7	EI-360038	2-IC65	ES-354115	3-SW2		
ED-359534	3-D8	EI-360039	2-IC39	ES-354115	3-SW3		
ED-359534	3-D9	EI-360040	2-IC40	ES-354115	3-SW4		
ED-359534	3-D10	EI-360042	2-IC42	ES-354115	3-SW5		
EF-305703	5-F4B	EI-360042	2-IC43	ES-354115	3-SW6		
EF-305703	5-F5B	EI-360043	2-IC45	ES-354115	3-SW7		
EF-306124	5-F4A	EI-360045	2-IC51	ES-354115	3-SW8		
EF-306124	5-F5A	EI-360045	2-IC68	ES-354115	3-SW9		
EF-306949	6-F1A	EI-360045	2-IC69	ES-354115	3-SW10		
EF-306952	5-F3A	EI-360045	2-IC70	ES-354115	3-SW11		
EF-306957	5-F3B	EI-360046	2-IC52	ES-354115	3-SW12		
EF-308847	6-F1B	EI-360047	2-IC54	ES-354115	3-SW13		
EF-355374	5-F4D	EI-360048	2-IC55	ET-316523	2-TR5		
EF-355374	5-F5D	EI-360049	2-IC56	ET-316523	2-TR6		
EF-355374	6-F1D	EI-360050	2-IC57	ET-338447	2-TR4		
EF-359225	5-F3D	EI-360050	2-IC67	ET-338447	2-TR7		
EF-593706	5-F4C	EI-360051	2-IC58	ET-349882	4-TR1		
EF-593706	5-F5C	EI-360052	3-IC1	ET-349883	5-TR2		
EF-593706	6-F1C	EI-360053	2-IC60	ET-353898	2-TR1		
EF-691007	5-F3C	EI-360054	2-IC61	ET-354083	5-TR3		
EI-310044	7-IC1	EI-360054	2-IC62	ET-354167	7-PH1		
EI-324255	2-IC46	EI-360054	2-IC63	ET-355216	3-TR1		
EI-324255	2-IC49	EI-360058	2-IC77	ET-355216	4-TR2		
EI-324255	2-IC71	EI-360058	2-IC78	ET-355216	2-TR5		
EI-324255	2-IC72	EI-360058	2-IC79	ET-356817	5-TR6		
EI-324255	2-IC73	EI-360058	2-IC80	ET-360067	5-TR4		
EI-324255	2-IC74	EI-360058	2-IC81	ET-360067	5-TR7		
EI-324255	2-IC75	EI-360058	2-IC82	ET-360067	5-TR8		
EI-324255	2-IC76	EI-360059	2-IC83	ET-360067	5-TR9		
EI-324255	2-IC86	EI-360059	2-IC84	ET-360687	5-TR1		
EI-324255	2-IC87	EI-360059	2-IC85	EV-359547	8-VR1		
EI-324255	2-IC88	EI-360763	2-IC66	EV-359549	8-VR2		
EI-324255	2-IC89	EI-360772	2-IC96	EV-359549	8-VR3		
EI-324255	2-IC90	EI-360772	2-IC97	EV-359549	8-VR4		
EI-324255	2-IC91	EI-360772	2-IC98	EV-359549	8-VR5		
EI-324255	2-IC92	EI-360772	2-IC99	EV-359549	8-VR6		
EI-324255	2-IC93	EI-360772	2-IC100	EV-359549	8-VR7		
EI-324255	2-IC94	EI-360772	2-IC101	EV-359549	8-VR8		
EI-324255	2-IC95	EI-360772	2-IC102	EV-359549	8-VR9		
EI-324255	2-IC96	EI-360772	2-IC103	EV-359549	8-VR10		
EI-324255	2-IC97	EI-360772	2-IC104	EV-359549	8-VR11		
EI-324255	2-IC98	EI-360772	2-IC105	EV-359549	8-VR12		
EI-324255	2-IC99	EI-360772	2-IC106	EV-359549	8-VR13		
EI-324255	2-IC100	EI-360772	2-IC107	EV-359549	8-VR14		
EI-324255	2-IC101	EI-360772	2-IC108	EV-359549	8-VR15		
EI-324255	2-IC102	EI-360772	2-IC109	EV-359549	8-VR16		
EI-324255	2-IC103	EI-360772	2-IC110	EV-359549	8-VR17		
EI-324255	2-IC104	EI-360772	2-IC111	EV-359549	8-VR18		
EI-324255	2-IC105	EI-360772	2-IC112	EV-359549	8-VR19		
EI-324255	2-IC106	EI-360772	2-IC113	EV-359549	8-VR20		
EI-324255	2-IC107	EI-360772	2-IC114	EV-359549	8-VR21		
EI-324255	2-IC108	EI-360772	2-IC115	EV-359549	8-VR22		
EI-324255	2-IC109	EI-360772	2-IC116	EV-359549	8-VR23		
EI-324255	2-IC110	EI-360772	2-IC117	EV-359549	8-VR24		
EI-324255	2-IC111	EI-360772	2-IC118	EV-359549	8-VR25		
EI-324255	2-IC112	EI-360772	2-IC119	EV-359549	8-VR26		
EI-324255	2-IC113	EI-360772	2-IC120	EV-359549	8-VR27		
EI-324255	2-IC114	EI-360772	2-IC121	EV-359549	8-VR28		
EI-324255	2-IC115	EI-360772	2-IC122	EV-359549	8-VR29		
EI-324255	2-IC116	EI-360772	2-IC123	EV-359549	8-VR30		
EI-324255	2-IC117	EI-360772	2-IC124	EV-359549	8-VR31		
EI-324255	2-IC118	EI-360772	2-IC125	EV-359549	8-VR32		
EI-324255	2-IC119	EI-360772	2-IC126	EV-359549	8-VR33		
EI-324255	2-IC120	EI-360772	2-IC127	EV-359549	8-VR34		
EI-324255	2-IC121	EI-360772	2-IC128	EV-359549	8-VR35		
EI-324255	2-IC122	EI-360772	2-IC129	EV-359549	8-VR36		
EI-324255	2-IC123	EI-360772	2-IC130	EV-359549	8-VR37		
EI-324255	2-IC124	EI-360772	2-IC131	EV-359549	8-VR38		
EI-324255	2-IC125	EI-360772	2-IC132	EV-359549	8-VR39		
EI-324255	2-IC126	EI-360772	2-IC133	EV-359549	8-VR40		
EI-324255	2-IC127	EI-360772	2-IC134	EV-359549	8-VR41		
EI-324255	2-IC128	EI-360772	2-IC135	EV-359549	8-VR42		
EI-324255	2-IC129	EI-360772	2-IC136	EV-359549	8-VR43		
EI-324255	2-IC130	EI-360772	2-IC137	EV-359549	8-VR44		
EI-324255	2-IC131	EI-360772	2-IC138	EV-359549	8-VR45		
EI-324255	2-IC132	EI-360772	2-IC139	EV-359549	8-VR46		
EI-324255	2-IC133	EI-360772	2-IC140	EV-359549	8-VR47		
EI-324255	2-IC134	EI-360772	2-IC141	EV-359549	8-VR48		
EI-324255	2-IC135	EI-360772	2-IC142	EV-359549	8-VR49		
EI-324255	2-IC136	EI-360772	2-IC143	EV-359549	8-VR50		
EI-324255	2-IC137	EI-360772	2-IC144	EV-359549	8-VR51		
EI-324255	2-IC138	EI-360772	2-IC145	EV-359549	8-VR52		
EI-324255	2-IC139	EI-360772	2-IC146	EV-359549	8-VR53		
EI-324255	2-IC140	EI-360772	2-IC147	EV-359549	8-VR54		
EI-324255	2-IC141	EI-360772	2-IC148	EV-359549	8-VR55		
EI-324255	2-IC142	EI-360772	2-IC149	EV-359549	8-VR56		
EI-324255	2-IC143	EI-360772	2-IC150	EV-359549	8-VR57		
EI-324255	2-IC144	EI-360772	2-IC151	EV-359549	8-VR58		
EI-324255	2-IC145	EI-360772	2-IC152	EV-359549	8-VR59		
EI-324255	2-IC146	EI-360772	2-IC153	EV-359549	8-VR60		
EI-324255	2-IC147	EI-360772	2-IC154	EV-359549	8-VR61		
EI-324255	2-IC148	EI-360772	2-IC155	EV-359549	8-VR62		
EI-324255	2-IC149	EI-360772	2-IC156	EV-359549	8-VR63		
EI-324255	2-IC150	EI-360772	2-IC157	EV-359549	8-VR64		
EI-324255	2-IC151	EI-360772	2-IC158	EV-359549	8-VR65		