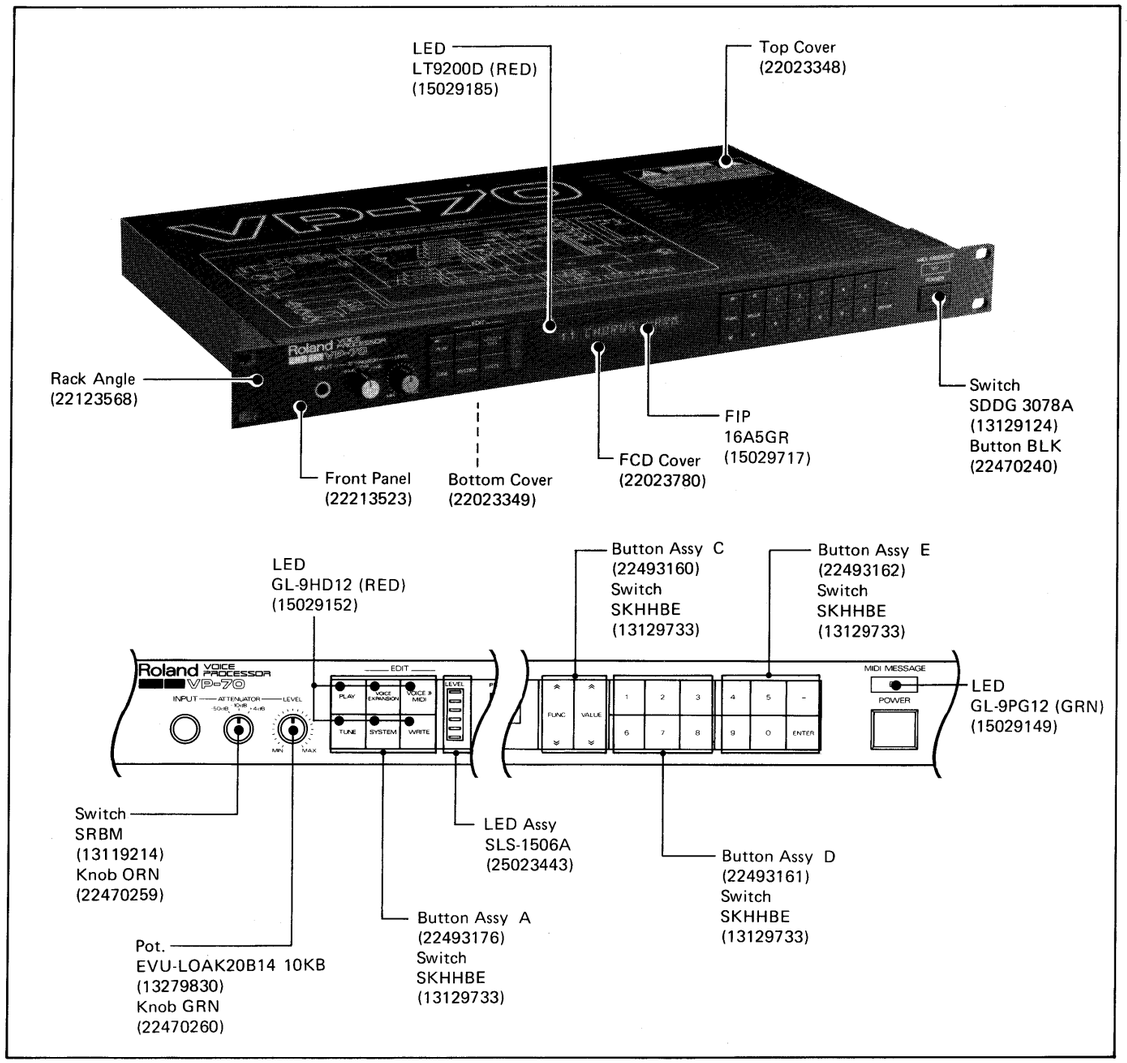
VP-70 SERVICE NOTES

First Edition

SPECIFICATIONS

Input Level/Impedance	: Unbalanced	−50dBm/1MΩ −10dBm/1MΩ +4dBm/1MΩ
	: Balanced	−50dBm/600Ω −10dBm/600Ω +4dBm/600Ω
Output Level/Impedance	: 0dBm/1.2KΩ	
Frequency Response	: 20Hz – 30KHz	dB (Direct)
	: 35Hz – 15KHz	dB (Effect)
S/N Ratio	: 89.2dB (Direct)	
	: 68.6dB (Effect)	
	[JIS-A, SHIFT ON : U1–U4 set at –12]	
Power Consumption	: 17W @100V	
	: 20W @117V/220V/240V	
Dimensions	: 482 (W) x 276 (D) x 44 (H) mm	
	: 19 (W) x 10-7/8 (D) x 1-3/4 (H) in.	
Weight	: 4kg 8 lb. 13 oz.	
Accessory	: Connection Cable LP-25 (PART No. 22430675S0)	



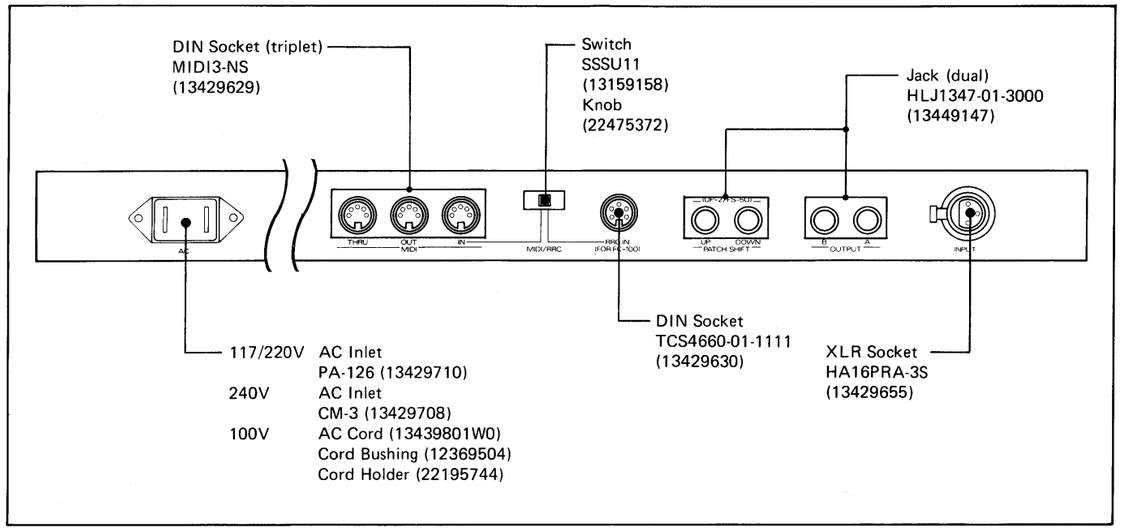


TABLE OF CONTENTS

EXPLODED VIEW

1	Front Panel	22213523
2	Escutcheon	22220319
3	Button	22470240
4	Keytop Assy A	22493176
5	Keytop Assy C	22493160
6	Keytop Assy D	22493161
7	Keytop Assy E	22493162
8	Switch Board (w/LED Board)	7414316000
9	FCD Cover	22023780
10	Knob (ORN)	22470259
11	Knob (GRN)	22470260
12	Front Holder	22193969
13	Input Board	7414317000
14	Arm	22140219
15	Joint	22150404
16	Side Holder L	22193970
17	Heat Sink	22463501
18	Side Holder R	22193971
19	Power Transformer	22453486D0 220/240V 22453487N0 100/120V
20	Power SW Holder	22193967
21	Power Supply Board	7414308000
22	Spacer B	22163555
23	Main Board	7414309000
24	Pitch Shift Board	7414312000
25	XLR Socket HA16PRA-35	13429655
26	Rear Panel	22213524
27	Top Cover	22023348
28	Rack Angle	22123568
29	Bottom Cover	22023349
30	Spacer A	22163556
31	FIP 16A5GR	15029717
32	LED (RED) LT9200D	15029185
33	LED Assy SLS-1506A	25023443
34	Knob	22475372
35	AC Inlet PA-126	13429710 117/220V
36	AC Inlet CM-3	13429708 240V
37	Cord Holder	22195744 100V
38	LED Board (attaching part to Switch board)	
39	Bass	22350313

CAUTION

To EP-ROMs A and B (PART No. 15179805, 15179806), no other ICs than specified below cannot be applied.

Mitsubishi M5M27C128K-2

Program data copied into the other brands' or different type will not work on the VP-70.

注意事項

EP-ROM A及びB(PART No.15179805, 15179806)は指定品であり、以下に示したもののみ使用できます。

三菱電気製 M5M27C128K-2

メーカ又は製番の異なるEP-ROMに、プログラムデータをコピーし、本製品に使用した場合、正常に動作しない事があります。

PARTS LIST

CASING

22023348	Top Cover	
22023349	Bottom Cover	
22213523	Front Panel	
22213524	Rear Panel	
22193969	Front Holder	
22193970	Side Holder (Left)	
22193971	Side Holder (Right)	
22123568	Rack Angle	

KNOB, BUTTON

22470259	Knob ORN	
22470260	Knob GRN	
22493176	Keytop Assy. A	PLAY, TUNE, VOICE EXPANSION, TUNE, SYSTEM, WRITE
22493160	Keytop Assy. C	FUNC, VALUE
22493161	Keytop Assy. D	1, 2, 3, 6, 7, 8
22493162	Keytop Assy. E	4, 5, 9, 0, -, ENTER
22470240	Button BLK	POWER

SWITCH

13129124	SDDG 3078A	(Push)	POWER
13159158	SSSU 11	(Slide)	MIDI/RRC
13129733	SKHHBE	(Tact)	
13119214	SRBM		ATT

JACK, SOCKET

13449147	HLJ1347-01-3000	(Dual)	PATCH SHIFT, OUTPUT
13429630	TCS4660-01-1111	(6P DIN)	RRC IN
13429629	MIDI3-NS	(Triplet)	MIDI
13449149	YKB21-5011		INPUT
13429655	HA16PRA-3S		XLR Socket

POWER TRANSFORMER

22453487N0	100V/120V	
22453486D0	220V/240V	

COIL

12449251	244-251	DC-DC Converter
12449244	SC-02-15E	Line Filter Coil

PCB ASSY

7414309000	Main Board	(pcb 22923475)
7414312000	Pitch Shift Board	(pcb 22923476)
7414316000	Switch Board w/LED Board	(pcb 22923477)
7414317000	Input Board	(pcb 22923480)
7414308000	Power Supply Board	(pcb 22923478)

POTENTIOMETER

13279830	EVU-L0AK20B14	LEVEL
13299195	EVND4AA00B14	10KB MAIN BOARD
13299193	EVND4AA00B54	50KB MAIN BOARD

IC

15179246	i8095	CPU
15229845	MSM75H016	Gate Array
15179201	μPD7537C-014	FIP Controller
15179334	TC5564PL-20	S-RAM
15179805	M5M27C128K-2	EP-ROM A
15179806	M5M27C128K-2	EP-ROM B

No substitutive brand or types for EP-ROMs A or B as a replacement.
EP-ROM A、Bは指定品です。 交換時には、必ず同一品を用いて下さい。

15179110N0	μPD8253C-2	Programmable Counter
15169340H1	HD74LS347	Octal Transparent Latch
15169319H0	HD74LS139	Dual 2 to 4 Demultiplexers
15159113H0	HD14051BP	Single 8-Channel Multiplexer/Demultiplexer
15159129H0	HD14053BP	Triple 2-Channel Multiplexer/Demultiplexer
15169515	TC74HC00P	Quad 2-Input NAND Gate
15169514	TC74HC04P	Hex Inverter
15169549T0	TC74HC32P	Quad 2-Input OR Gate
15169513	TC74HC74P	Dual D Flip-Flop with Preset and Clear
15169550T0	TC74HC138P	3-to-8 Line Decoder
15169551T0	TC74HC174P	Hex D Flip-Flop with Clear
15169552T0	TC74HC245P	Octal 3 STATE Transceiver
15169553	TC74HC373P	3 STATE Octal D-type Latch
15169554T0	TC74HC374P	3 STATE Octal D-type Flip-Flop
15219108	NE570N	COMPANDOR
15229843	M74007B0S-0001	GATE ARRAY
15179381	M5M4416P-15	D-RAM
15159111H0	HD14046BP	Phase-Locked Loop
15159115H0	HD14066BP	Quad Bilateral Switch
15219186	M5207L-05	VCA
15189171	M5218P	OP Amp
15189111J1	NJM311	Precision Voltage Comparator
15189152	NJM5534	OP Amp
15189136	M5218L	OP Amp
15229706	TLP-552	Optoisolator
1599137	AN7805F	+5 Voltage Regulator
15219139	PST518	RESET

TRANSISTOR

15119814	2SB1015	
15129827	2SD1406	
15119111	2SA970GR	
15129120	2SC2240GR	
15129107	2SC945	
15129613	2SD1207S	
15119134	2SA933	
15129152	2SC2878A	
15119141	DTA-114ES	w/built-in bias resistors
15129164	DTC-114ES	w/built-in bias resistors
15139121	2SK117GR	FET

DIODE

15019126	1SS-133	
15019143	1S-116	
15019323	04AZ9.1X	
15019324	04AZ39X	
15019324	4D4B41	Rectifier Bridge
15019243	1B4B1	Rectifier Bridge
15029185	LT9200D	LED (RED)
15029152	GL-9HD12	LED (RED)
15029149	GL-9PG12	LED (GRN)
25023443	SLS-1506A	LED Assy

FUSE

41015158	SD6 315mA	100V/120V
12559539	CEE T125mA	220V/240V

AC CORD

13439812F0	JC-704-J01	120V
13439813F0	EC-210-J06	220V
23495110	5722-660-4606	240VE
13439814F0	SC-415-J06	240VA

RESISTOR

13919308	RMLS 6-103J	10K X 6
13919310	RMLS 8-103J	10K X 8
13919172	RKM10L502F	
12559810	ERQ-16NK1R5E	Fuse Resistor

FIP, FCD COVER

15029717	16A5GR	FIP
22023780	FCD Cover	

CAPACITOR

13629155J0	SR16VB2200	2200/16V
13529104	DE7150F472MVA1	
13659205	ECEA1CSS332	3300/16V
13619706N0	CS15E1VR68K1S	0.68/35V T
13619703N0	CS15E1VR221S	0.22/35V T

CRYSTAL

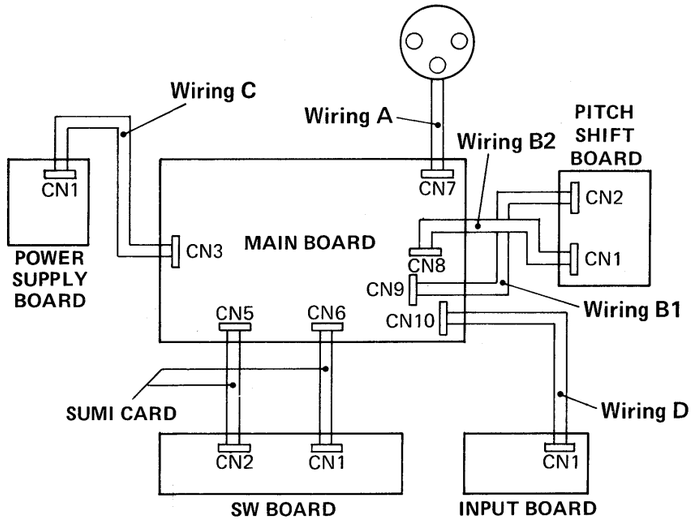
12389765	TQC-226A-6R	12MHz
12389738	CSB400P	400KHz
12389757	HC-49/U	4.286464MHz

CONNECTOR

13439390	5484-08AX	8 PIN
13439391	5484-09AX	9 PIN
13439371	5483-03AX	3 PIN
13439376	5483-08AX	8 PIN
13439368	5281-02A	2 PIN
13439315	CF-034	34 PIN
13439388	5484-06AX	6 PIN

WIRING ASSY

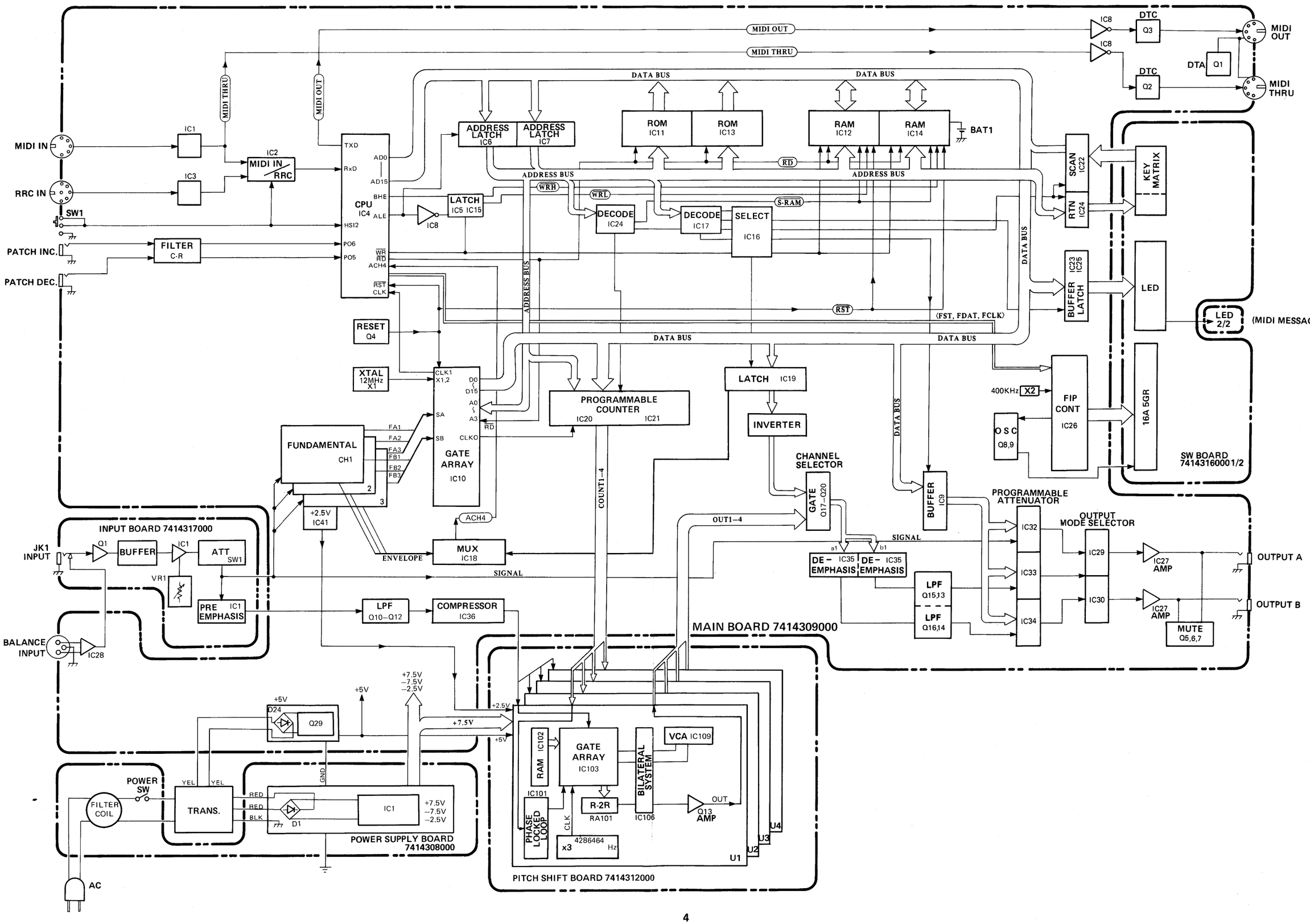
23493573	Wiring A
23493574	Wiring B (a pair of Wirings B1 and B2)
23493575	Wiring C
23493576	Wiring D



MISCELLANEOUS

22140219	Arm	
22150404	Joint	
22150404	Sleeve	
22220319	Escutcheon	
22163556	Shield Sheet A	
22163555	Shield Sheet B	
12569252	CR-2450	Lithium Battery
13479203	SUMI Card (100mm)	
22193980	FCD Holder	SW Board
22195889	MIDI Holder	Main Board
22463501	Heat Sink	
22193967	Power SW Holder	
22163555	Spacer B	
22163556	Spacer A	
22350313	Bass	

BLOCK DIAGRAM



CIRCUIT DESCRIPTIONS

GENERAL DESCRIPTION

The main features of the VP-70:

Voice to MIDI

Determines the pitch and dynamics of the incoming voice (single) and converts them into a suite of MIDI messages containing such information on Note, Volume, Bender and After Touch.

Harmonizing

Pitch shifts the input voice by a predetermined degree.

Pitch Follow

Reproduces a voice at a fixed note irrespective of input signal pitch.

CONTROL SECTION

The main CPU IC4 8095 (main board) manages the following functions and devices on the main board.

* Transferring of MIDI messages
* Reception of RRC signal
* Gate Array IC10 MSM75H016
* FIP Controller IC26 (CPU) μPD7537C-014
* Programmable Counters ICs 20 and 21 82C53

回路解説

概要

ＶＰ－７０の主な機能は、次の通りです。

- 入力された単音の音声信号からピッチ及びダイナミクスを検出し、ＭＩＤＩメッセージ（ノート情報、ボリューム情報、ベンダー情報、アフタータッチ情報）に変換する。〔VOICE→MIDI機能〕
- 入力された音声を指定されたシフト量を基にピッチシフトする。〔ハーモナイズ機能〕
- 入力された音声を指定した一定のキーの高さで発音させる。〔ピッチフォロー機能〕

制御部

メインＣＰＵには８０９５（ＩＣ４）が使用されており、以下のものを制御しています。

- ＭＩＤＩメッセージの送受信
- ＲＲＣ信号の受信
- ゲートアレイ MSM75H016（IC10）
- ＦＩＰ用CPU uPD7537C—014（IC26）
- プログラマブルカウンター82C53（IC20，21）

DETAILED DESCRIPTION
FUNDAMENTAL CIRCUIT (CH1–CH3)

詳細
音声信号(単音)⟶変換⟶MIDIメッセージ

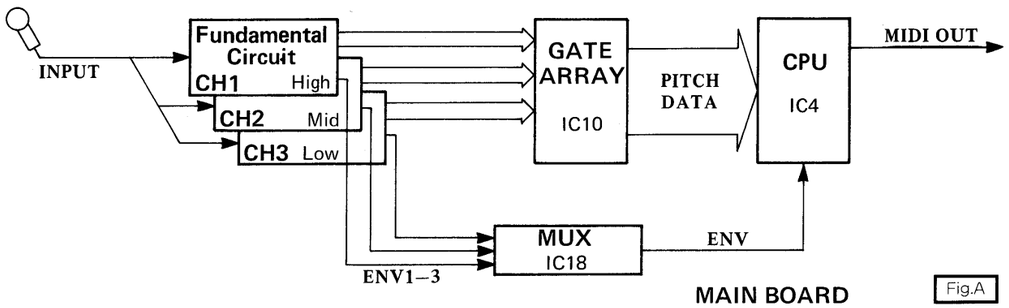


Fig.A

The fundamental circuit consists of three channels connected in parallel. The three channels share audio spectram; each being assigned with different frequency range, Low, Mid or High, respectively. When a single input sound is applied, each channel determines the fundamental of the sound. Then a channel generates two kind of pulses whose duty cycle equal the period from the first positive peak to the second positive peak and from the first negative peak to the second negative peak, respectively, of the fundamental. Each channel also determines the envelope of the input voice and feeds the contour amount to multiplexer IC18.

音声信号（単音）は並列接続された３つのFundamental回路（３系統）に入力されます。
各Fundamental回路では音声信号（単音）の基本成分を検出し、正信号のピーク間、負信号のピーク間をパルス化し、ピッチデータとしてGATE ARRAY（IC10）へ送ります。また、音声信号（単音）のエンベロープ成分も検出しており、MUX（IC18）を介してCPU（IC４）内のA／Dコンバータに読み込ませます。
Fundamental回路（CH1—3）はオーディオ帯域をLow，Mid，Highに分割したうちの１帯域を１系統ずつ受け持っており、それぞれ異なったFilter特性を有しています。

GATE ARRAY (IC10)

The gate array reads the pulses from the fundamental circuit and selects among them the most appropriate ones: since three channels (in the fundamental circuit) have different filtering characteristics, it is easier for the gate array to choose the best. IC10 converts the selected pulses into a pitch data and sends it to the CPU IC4.

CPU (IC4)

The CPU prepares and transmits MIDI messages based on the pitch data from the gate array IC10 and envelope signal from the MUX IC18 (CPU first converts analog envelope signal into digital format at internal A/D converter).

GATE ARRAY（IC10）では、入力された音声信号（単音）に応じて（CH1—3の）どのFundamental回路から最良のパルスデータを得る事ができるのかを判断し、その経路からパルスデータを読み込みます。そして読み込んだパルスデータをピッチデータに変換しCPU（IC４）に送ります。
CPU（IC４）はGATE ARRAY（IC10）から送られてくるピッチデータ及びMUX（IC18）から送られてくるエンベロープ信号を基にＭＩＤＩメッセージを作り、送信します。

PITCH SHIFT (U1–U4)

ピッチシフト

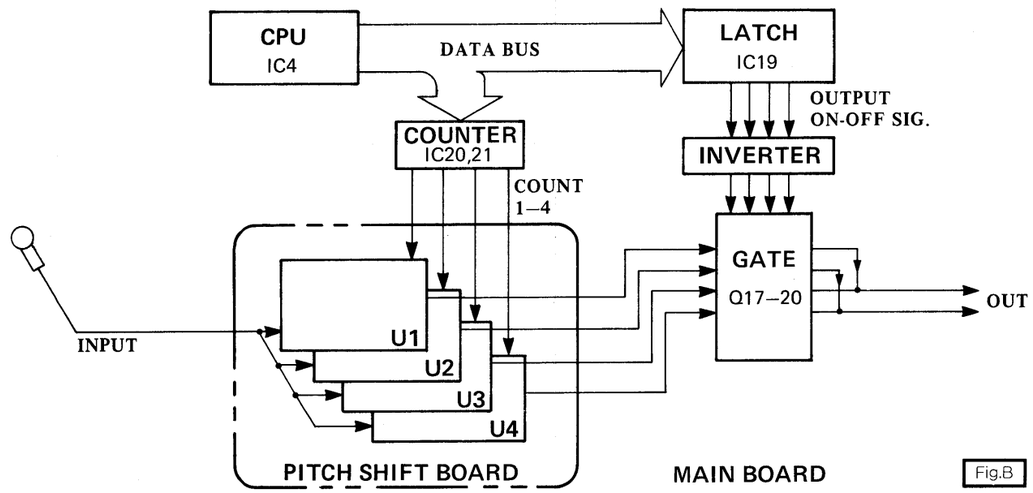


Fig.B

Input audio is also routed to Pitch Shift board where the signal is applied to four pitch shift units of the same configuration. The data determining the amount of pitch shift are fed to programmable counters ICs 20 and 21 via the CPU data bus. The CPU has derived the date from patch data or external MIDI Note On message.
The counters generate four clocks at different frequencies or at the same frequency, depending on the mode selected; then pass them onto pitch shift units U1–U4.

入力された音声信号はピッチシフトユニット（Ｕ１～Ｕ４）へ入力されます。
（Ｕ１～Ｕ４は全て同一回路構成）
CPU（IC４）はパッチデータまたは外部からのＭＩＤＩノート情報に応じたピッチシフト量のデータを、データバスを通じてプログラマブルカウンター（ＩＣ２０，２１）へ送ります。カウンターはこのデータ（ピッチシフト量）をクロックの形態に変換し、各ユニット（Ｕ１～Ｕ４）へ送ります。
各ピッチシフトユニット（Ｕ１～Ｕ４）は、カウンター（ＩＣ２０，２１）からのクロックの周波数に基づき入力された音声信号を目的の音程に変化させ、ゲート回路（Q17—２０）へ送ります。

PITCH SHIFT UNITS (U1–U4)

The following description takes U1 as a representative since four units work with the same circuit configuration.

An input signal passing through S/H circuit (IC107) is converted to the digital equivalent by the comparator (IC105) and the gate array (IC102) which writes the converted data into the RAM. (Fig. 1.) The gate array reads RAM stored data twice from different memory locations by the time next writing cycle starts. Two data are converted into analog voltage at RA101 (B and C) and then routed to the dedicated VCA, IC109, before being mixed. (Fig. 3.)

This process can well be analogized with a tape recorder having an additional playback head. (Fig. 2.) In Fig. 2 the tape loop stands for a RAM, the recording head (RH) for writing and the playback heads (PH) for reading.

The RH and RHs travel in the same direction along the tape loop which does not run.

Suppose that the two PHs (A and B) run at a rate twice that of the RH, the tone of the played back sounds is one octave higher than the recorded one. The pitch is lowered by one octave than the original when played back at half the recording speed.

NOISE ELIMINATION

The recorded signals on both sides of the RH gap are out of phase to each other —— the degree of phase difference depends on the tape length, signal frequency and the time it takes for the RH to revolve the entire tape loop. Therefore, a phase transient occurs at a PH output at every overlap of RH and PH when PHs and RH travel at different speeds, resulting in noise components to be heard.

The two PH configuration overcomes this problem. The two heads are switched to pick up only the signal from a tape location far away off the RH.

In the actual application the control signals D and E (Fig. 3) cut off respective VCA, IC109, as the writing address and the reading address become close. Note that the address span between the first and the second reading remains constant regardless of reading cycle speed. The outputs from the two VCAs are combined to form F. If the phase difference between the two signals (B and C) becomes more than 90 degrees (Fig. 3 F')

ピッチシフトユニットについて

各ピッチシフトユニット(U1～U4)の回路構成は全く同一ですのでU1を例にとり説明します。

Fig. 1のように入力波形AはS/H回路(IC107)を経て、コンパレータ(IC105),ゲートアレイ(IC102)でA/D交換されます。ゲートアレイはA/D交換されたデータをRAMに書込んでゆくと同時に既にRAMに書込まれているデータを一定の間隔で2回読み出してゆき、D/Aコンバータ(RA101)を経て、波形B,Cを発生します(Fig. 3参照)。この原理をテープレコーダーに置き換えて説明します(Fig. 2参照)。テープをRAM,RAMへの書込みを録音ヘッド(RH)、読み出しを再生ヘッド(PH)に対応させます。静止したエンドレステープ上で、対称位置にある2つのPHヘッドA,BならびにRHヘッドが同一方向に回転しているとします。

今、PHのスピードをRHの2倍にすると、再生音のピッチは原音の2倍に、スピードを1/2にするとピッチも1/2となります。

ノイズ消去

RHの直前直後のテープ上の録音信号は、RHがテープを一周する時間に応じた位相差を生じるので、RHとPHが重なり合う瞬間の再生波形は不連続となり、雑音成分となります。本方式で2個のPHを用いているのは、この点を解決するためのものです。つまり、2つのPH出力を交互に切替えて、RHと反対位置のPHの出力のみを取り出します。

実際の回路では、この不連続部分で出力がゼロになる様なコントロール信号D,E(Fig. 3)をそれぞれのVCA IC109へ加えます。2つのVCA出力は合成されてFとなります。

PLAYED BACK SOUND DURATION

The duration of a played back sound will vary as its pitch shifts from the original sound. With this two head configuration the same portion of a recorded sound* is reproduces twice when PHs run at double the RH speed (Fig. 4). Inversely, when PHs are slowered to half the RH speed, they skip half of the recorded portion per recording loop (Fig. 5). Similar compromise should take place at various playback speeds to maintain the both pitch equal.

* Can safely be said so because the time elapse from the first reading is negligible when compared with period of the sounds.

再生音の長さ

通常のテープ式エコー等では、再生音のピッチが原音からずれるに応じて、音の長さが変化します。本方式では、ピッチが2倍になった時にはPHがRHの2倍のスピードでまわり同一音(とみなして差支えない)を2度再生しますし(Fig. 4)、逆に1/2になった時にはRHがテープを2周する間に各周の録音RH信号の半分づつのみを再生するので(Fig. 5)、音の再生時間長は抱わらず常に一定となります。

Fig.1

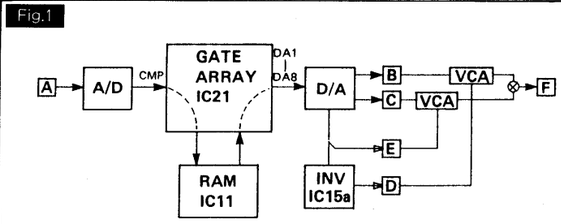


Fig.2

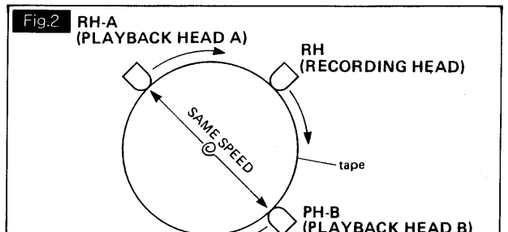


Fig.3

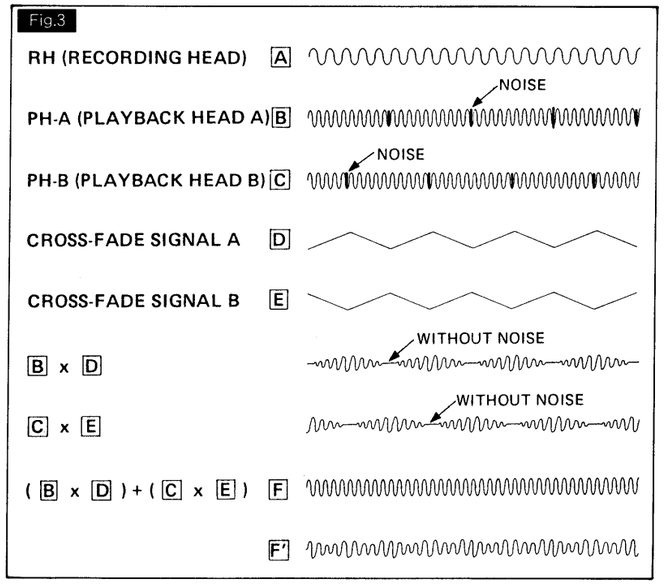


Fig.4

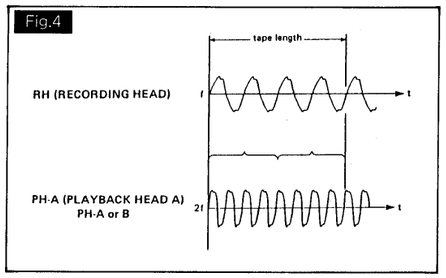
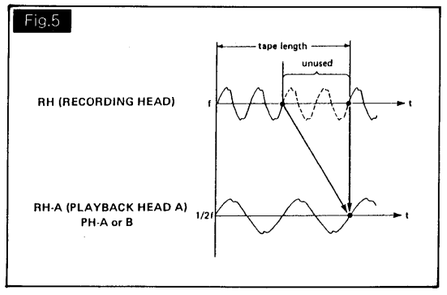


Fig.5



DETERMINING ROM VERSION NUMBER

. The display reads current ROM version number when power is applied while holding [PLAY] , [VOICE 〉〉 MIDI] and [SYSTEM] buttons; and keeps the reading as long as these buttons are held down.

CAUTION

Releasing the three buttons changes the reading to sign-on message in the normal play mode. This is false reading and the unit does not change mode: Twiddling the unit without first turning off and repowering may cause malfunctioning.

ROMバージョンの確認方法

• [PLAY] , [VOICE〉MIDI] , [SYSTEM] のボタンを同時に押しながら電源を入れる。

• バージョン確認モードに入り、上記ボタンを押している間、ディスプレイに' VERX.XX'と表示します。

注 意

ボタンを離すとディスプレイ表示は通常モードと同じ状態になりますが、モードそのものは切り換わっていません。
そのまま使用していると正常に動作しないことがあります。従って通常に使用する場合は一旦電源を切って下さい。

ADJUSTMENT

Set ATT to −10dB and LEVEL to the center. Connect scope to TP1 (of Main Board).

1. BIAS SET

1-1. Keep INPUTs (balanced and unbalanced) disengaged.

1-2. Adjust VR2 for a 2.5V reading on the screen. Fig. A

2. OFFSET

2-1. Feed a 1KHz sinewave from audio generator (AG) to INPUT (unbalanced).

2-2. Adjust AG output level so that all yellow LEDs on the VP-70 level meter are lit and red one is on the onset of lighting.

2-3. Adjust VR1 for a 3Vp-p reading on the scope. Fig. B

調整仕様

TP−1にオシロスコープを接続し、ATTツマミを−10dB，LEVELツマミを中央にセットする。

1.バイアス セット

1−1. INPUT端子（アンバランス、バランス共）を開放にする。

1−2. オシロスコープの波形が＋2.5VになるようにVR2を調整する。（Fig. A参照）

2.オフ セット

2−1. INPUTジャック（アンバランス）に発振器を接続する。

2−2. 1KHzの正弦波を入力し、VP−70本体のレベルメータが黄色の範囲から赤に移り変わる直前に発振器の出力を調整する。

2−3. オシロスコープの波形が3Vp-pになるようにVR1を調整する。（Fig. B参照）

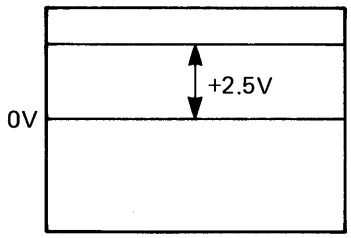


Fig.A

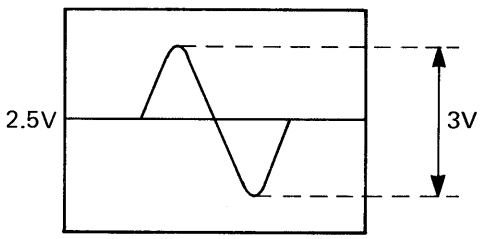


Fig.B

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

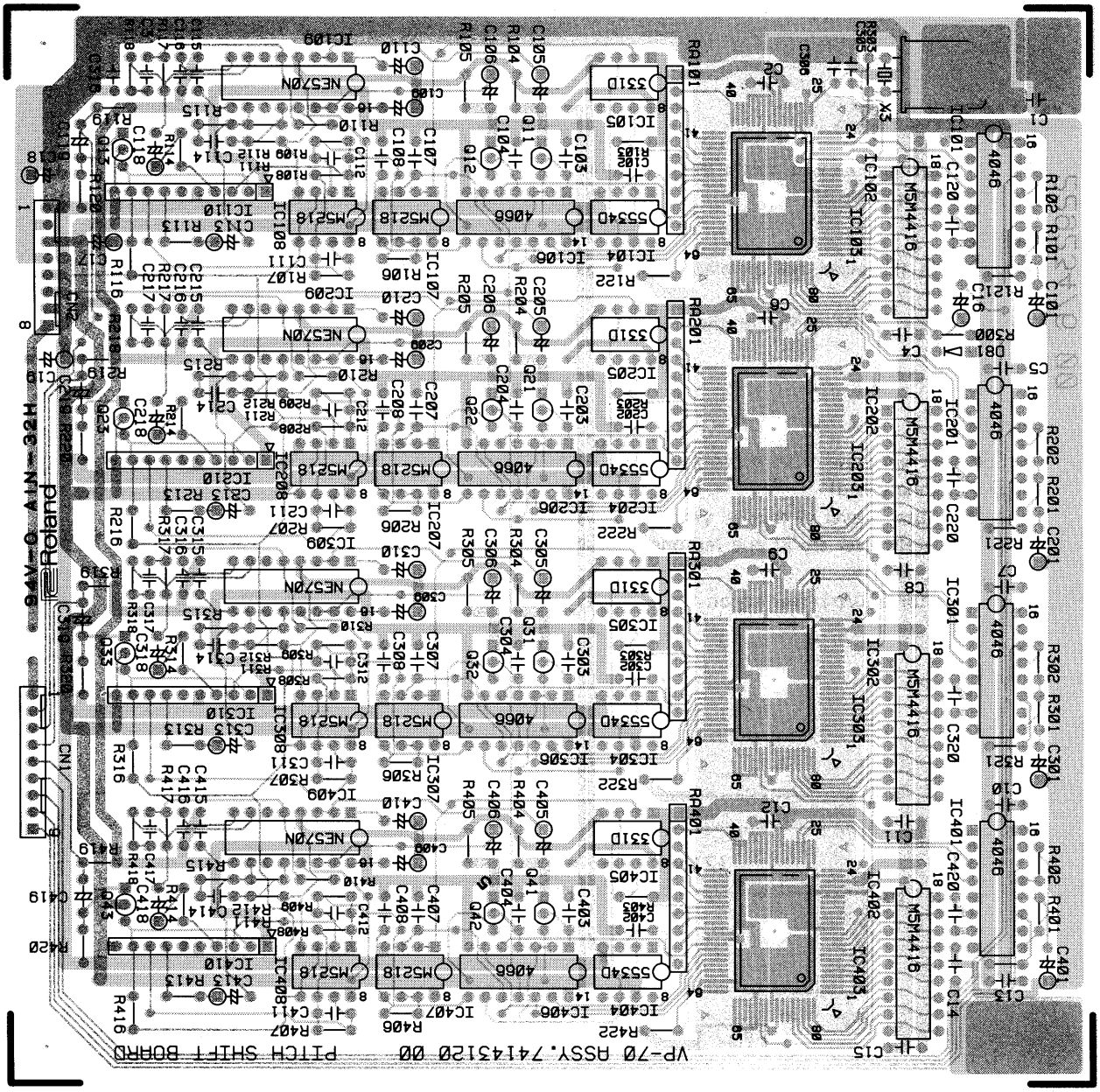
A B C D E F G H I J K L M N O P Q R S T U V

PITCH SHIFT BOARD

ASSY 7414312000

(pcb 2292347600)

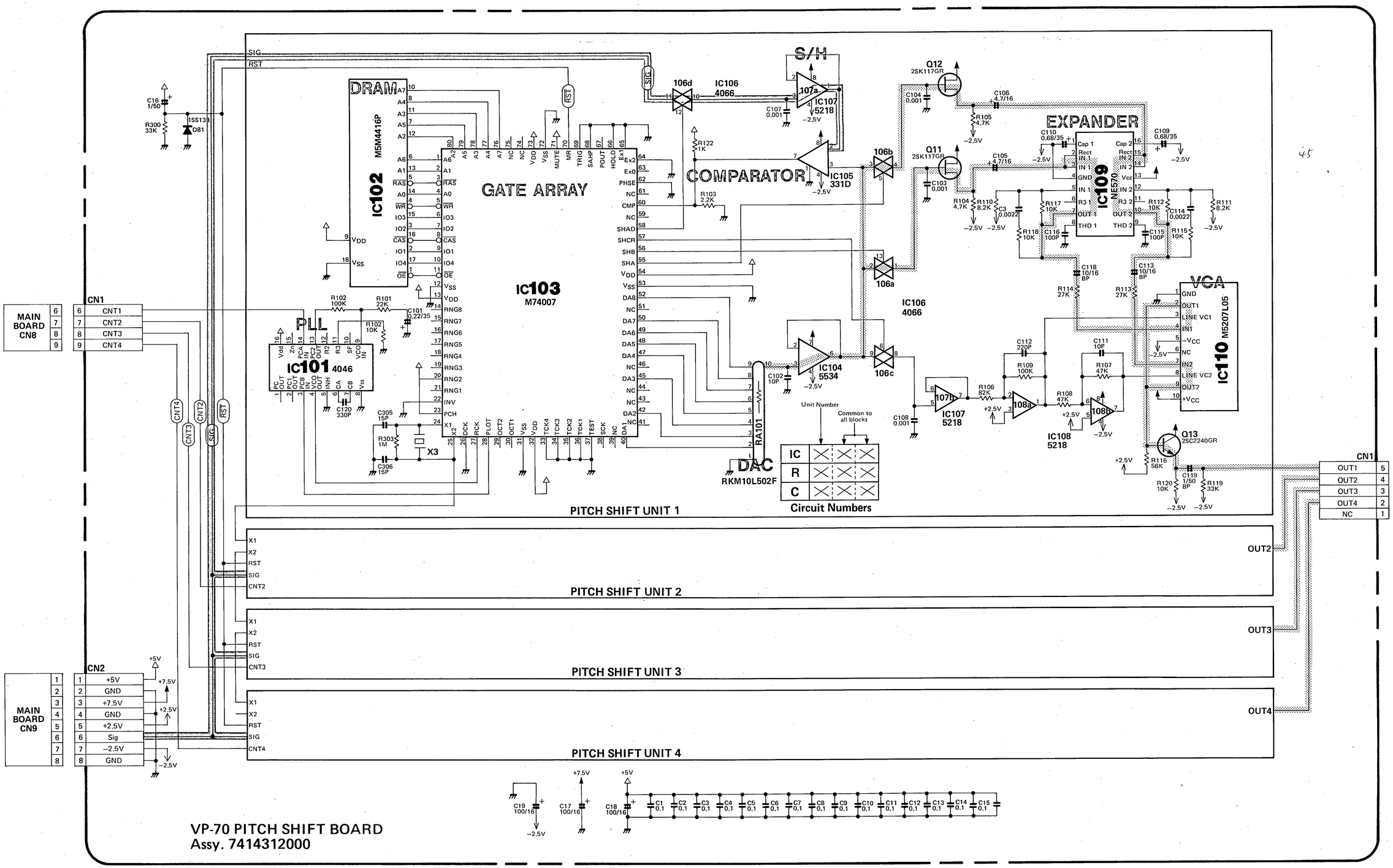
View from component side



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

CIRCUIT DIAGRAM



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

A B C D E F G H I J K L M N O P Q R S T U V W X Y

MAIN BOARD
ASSY 7414309000
(pcb 2292347500)

ADVARSEL!
Lithiumbatteri. Eksplosionsfare.
Udskiftning må kun foretages af en sagkyndig, og som beskrevet i servicemanual.

Lithium batteri må kun udskiftes med samme type og fabrikat.

ADVARSEL!
Lithiumbatteri. Fare for eksplotion.
Ma bare skiftes av kvalifisert tekniker som beskrevet i servicemanualen.

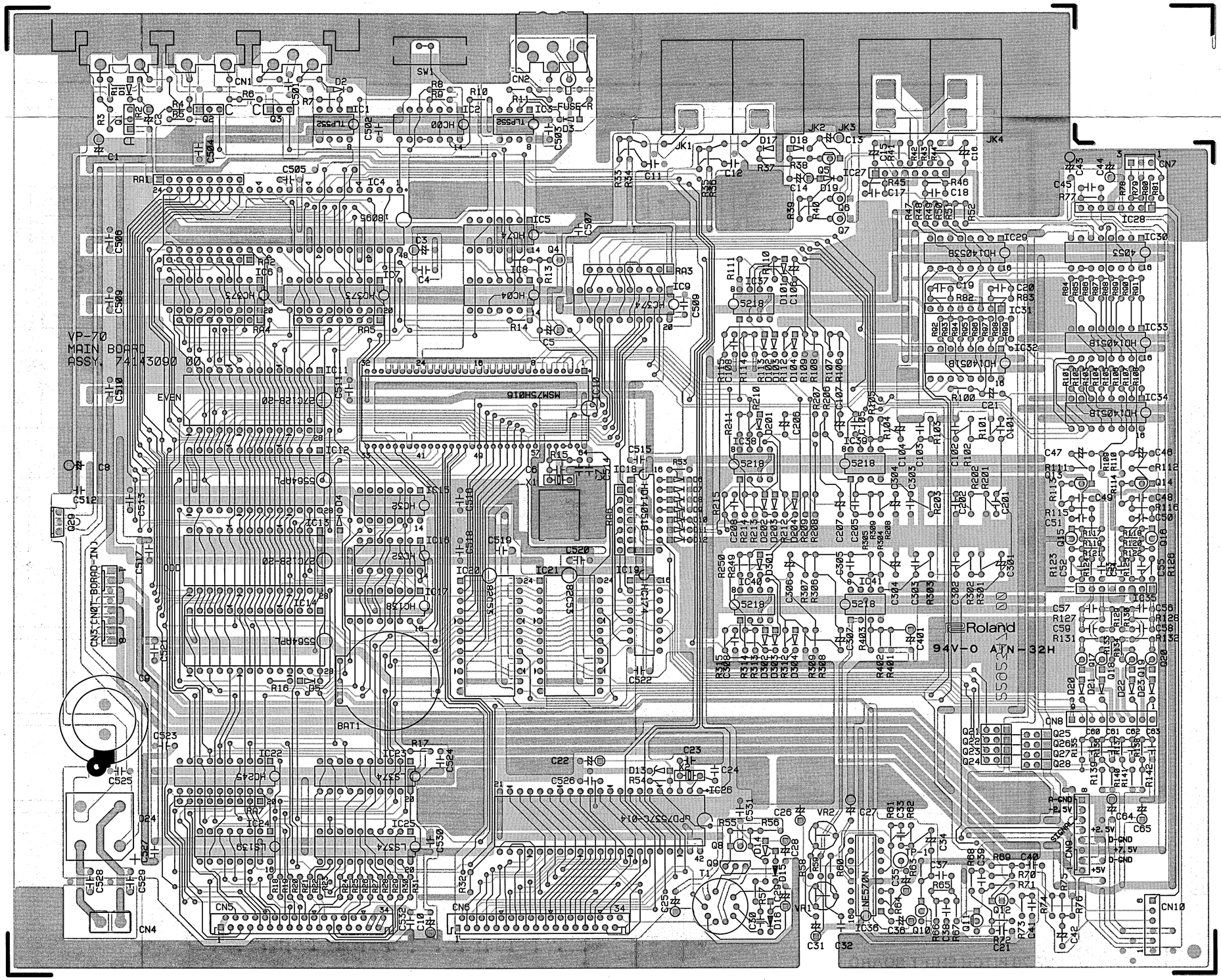
Lithium batteri må kun utskiftes med samme type og fabrikat.

VARNING!
Lithiumbatteri. Explosionsrisk.
Far endast bytas av behörig servicetekniker.
Se instruktioner i servicemanualen.

Lithium batteri för endast ersättes med samme typ och fabrikat.

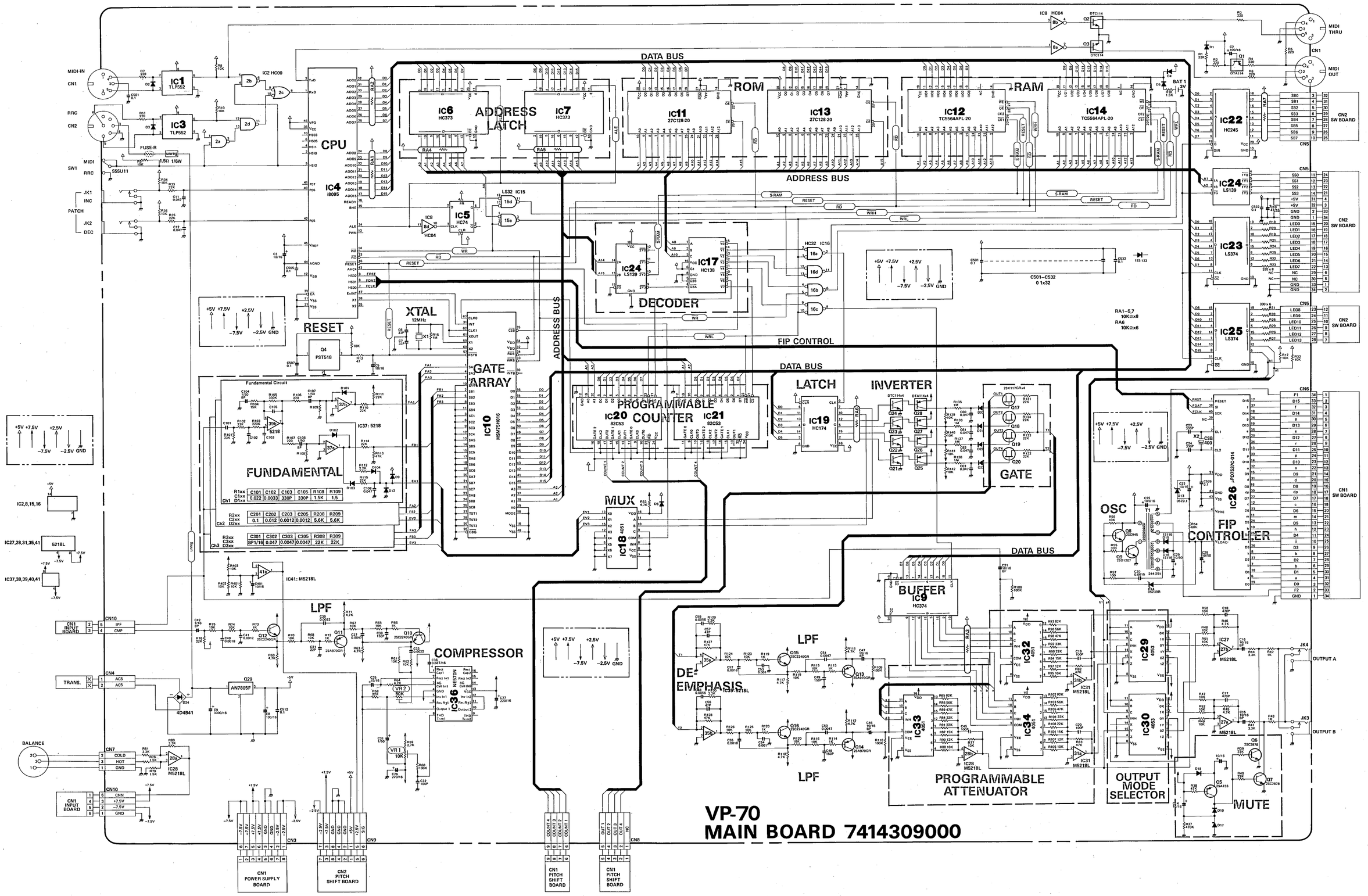
VAROITUS!
Lithiumparisto. Räjähdysvaara.
Pariston saa vaihtaa ainoastaan alan ammottimies.

Kun vaihat lithium pariston KÄYTÄ saman valmistajan samaa tyyppiä.

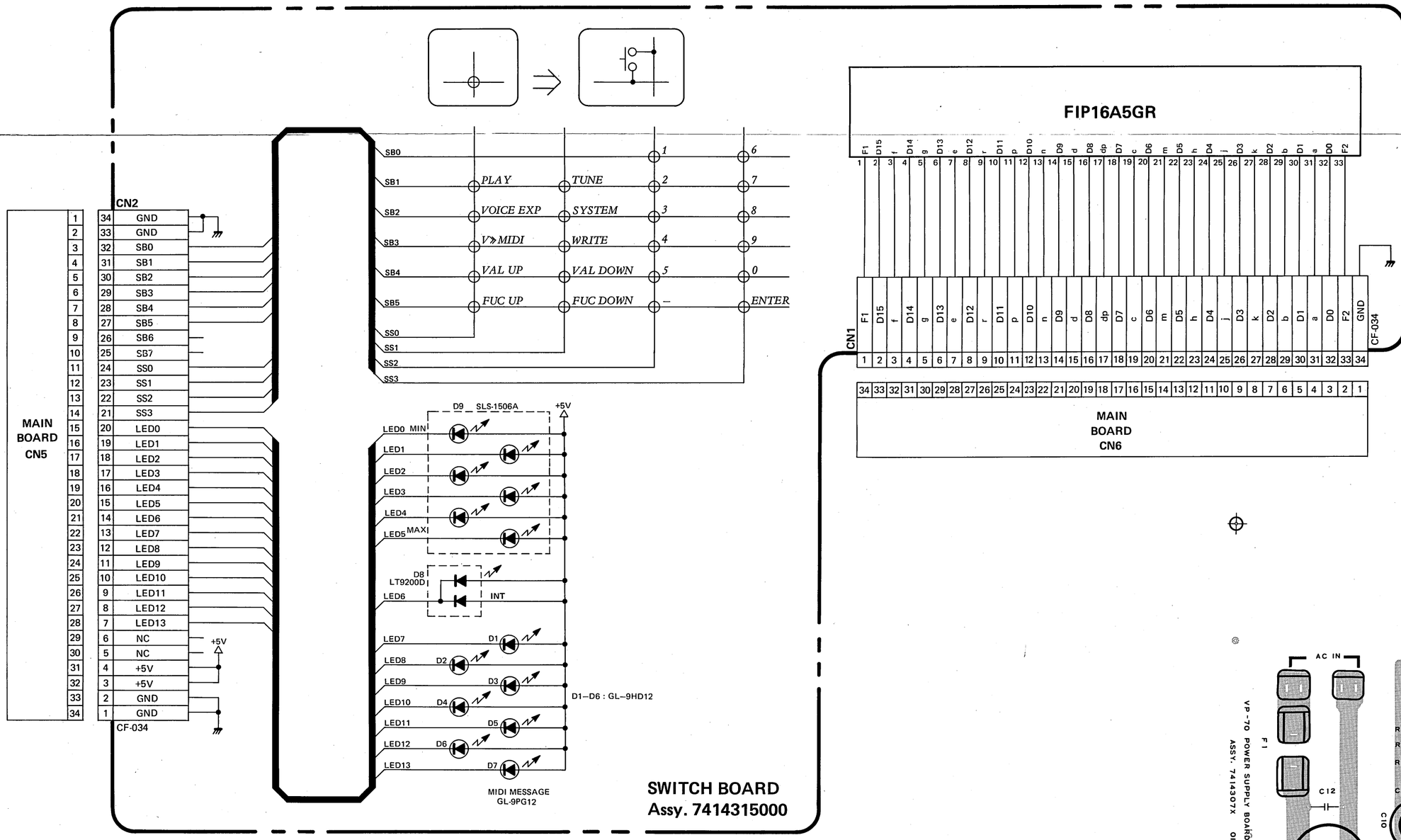


View from component side

CIRCUIT DIAGRAM

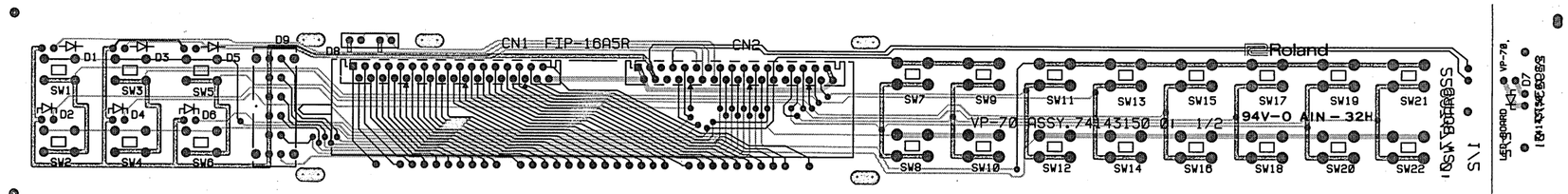


CIRCUIT DIAGRAM



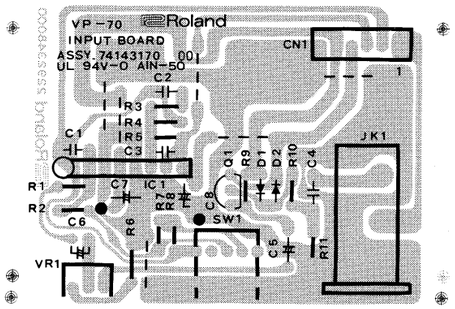
View from component side

SW BOARD w/LED BOARD ASSY 7414315001 (pcb 2292347701)



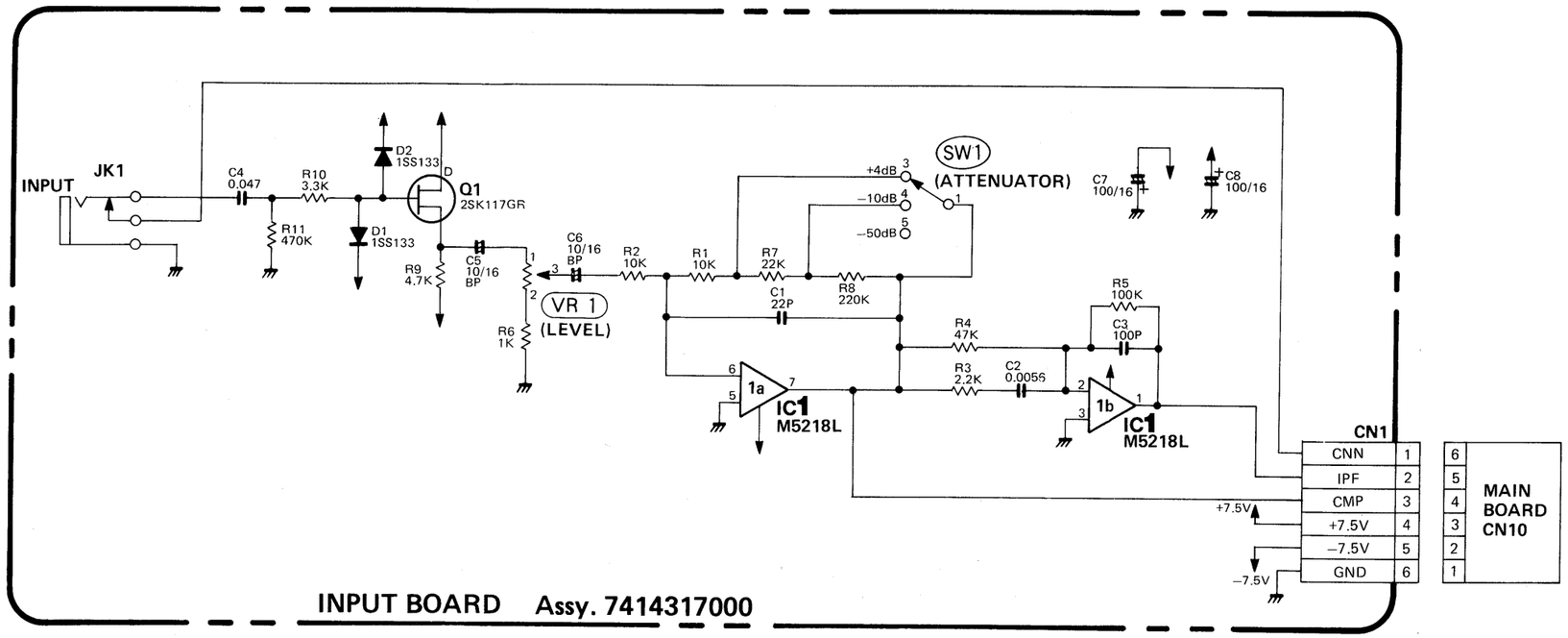
View from component side

INPUT BOARD
ASSY 741431700
(pcb 2292348000)



View from component side

CIRCUIT DIAGRAM



CIRCUIT DIAGRAM