Operational Description

1 Video

1.1 Outline

This video circuit uses a LA71201M Super A/V 1 chip IC made by Sanyo which includes luminance and color processor, CCD and pre Amp.

This IC has 80 pins, but only 74 pins (12-74 pin) are related to Video circuit among them.

1.2 Video circuit

A. EE mode

1.0Vp-p video signal out of jack or TMI(Tuner, Modulator and IF) module is input to pin 38,40,42, of IC301. One of them is selected, and input to AGC AMP(sync and peak AGC).

Output from AGC AMP is input to QV/QH Insert circuit.

After it is amplified 6dB through Video Amp ,2.0Vp-p signal is output to pin 26.

Finally it is output through pin 5 of TMI and line jack through OSD circuit in Micom.

EE mode process

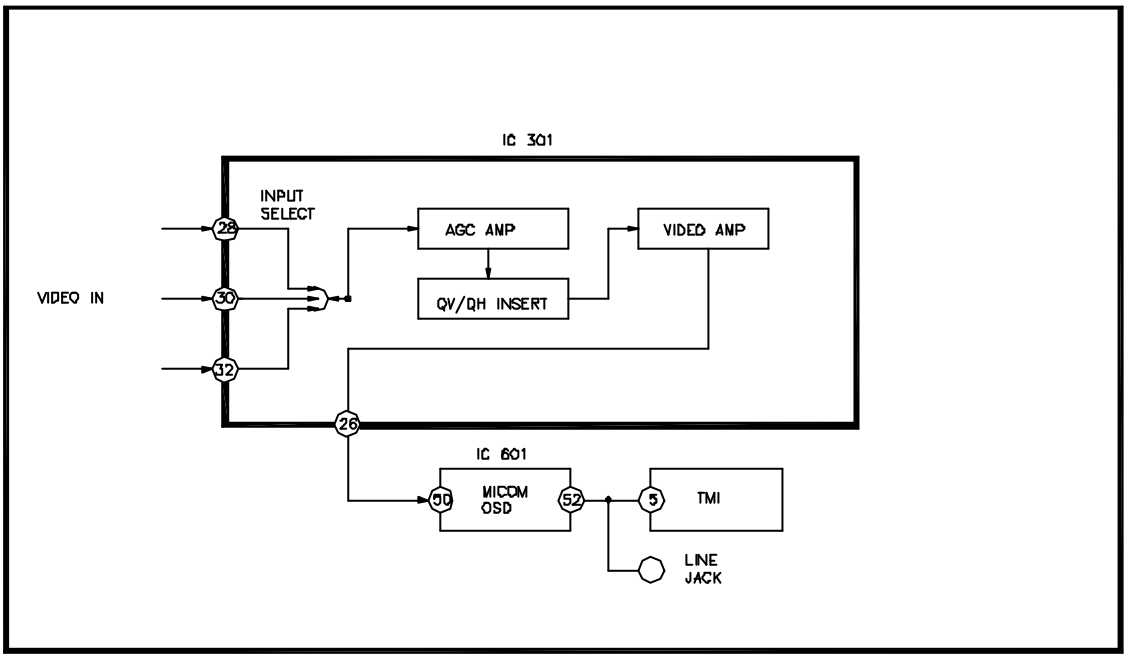

Fig. 3-1 EE mode process

B. REC mode

a) Luminance Signal Processing.

The signal is input to pin 28,30,32 of IC301, and one is selected to input to AGC AMP.

This input signal performs sync AGC and peak AGC.

And then, it is input to the –6dB divider where its level is reduced to 0.5V.

LPF and 1H-Delay separates luminance signal from output signal of the divider.

The separated luminance signal is passed through pin 21, and it is input to pin22.

The level is clamped in clamp circuit which fixes sync tip to a specific DC level in order to prevent frequency drift while video signal is converted to FM signal.

The edge of the signal is emphasized by Detail Enhancer.

The emphasized signal is supplied to Non-Linear Emphasis circuit to improve S/N ratio.

Non-Linear Emphasis circuit adjusts amount of emphasis in high frequency in SLP mode,

which means that amount of emphasis is dependent on the input level;

for instance, the lower input level, the larger amount of emphasis.

Main emphasis emphasizes the high frequency of the adjusted signal again.

White/Dark clip is conducted in order to prevent the luminance signal from undershooting

and overshooting which are occurred during the above emphasize process.

The luminance signal modulated by FM modulator is passed through REC-EQ, modulated Y Signal is mixed with the down converted color signal.

It is supplied to AGC Amp of Pre-Amp section and then supplied to video head through Pin 73 or 66 each in SP mode or SLP mode.

REC luminance process

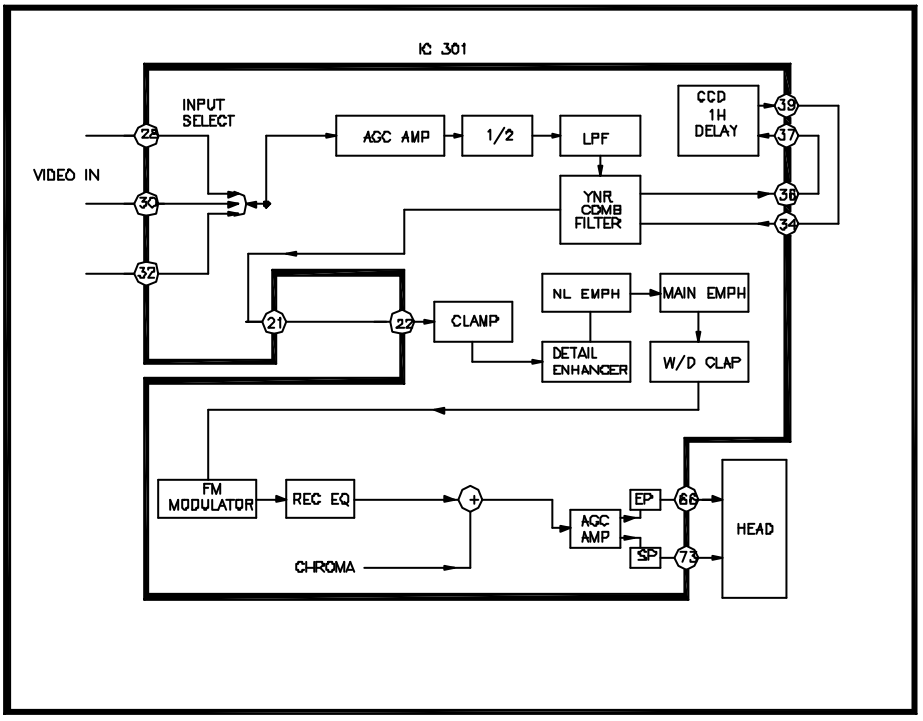

Fig. 3-2 REC luminance process

b) Color Signal Processing

The video signal input from pin 28,30,32 of IC301 is passed through AGC AMP and BPF.

A color signal separated by 3.58MHz BPF.

This signal is supplied to Comb Filter, and separated color signal.

Then the signal goes to ACC section which automatically controls color burst level.

After Burst Emphasis boosts burst signal 6dB, 3.58MHz carrier frequency is input to Main Converter and mixed with 4.21MHz carrier frequency from sub-converter.

In the long run, the output is 4.21MHz ± 3.58MHz.

The down-converted 629KHz color signal, the difference between two frequencies, is passed through 1.3MHz LPF. The output signal is mixed with modulated Y-FM signal and supplied to AGC part.

It is supplied to the head through pin 73 or 66 each in SP mode or SLP mode.

REC color process

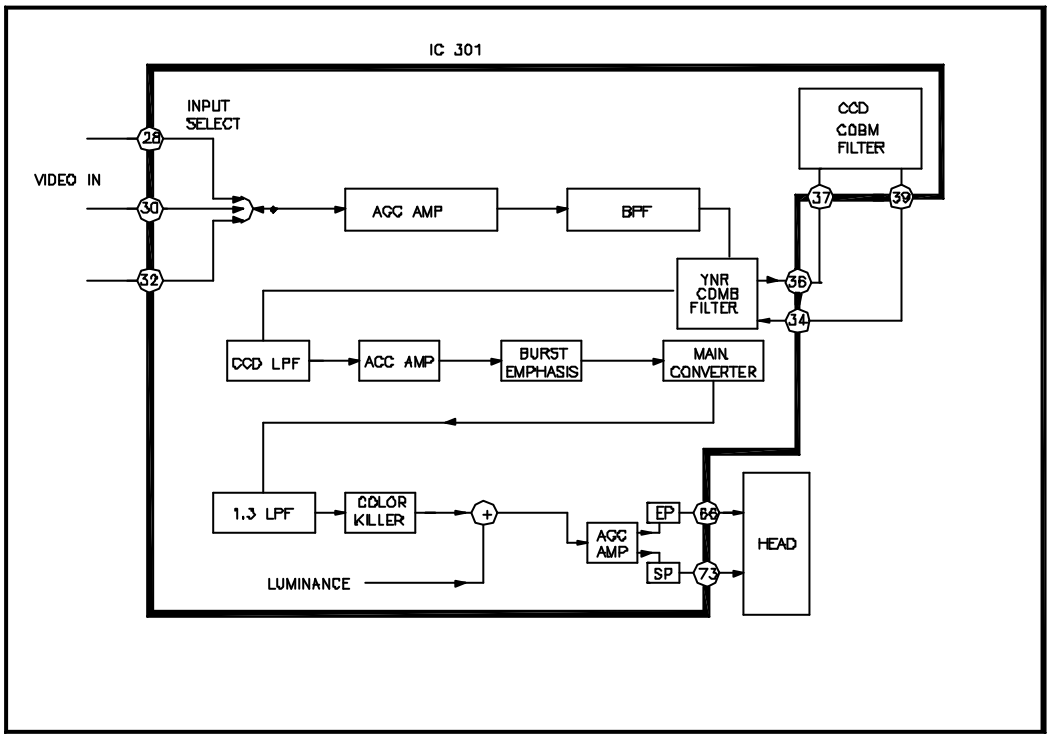

Fig. 3-3 REC color process

C. PB mode

a) Luminance Signal Processing

The recorded signal is picked up by the head, and is amplified 60dB by PRE AMP part.

The amplified FM signal is supplied to FM AGC.

It is automatically controlled by FM AGC to adjust output tolerance of CH1 and CH2.

This signal is fed to FM EQ and phase compensation.

It is sent to Double Limiter circuit which removes AM noise, prevents over-modulation and lets the signal input to FM DEMOD.

The signal from FM DEMOD is fed to main de-emphasis through SUB LPF, and the boosted high frequency in REC mode is de-emphasized there, and input to pin 21 through pin 22.

After eliminating demodulation noise caused during the above processes by 3M LPF, it is input to YNR circuit.

The signal passing through YNR is supplied to non-linear de-emphasis circuit.

Non-linear de-emphasis plays a role quite opposed to Non-linear emphasis in record mode, that is, it de-emphasizes the high frequency level emphasized by Non-linear emphasis.

Double noise canceller reduces minute noise of video signal.

After being passed it is mixed with color signal.

The mixed signal is obtained through pin 26, supplied to pin 50 of IC601, output through pin 52, and finally, supplied to both line output jack and pin 5 of TMI.

PB luminance process

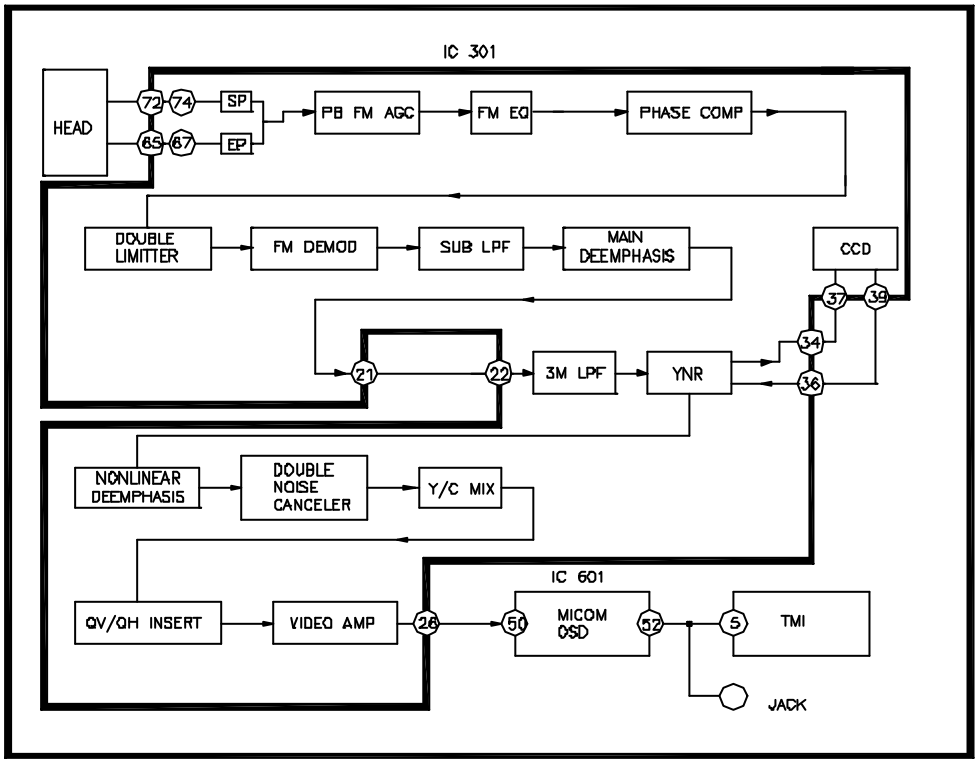

Fig. 3-4 PB luminance process

b) Color Signal Processing.

The 60 dB amplified signal in PRE AMP goes to 1.3 MHz LPF, which separates down converted color signal. And then it is supplied to ACC part. ACC(Automatic Color Control) AMP stabilizes the color signal. The stabilized signal is supplied to main converter and mixed with the 4.21MHz signal come from sub-converter.

Its output is 4.21MHz ± 629KHz. The mixed signal is fed to 3.58MHz BPF in order to pass 3.58MHz color signal only. And it is supplied to Comb Filter.

During this process, cross-talk between adjacent tracks is eliminated.

The output signal from Comb Filter is supplied to Burst De-emphasis which reduces the 6dB boosted burst level (in REC mode, but not in LP mode).

This color signal is mixed with luminance signal, and the mixed signal is output to pin 26 Of IC301 through Video AMP.

PB color process

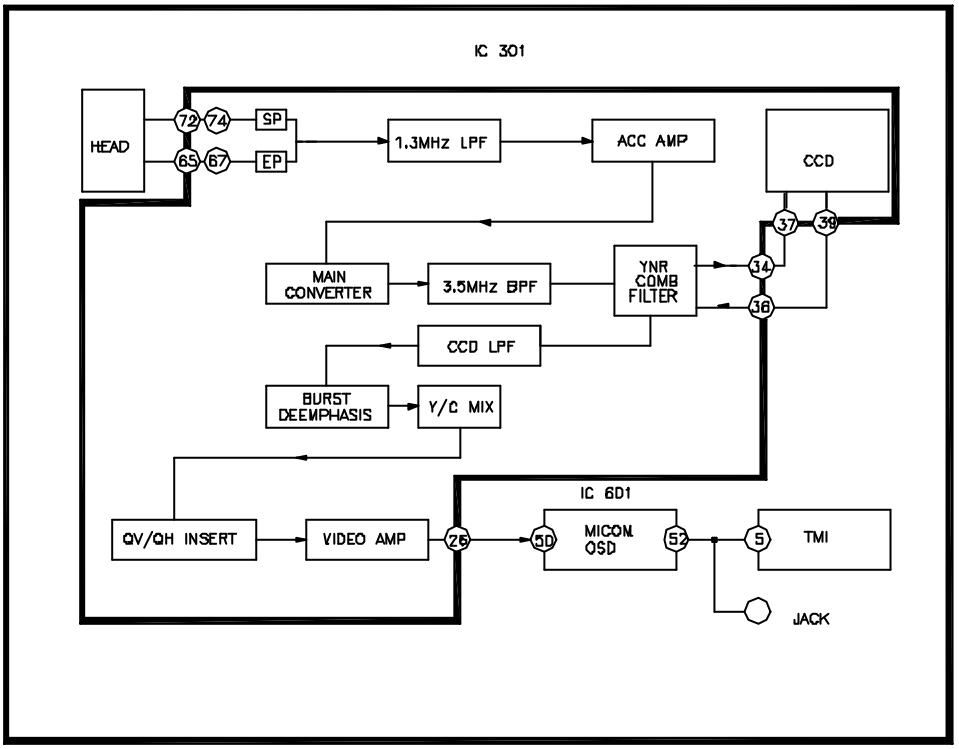

Fig. 3-5 PB color process

2 Linear Audio

2.1 Outline

This audio circuit uses a LA71201M Super A/V 1 chip IC made by Sanyo.

The major features of this IC is that REC/EE mode, PB/EE mode, SP/LP/SLP mode and audio input selection are controlled by serial.

17pins (1-11pin and 75-80pin) are related to Audio circuit.

2.2 Audio IC: name and operation of pins

A. Features

Including PB Amp, Line Amp, REC Amp, ALC circuit, EQ switch and Auto REC bias circuit.

It is equipped with EQ switch which operates in SP/LP/SLP modes respectively.

ALC level is fixed on -4dBm by internal values in the IC.

B. Function

Pin No.	Name	Function
1	Vref	Vref filter
2	Audio-PB-IN	Line Amp input of PB Amp out
3	EQ-OUT	Playback Amp output
4	EQ-SW2	Capacitor switch for head resonance: in SP or LP, SW ON
5	EQ-NFB	Negative feedback of PB Amp
6	EQ-IN	Input impedance : 120Kohm
7	EQ-SW1	Playback equalizer switch : in SLP mode, SW ON
8	Auto-Bias-IN	70KHz signal input for auto-bias
9	Audio-Rec-OUT	Recording Amp out
10	Audio Line OUT	Line-Amp output
11	Auto-Bias-OUT	DC control voltage for auto-bias
75	A-GND	GND
76	Audio-IN1	Audio in
77	A-Vcc	Vcc
78	Audio-IN2	Audio in
79	ALC DET	Port for ALC Filter
80	Audio-IN3	Audio in

2.3 Explanation by Mode

A. Mute Control (pin 58)

Control Port	Mode	Function
Mute		Line SW
H	Mute	Open
L	Except for Mute	Close

('L' : 0 – 0.5V 'H' : 4.0V – 5.0V)

B. Explanation by mode

a) EE mode(Rear line IN)

The line input signal divided by R212 and R213 is input to pin 76 of IC, and output to pin 10 through ALC circuit and Line Amp. This signal output to line out.

At the same time and the signal is passed to REC Amp in the IC.

ALC point is fixed on -4dBm by internal values in the IC.

b) PB mode

The signal from audio head is input to pin 6 through frequency equalizer circuit composed of R205 and C204. This input signal is output to pin 3 through EQ Amp.

It is input to pin 2 through R221 and finally output to pin 10 through Line Amp.

This signal which passed to pin 10 through Line Amp is also divided to ICC01 (CA/MA IC). (Only C/A models)

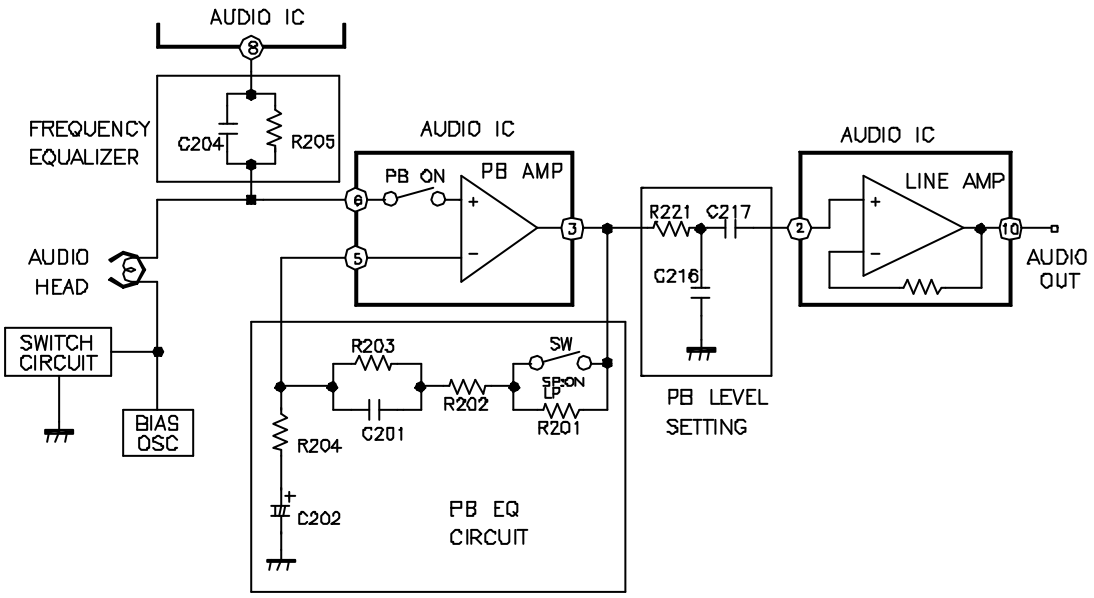

Fig. 4-1 PB mode

c) REC mode

The Audio input signal is passed Line Amp and this signal is passed to REC Amp in the IC.

The audio signal from pin 9 of REC Amp is mixed with Bias signal,70KHz and recorded in A/C Head.

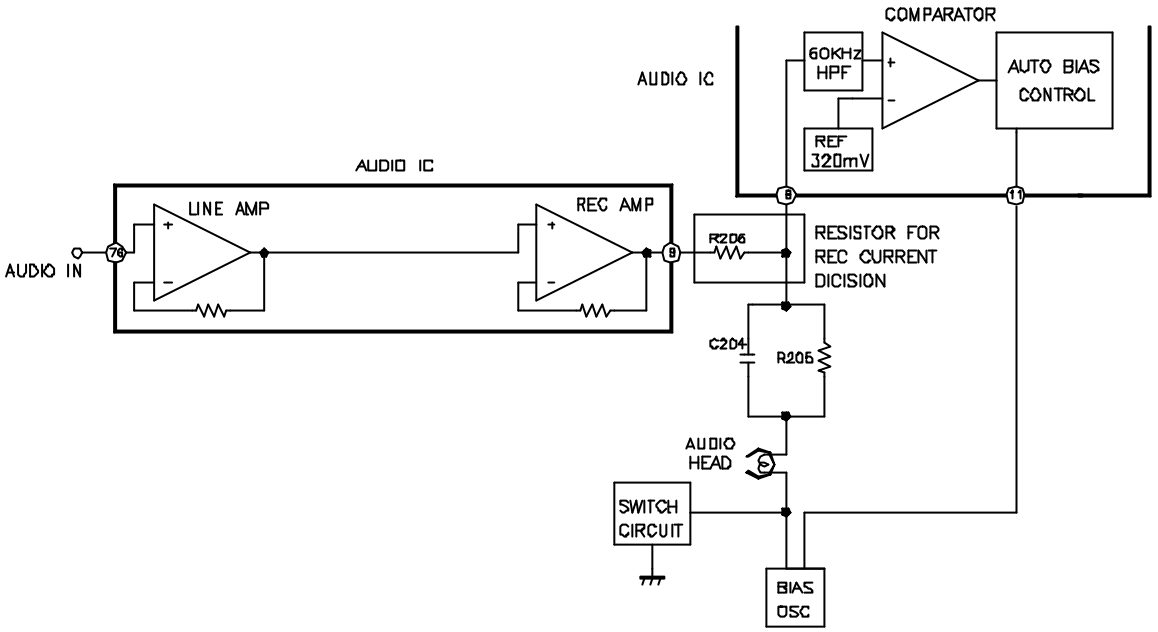

Fig. 4-2 REC mode

3 Hi-Fi

3.1 Description of each pin

No.	Description	No.	Description
1	BS IN (R)	33	NR REF (R CH)
2	EXT3 IN (R)	34	NR DET 2 (R CH)
3	BS IN (L)	35	NR DET1 (R CH WEIGHTING)
4	EXT3 IN (L)	36	MUTE CONTROL
5	SPECTRAL DET2	37	REC AGC ADJUSTMENT
6	1/2 Vcc1 Vref	38	GND 1 R
7	IN REF (R)	39	PE
8	WIDE BAND TIMING	40	Vcc (Vcc 1 = 5V)
9	EXT1 IN (R)	41	LOGIC GND
10	EXT2 IN (R)	42	SERIAL CLOCK INPUT
11	GND 1 L	43	SERIAL DATA INPUT
12	IN REF (L)	44	dBx REF
13	WIDE BAND DET	45	3.58Mhz INPUT
14	EXT1 IN (L)	46	STEREO PLL
15	EXT2 IN (L)	47	DEM REF
16	NR DET 1 (LCH WEIGHTING)	48	SIF IN
17	NR DET 2(LCH)	49	PILOT DET
18	NR REF (LCH)	50	SAP NOISE DET
19	CCA OUT (L)	51	MTS Vcc (Vcc = 5V)
20	(+)REC AMP DC FB	52	SAP DET
21	(+)REC AMP OUTPUT	53	LINE OUT (R)
22	PB CH2 INPUT	54	L + R REF
23	PRE/REC GND	55	GND 2
24	PB CH1 INPUT	56	LED PORT
25	PRE/REC Vcc	57	LINE OUT (L)
26	(-)REC AMP DC FB	58	Vcc2 (Vcc2 = 12V)
27	HEAD SWITCHING PULSE INPUT	59	RFC OUT
28	ENVELOP DET AND FORCED NORMAL OUT	60	RFC AGC DET
29	PB FM OUT	61	NORMAL OUT
30	PB FM IN	62	NORMAL IN
31	NORMAL DECISION NOISE DETECTION	63	SPECTRAL DET 1
32	CCA OUT(R)	64	SPECTRAL TIMING

3.2 Flow and Operation of signal in REC/EE/PB mode

A. Record mode

- The input of Tuner IN, Line L/R 1 or 2 IN is selected by BUS data.
- The selected input signal passes PNR circuit to reduce noise.

Then, FM modulation is done by MOD and it is output to Pre Amp circuit.

- The internal modulator type is Voltage Controlled Oscillator (VOC) which has good linear characteristics.
- FM Record signal is input to Pre-Amp circuit after L CH and R CH is mixed.
- Mix ratio of L CH and R CH can be adjusted by step by BUS data.

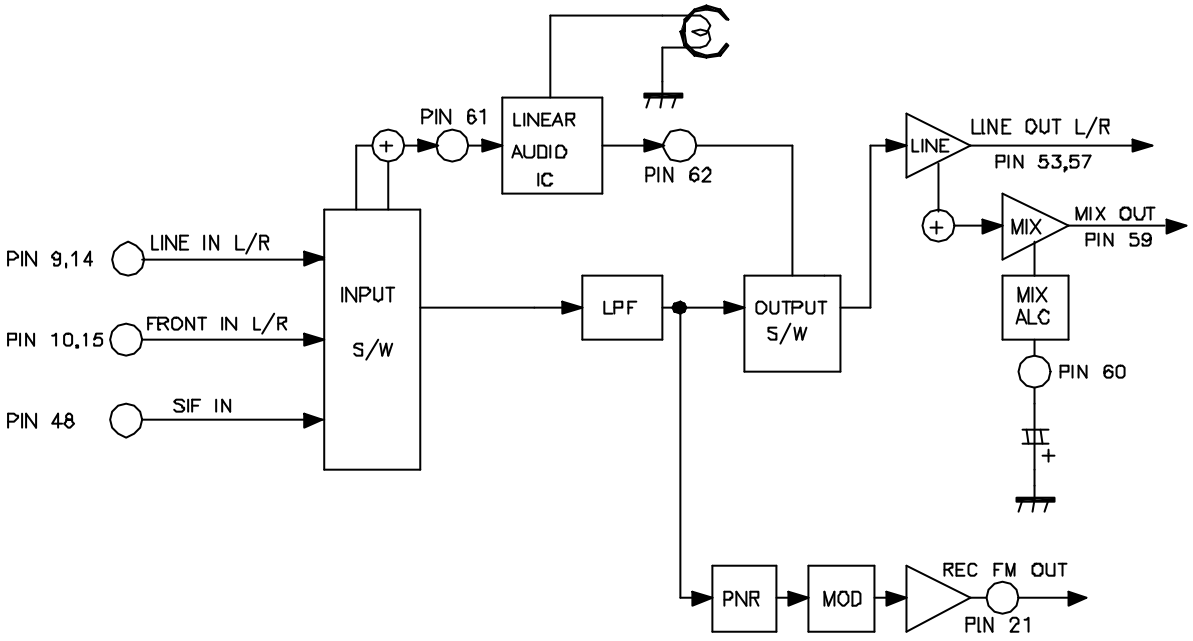

Fig. 5-1 Block diagram in REC & EE mode

B. EE mode

- The signal selected in Input Select S/W goes to Output S/W which selects one of Hi-fi, Linear or Mix by Bus data. And it is output as Line Out or Monaural Out which is already amplified by Output Gain Amp.
- ACL circuit of Monaural Out can control maximum level of signal.

C. Linear Audio

- The Input Selector outputs the selected input signal through pin 61.
- The output signal of MIX, L CH or R CH is selected by BUS data.
- The signal from Linear audio IC is input through pin 62 and then output as one of Line Output or Monaural Out, which is selected by Output Selector circuit.

D. Playback mode

- The playback FM signal from Pre-Amp passes AGC Amp to compensate level of head and BPF separates L CH and R CH.
- The center frequency of BPF is automatically adjusted to the center frequency of VCO.
- The playback FM signal is demodulated, passes Switching Noise Compensation circuit, and is input to Output Selector after PNR circuit reduces its noise.

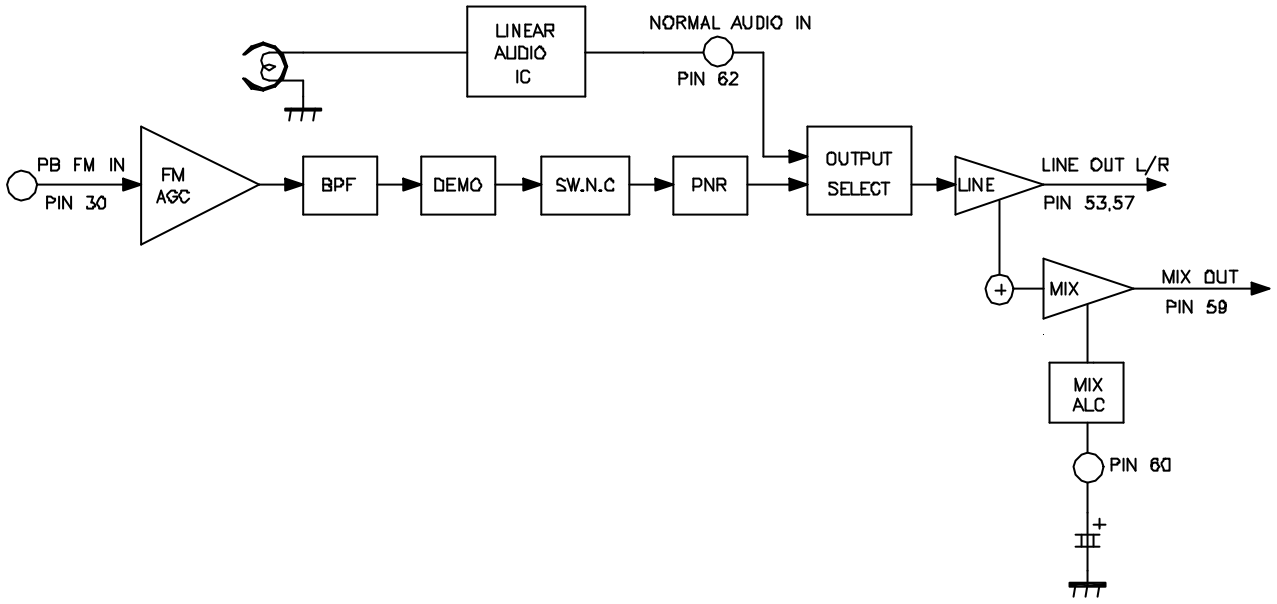

Fig. 5-2 Block diagram in PB mode

3.3 Blocks

A. Input Switcher

- IIC BUS selects a Hi-Fi input of three kinds of input : Tuner, Line 1 or Line 2.
- IIC BUS can also select a Linear Audio IC output of Hi-fi L/R Mix, Hi-fi L, or Hi-fi R.

B. Output Switcher

- IIC BUS can select an output mode of Hi-fi Stereo, Hi-fi L, Hi-fi R, Linear.
- Two kinds of Line Amp Gain can be set.

C. MODEM

- This is composed of VCO, phase comparator and over-modulation limiter in order to modulate and de-modulate.

D. FM BPF

- This is composed of FM Input Auto Level Control circuit and BPF L CH / R CH.

E. VCO BPF Automatic Control Circuit

- This automatically controls BPF center frequency of Fo 1.3MHz, 1.7MHz according to IIC BUS' data transmission and Fsc input.

F. Drop Out Detection Circuit

- This compensates smoothing for audio signal in Playback mode when FM Playback signal is dropped temporarily.

G. Switching Noise Compensation Circuit

- This compensates noise occurred while heads are rotating.
- The compensation pulse width is about 10 uSec.

H. Envelop Detection Circuit

- This detects FM PB signal according to tracking.

I. Automatic FM Detection Circuit (noise detection)

- When there is no FM PB signal or noise is occurred too much over spec, this detects forced Linear. Output switcher is changed to Linear regardless of IIC BUS status.
- Hi-Fi DET port (ENVE OUT) is 0 V in Normal and 4.0 V in Hi-fi.
- Once forced Linear is detected, Hi-fi can be recognized after 65 mSec even though FM PB signal is input.

4 MPX Circuit

4.1 Outline

Hi-Fi IC included H-Fi audio circuit and MPX circuit.

MPX circuit is designed as a decoder for the Zenith TV Multi-channel system and its functions include stereo demodulation, SAP(Separate Audio Program) demodulation, and dbx noise reduction.

4.2 Features

- Micom controls mode by I^2C BUS
- This IC can be used as stereo separation adjustment free.

4.3 Mode Detection

Signal Input	56Pin voltage
Mono	0 V
Sap	1.0 V
Stereo	2.0 V
Stereo + Sap	3.0 V

4.4 Description of Operation

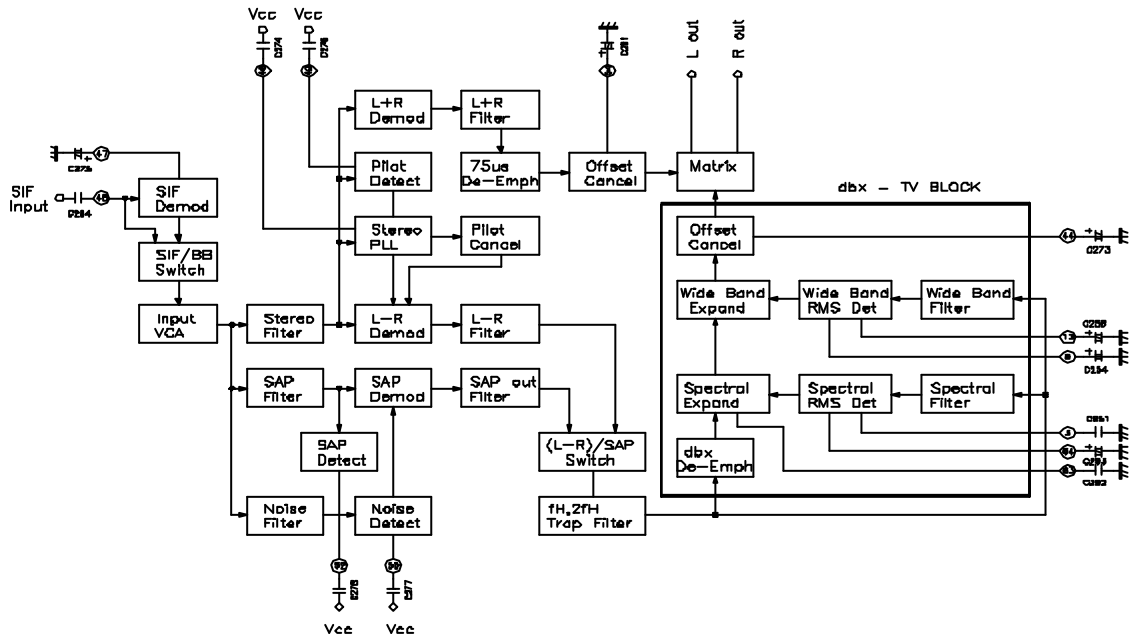

Fig. 4-1 Overall block diagram

A. L+R (MAIN)

MPX signal input from Pin48 passes through VCA, the SAP signal and telemetry signal are suppressed by STEREO Filter. Next, the pilot signals are canceled. Finally, the L-R signal and SAP signal are removed by L+R Filter, and frequency characteristics are flattened(de-emphasized) and input to the matrix.

B. L-R (SUB)

The L-R signal follows the same course as L+R before the pilot signal is canceled. L-R has no carrier signal, as it is a suppressed-carrier double-sideband amplitude modulated signal (DSB-AM modulated).
For this reason, the pilot signal is used to regenerate the carrier signal (quasi-sine wave) to be used for the demodulation of the L-R signal. In the last stage, the residual high frequency components are removed by L-R Filter and the L-R signal is input to the dbx-TV block via the Trap Filter circuit.

C. SAP

SAP is an FM signal using $5f_H$ as a carrier . First, the SAP signal only is extracted using SAP Filter.
Then, this is subjected to FM detection. Finally, residual high frequency components are removed and frequency characteristics is flattened using SAP LPF, and the SAP signal is input to the dbx-TV block via the Trap Filter circuit.
When there is no SAP signal, the SAP output is soft muted.

D. Mode discrimination

Stereo discrimination is performed by detecting the pilot signal amplitude. SAP discrimination is performed by detecting the $5f_H$ carrier amplitude. NOISE discrimination is performed by detecting the noise near 25kHz after FM detection of SAP signal.

E. dbx-TV block

Either the L-R signal or SAP signal input respectively from ST IN or SAP IN is selected by the mode control and input to the dbx-TV block.
Either the L-R signal or SAP signal input to the matrix after passing through dbx-TV block.

F. Matrix

The signals (L+R, L-R, SAP) input to MATRIX become the outputs for the ST-L, ST-R, MONO and SAP signals according to the BUS data and whether there is ST/SAP discrimination.