

SANYO	No. 5119	LA7449, 7449M
		Video Signal Processing IC for VHS VCR Systems

Overview

The LA7449, 7449M is a video signal processing single-chip IC that handles the PAL-G, B and I, 4.43 NTSC, MESECAM and NAP-G, B and I formats. IC internal trimming is used to make the LA7449, 7449M is completely adjustment free, and in combination with a special-purpose CCD (the LC89970, 89970M) it provides a significant reduction in external components, including the glass delay line. Thus the LA7449, 7449M can significantly reduce the signal processing board manufacturing costs. Furthermore, the LA7449, 7449M supports the NAP format (NTSC to PAL conversion) that is poised to become widespread in Europe, China and other markets.

Features

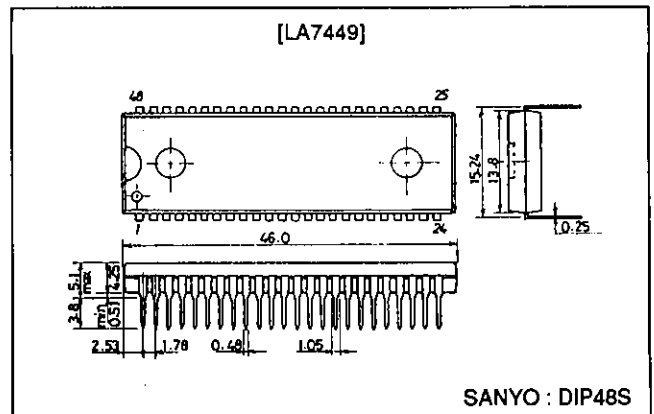
- Completely adjustment free
The AGC, carrier, deviation, and PB-Y level are adjustment free.
The YC record current can also be made adjustment free by using the LA7411, 7416 as the head amplifier.
- Support for NAP and PAL color array correction
Full modulation using a balanced modulator allows playback and conversion to PAL format of NTSC signals recorded on tape.
- Crosstalk exclusion in combination with a special-purpose CCD
Crosstalk can be excluded without using a glass delay line by combining the LA7449, 7449M with a special-purpose CCD (the LC89970, 89970M).
- Minimal number of external components
New built-in components:
 - Detail enhancer CR
 - C-trap in the Y low-pass filter
 - Playback C low-pass filter
- High performance and multiple functions

- Linear phase picture controller
- Double high-pass noise canceller, high-speed AFC, DCC
- New built-in functions
 - NAP circuit
 - AVNS (advanced vertical noise suppressor)
 - Automatic QH insertion
 - FM AGC
- Miniature package (48-pin QIP or DIP)

Package Dimensions

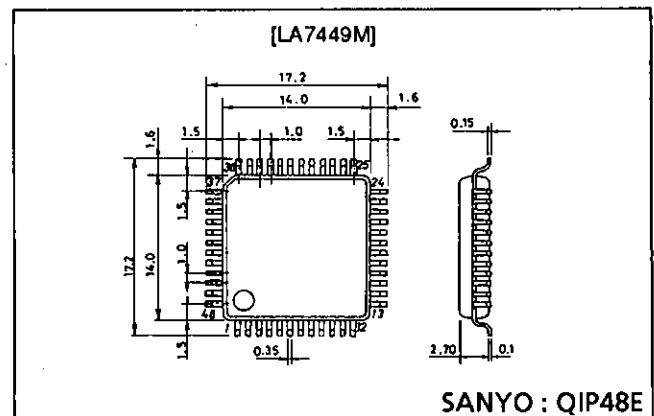
unit: mm

3149-DIP48S



unit: mm

3156-QIP48E



Functions

All VHS format VCR signal processing functions

	Luminance		Chrominance	
R/P	Video amp. Feed back clamp Main LPF YNR (AVNS) VCA Sync separator 4.2 V regulator		4.43 BPF ACC amp. ACC det. Main converter 1.3 M LPF VXO/XO Side lock det. 3rd lock protector	Half H killer BGP generator Killer det. VCO Phase shifter Sub converter 5.06 BPF
REC	Video AGC amp. Video AGC det. Pre LPF Detail enhancer 1/2 f _H carrier shift	NL emphasis Main emphasis White/dark clip FM modulator	Pre amp. Burst emphasis (NTSC) Killer APC det. AFC det.	Burst gate amp.
PB	FM AGC amp. FM AGC det. Double limiter FM demodulator Sub LPF Double high pass noise canceller QV/QH/character insert Main de-emphasis DOC	Drop out det. NL de-emphasis Picture control Y/C mix	Pre amp. Burst de-emphasis (NTSC) PB amp. Killer NAP PAL burst sequence - Compensator Carrier balancer Burst gate amp.	APC det. ID det. DCC Trick det. DPLL

Specifications

Pin numbers are for the LA7449M.

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{CC} max		7.0	V
Allowable power dissipation	P _d max	Ta ≤ 65°C*	1350*	mW
Operating temperature	T _{opr}		-10 to +65	°C
Storage temperature	T _{stg}		-40 to +150	°C

Note: * When mounted on a 70 mm by 65 mm, 1.5 mm thickness Bakelite board. The value for the DIP package is 1150 mW.

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V _{CC}		5.0	V
Operating supply voltage	V _{CC} op		4.8 to 5.2	V

Operating Characteristics at Ta = 25°C, V_{CC} = 5.0 V

Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
Record mode current drain	I _{CCR}	Input: 1.0 Vp-p video signal	100	130	160	mA
EE output level 1	V _{EE1}	Input: 50 Hz system 1.0 Vp-p video signal	1.95	2.05	2.15	Vp-p
AGC characteristics 1	AGC1	Input: 50 Hz system 2.0 Vp-p video signal	2.05	2.15	2.25	Vp-p
AGC characteristics 2	AGC2	Input: 50 Hz system 0.5 Vp-p video signal	1.90	2.00	2.10	Vp-p
AGC characteristics 3	AGC3	Input: 50 Hz system with only SYNC increased 6 dB	555	615	695	mVp-p
AGC characteristics 4	AGC4	Input: 50 Hz system with only SYNC decreased 6 dB	370	410	450	mVp-p
Sync separator output level	V _{SYR}	The SYNC-OUT output pulse wave height	3.9	4.1	4.3	V
Sync separator output pulse width	PW _{SYR}	The SYNC-OUT output pulse width	4.0	4.3	4.6	μs
Sync separator output prerecord delay time	ΔT _{SYR}	The SYNC-OUT delay time	0.9	1.1	1.3	μs
Sync separator threshold level	TH _{SYR}			-20	-15	dB

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Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
Pseudo-H insertion level	ΔHD_R	With 2.7 V applied to T14A	-400	-300	-200	mV
White insertion level	ΔWH_R	With 1.3 V applied to T14A	100	250	400	mV
VCA detection voltage	V_{VCA}		3.00	3.20	3.40	V
Record YNR operation EP/LP	V_{R-YNR1}	Input: 50 Hz system standard color bar signal	10	12	14	mVp-p
Y-LPF frequency characteristics 1	YLPF1	The 1 MHz attenuation with respect to 500 kHz	-0.5	0.0	+0.5	dB
Y-LPF frequency characteristics 2	YLPF2	The 2 MHz attenuation with respect to 500 kHz	-1.0	0.0	+1.0	dB
Y-LPF frequency characteristics 3	YLPF3	The 3 MHz attenuation with respect to 500 kHz	-2.5	-0.5	+1.0	dB
Y-LPF frequency characteristics 4	YLPF4	The 4.43 MHz attenuation with respect to 500 kHz			-25	dB
FM modulator output level	V_{FM}	No input	1.0	1.2	1.4	Vp-p
Carrier frequency 1	F_{FM1}	50 Hz system	3.7	3.8	3.9	MHz
FM modulator output 2nd harmonic distortion	H_{MOD}			-40	-35	dB
Deviation 1	DEV1	50 Hz system	0.95	1.00	1.05	MHz
FM modulator linearity	L_{MOD}		-2	0	2	%
1/2 f_H carrier shift	CS		6.5	7.8	9.1	kHz
Emphasis gain	G_{EMP}	Input: 0.5 Vp-p, 10 kHz sine wave	-0.5	0.0	0.5	dB
Detail enhancer characteristics 1	G_{DET1}	Input: 316 mVp-p, 2 MHz sine wave	1.6	1.9	2.6	dB
Detail enhancer characteristics 2	G_{DET2}	Input: 100 mVp-p, 2 MHz sine wave	3.1	4.1	5.1	dB
Detail enhancer characteristics 3	G_{DET3}	Input: 31.6 mVp-p, 2 MHz sine wave	5.3	6.3	7.3	dB
NL emphasis characteristics 1	G_{NLEMP1}	Input: 500 mVp-p, 2 MHz sine wave	0.5	1.4	2.3	dB
NL emphasis characteristics 2	G_{NLEMP2}	Input: 158 mVp-p, 2 MHz sine wave	2.6	3.8	5.2	dB
NL emphasis characteristics 3	G_{NLEMP3}	Input: 50 mVp-p, 2 MHz sine wave	4.9	6.4	7.9	dB
Main emphases characteristics 1	G_{ME1}	Input: 100 mVp-p, 500 kHz sine wave	4.9	5.2	5.5	dB
Main emphases characteristics 2	G_{ME2}	Input: 100 mVp-p, 2 MHz sine wave	13.1	13.6	14.1	dB
White clipping level	L_{WC}	Input: 1.0 Vp-p, white 100% video signal	186	195	204	%
Dark clipping level	L_{DC}	Input: 1.0 Vp-p, white 100% video signal	-55	-50	-45	%
[Playback Mode Y System]						
Playback mode current drain	I_{CCP}		135	160	185	mA
Dropout compensation time	T_{DOC}		0.72	0.85	0.98	ms
DOC loop gain	G_{DOC}	5H later	-1.0	0.0	+1.0	dB
Playback Y level	V_{VOUT}	For playback of an FM signal with a 1.0 MHz deviation	1.95	2.05	2.15	Vp-p
FM demodulator linearity	L_{DEM}	2, 4, 6 MHz	-3.5	0.0	+3.5	%
Demodulation sensitivity	S_{DEM}		0.47	0.52	0.57	V/MHz
Carrier leakage	CL	Input: 4 MHz, 600 mVp-p		-40	-35	dB
Playback YNR characteristics LP/EP	G_{P-YNR1}	Input: 50% white + CW	-2.5			dB
NL de-emphasis characteristics 1	G_{NLDE1}	Input: 158 mVp-p, 2 MHz sine wave	-6.0	-5.0	-4.0	dB
NL de-emphasis characteristics 2	G_{NLDE2}	Input: 50 mVp-p, 2 MHz sine wave	-10.5	-9.0	-7.5	dB
Double noise canceller characteristics 1	G_{WNC1}	Input: 158 mVp-p, 2 MHz sine wave	-1.8	-1.3	-0.8	dB
Double noise canceller characteristics 2	G_{WNC2}	Input: 50 mVp-p, 2 MHz sine wave	-6.2	-5.2	-4.2	dB
Double noise canceller characteristics 3	G_{WNC3}	Input: 15.8 mVp-p, 2 MHz sine wave	-11.7	-10.7	-8.7	dB
PIC-CTL hard response characteristics 1	G_{PH1}	Input: 50% video + sine wave $f = 1$ MHz, 158 mVp-p	4.5	5.5	6.5	dB
PIC-CTL hard response characteristics 2	G_{PH2}	Input: 50% video + sine wave $f = 2$ MHz, 158 mVp-p	8.0	9.0	10.0	dB
PIC-CTL soft response characteristics 1	G_{PS1}	Input: 50% video + sine wave $f = 1$ MHz, 158 mVp-p	-4.5	-3.5	-2.5	dB
PIC-CTL soft response characteristics 2	G_{PS2}	Input: 50% video + sine wave $f = 2$ MHz, 158 mVp-p	-9.0	-7.0	-5.0	dB
Pseudo-V insertion level (playback)	ΔVDP	With 5 V applied to T14A	-150	-50	+50	mV
Pseudo-H insertion level (playback)	ΔHDP	With 2.7 V applied to T14A	-400	-300	-200	mV

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Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
White insertion level (playback)	ΔWHP	With 1.3 V applied to T14A	100	250	400	mV
Sync separator output level	V_{SYP}	The SYNC-OUT output pulse wave height	3.9	4.1	4.3	V
Sync separator output pulse width	PW_{SYP}	The SYNC-OUT output pulse width	4.2	4.5	4.8	μs
Sync separator output pre-record delay time	ΔT_{SYP}		1.4	1.6	1.8	μs
4.2 V regulator voltage	V_{REG}		4.0	4.2	4.4	V
[Record Mode Chrominance System]						
Chrominance low band conversion output burst level	V_{OR-38}	Input: PAL/GBI standard color bar signal, 1 Vp-p	150	190	230	mVp-p
VXO oscillator level 1	V_{VXO-R1}	Input: PAL/GBI standard color bar signal, 1 Vp-p	300	500	700	mVp-p
Record ACC characteristics 1	ACC_{R1}	With only the chrominance signal level increased 6 dB		+0.2	+0.6	dB
Record ACC characteristics 2	ACC_{R2}	With only the chrominance signal level decreased 6 dB	-0.5	-0.1		dB
ACC killer on input level	$V_{ACCK-ON}$			-26		dB
ACC killer on output level	V_{O-ACCK}			-60	-50	dB
ACC killer recovery input level	$V_{ACCK-OFF}$			-20		dB
VXO control sensitivity	S_{VXO}		1.3	3.2	5.1	Hz/m
APC pull-in range 1	Δf_{APC1}		350			Hz
APC pull-in range 2	Δf_{APC2}				-350	Hz
BGP delay time	t_D	Input: PAL/GBI standard color bar signal, 1 Vp-p	3.1	3.4	3.7	μs
BGP pulse width	t_W		4.7	4.9	5.1	μs
AFC pull-in range 1	Δf_{AFC1}		+1.0	+7.0		kHz
AFC pull-in range 2	Δf_{AFC2}			-3.7	-1.0	kHz
[Playback Mode Chrominance System]						
Video output burst level	V_{OP-11}	SP mode, input: burst 30 mVp-p	255	300	345	mVp-p
Pin 25 output burst level	V_{OP-25}	SP mode, input: burst 30 mVp-p	195	230	265	mVp-p
Playback ACC characteristics 1	ACC_{P1}	With the chrominance level increased 6 dB		+0.5	+0.8	dB
Playback ACC characteristics 2	ACC_{P2}	With the chrominance level decreased 6 dB	-0.8	-0.5		dB
Playback killer on input level	V_{ACK-P}		-40	-32	-25	dB
Playback killer on chrominance output level	V_{OACK-P}			-44	-40	dB
Main converter carrier leakage	C_{LP}	The 5.06 MHz carrier leakage component		-40	-33	dB
Burst de-emphasis level NT	G_{BD}	NTSC mode	-5.25	-5.0	-4.75	dB
Playback XO output level 1	V_{XO-P1}		300	450	600	mVp-p
Playback XO oscillator frequency deviation	Δf_{XO}	$\Delta f_{XO} = f - 4.433619$ (MHz)	-9	0	+9	Hz
SLD detector current 1	I_{SLD1}			170		μA
SLD detector current 2	I_{SLD2}			170		μA
NTSC playback burst output level	V_{BNT}	NTSC mode	255	300	345	mVp-p
NTSC to PAL conversion - V axis burst level	$VB-NAP$		-1.0	0.0	+1.0	dB
NTSC to PAL conversion burst level ratio	$\Delta B-NAP$		-2.0	0.0	+2.0	dB

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L7449M Control Pin Table

Pin No.	Control function		L		M		H		
3	R/P	Edit					3.8 VDC or more		
5	R/P	YNR (AVNS)-CTL	1.0 VDC to less YNR-off		1.5 to 2.5 VDC YNR-CTL		3.5 VDC or more YNR (strong)		
6	R	*****					3.9 VDC or more		
	P	N, C, CTL	1.5 VDC or less N, C-off		2.0 to 3.0 VDC N, C-CTL				
12	R/P	C-rotary	0 to 1.9 VDC Low CH			2.3 VDC or more High CH			
14	P	QV/QH CHARA. INS	0.8 VDC or less Through	1.2 to 2.2 VDC CHARA insert		2.6 to 3.3 VDC Pedestal insert	3.7 VDC or more QV insert		
15	P	Auto QH INS on	Pull down by 3.9 kΩ						
18	R/P	N. L.-on (weak)	0.6 VDC or less N. L.-on			1.0 to 3.0 VDC N. L.-on			3.9 VDC or more N. L.-off
	R	Detail-ENHA	Normal			Weak and f _C down			Normal
22	R/P	EP/LP/SP	1.2 VDC or less SP		2.0 to 2.7 VDC LP			3.9 VDC or more EP	
23	R	SP carrier shift stop						3.0 VDC or more SP carrier shift stop	
24	P	NAP	1.2 VDC or less Through		2.0 to 2.7 VDC Balanced-mod output			3.3 VDC or more NAP-on	
26	R/P	NT/MESEC/PAL	1.2 VDC or less PAL		2.0 to 2.7 VDC MESEC			3.9 VDC or more NTSC	
29	P	Trick						3.9 VDC or more	
44	P	DOC-off						4.1 VDC or more	
48	R/P	PB-H						4.0 VDC or more	

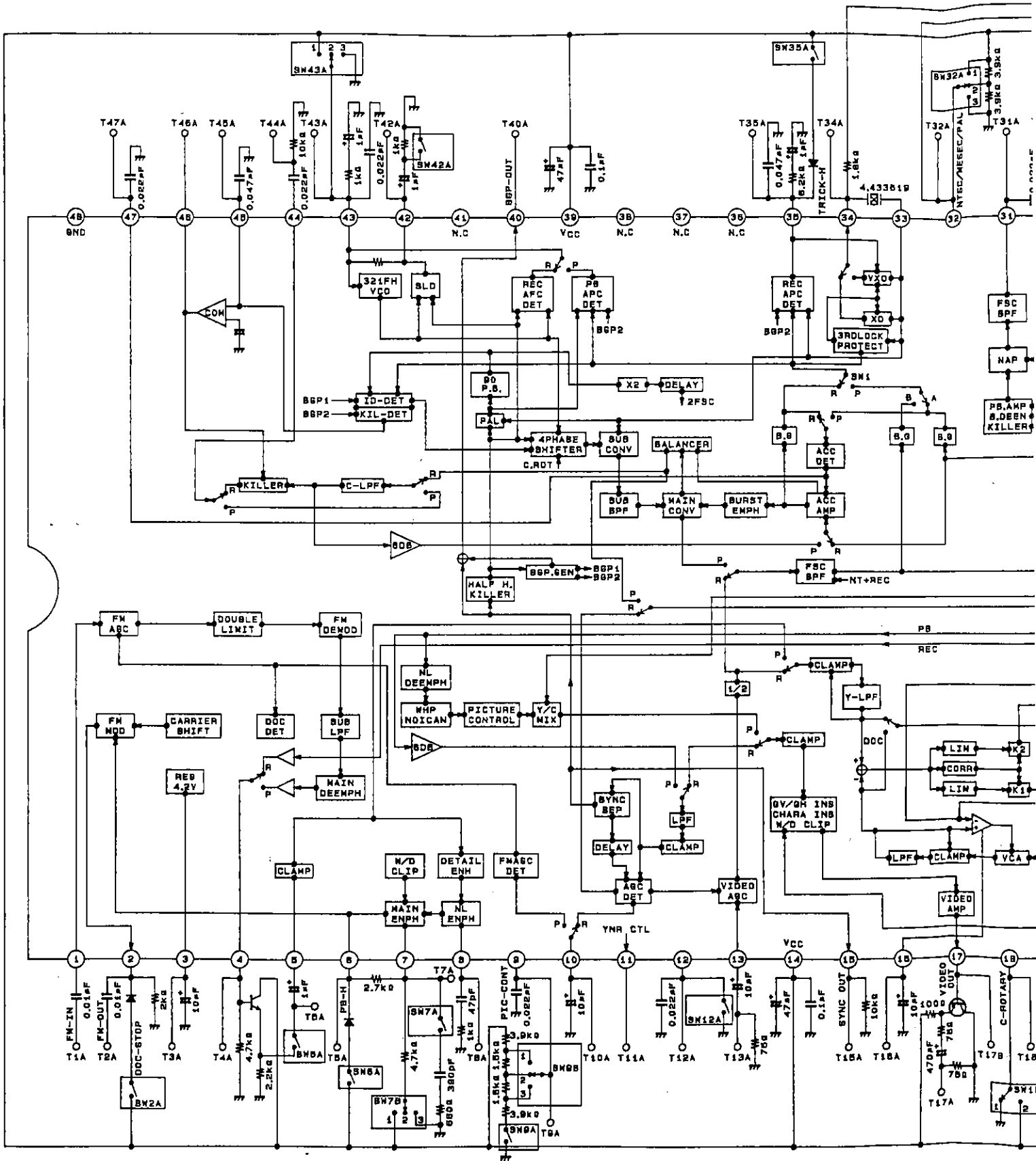
Note: Do not allow pin 3 to fall under 1.5 V. (The chip will enter test mode.)

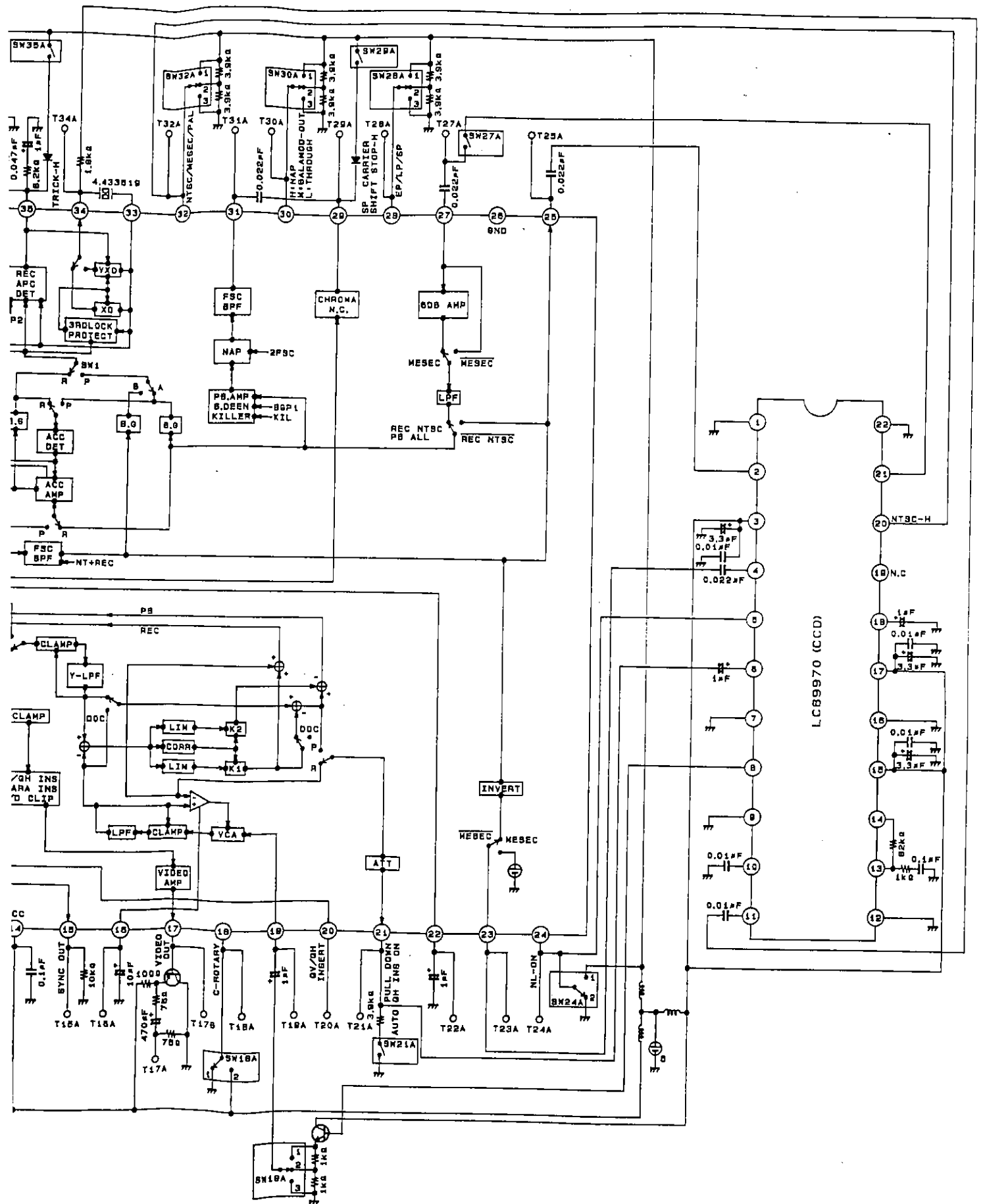
Function Control In each of the LA7449M Operating Modes

	Edit	YNR			NL		Detail enhancer			NC			PIC-CTL	1/2 f _H carrier shift	
		Pin 5 control			Pin 18 control		Pin 6 control (with pin 18 control L/H)			Pin 6 control					
		L	M	H	L/H	M	L	M	H	L	M	H			
REC	SP	On	Off	Off	Off	On	Off	Variable	Center	—	—	—	—	○ (X)	
		Off	Off	Off	Off	On	Off	Variable	Center	—	—	—	—	○ (X)	
	LP EP	On	Off	K1 = 0.2 K2 = 0.0	K1 = 0.2 K2 = 0.0	On	On	Off	Variable	Center	—	—	—	○	
		Off	Off	K1 = 0.5 K2 = 0.0	K1 = 0.5 K2 = 0.0	On	On	Off	Variable	Center	—	—	—	○	
PB	SP	On	K1 = 0.0 K2 = 0.0	K1 = 0.0 K2 = 0.0	K1 = 0.5 K2 = 0.0	Off	On	—	—	—	Off	Variable	Center	Center	—
		Off	K1 = 0.0 K2 = 0.0	K1 = 0.2 K2 = 0.0	K1 = 0.5 K2 = 0.0	Off	On	—	—	—	Off	Variable	Center	○	—
	LP EP	On	K1 = 0.0 K2 = 0.5	K1 = 0.2 K2 = 0.5	K1 = 0.5 K2 = 0.5	On	On	—	—	—	Off	Variable	Center	Center	—
		Off	K1 = 0.0 K2 = 0.5	K1 = 0.2 K2 = 0.5	K1 = 0.5 K2 = 0.5	On	On	—	—	—	Off	Variable	Center	○	—

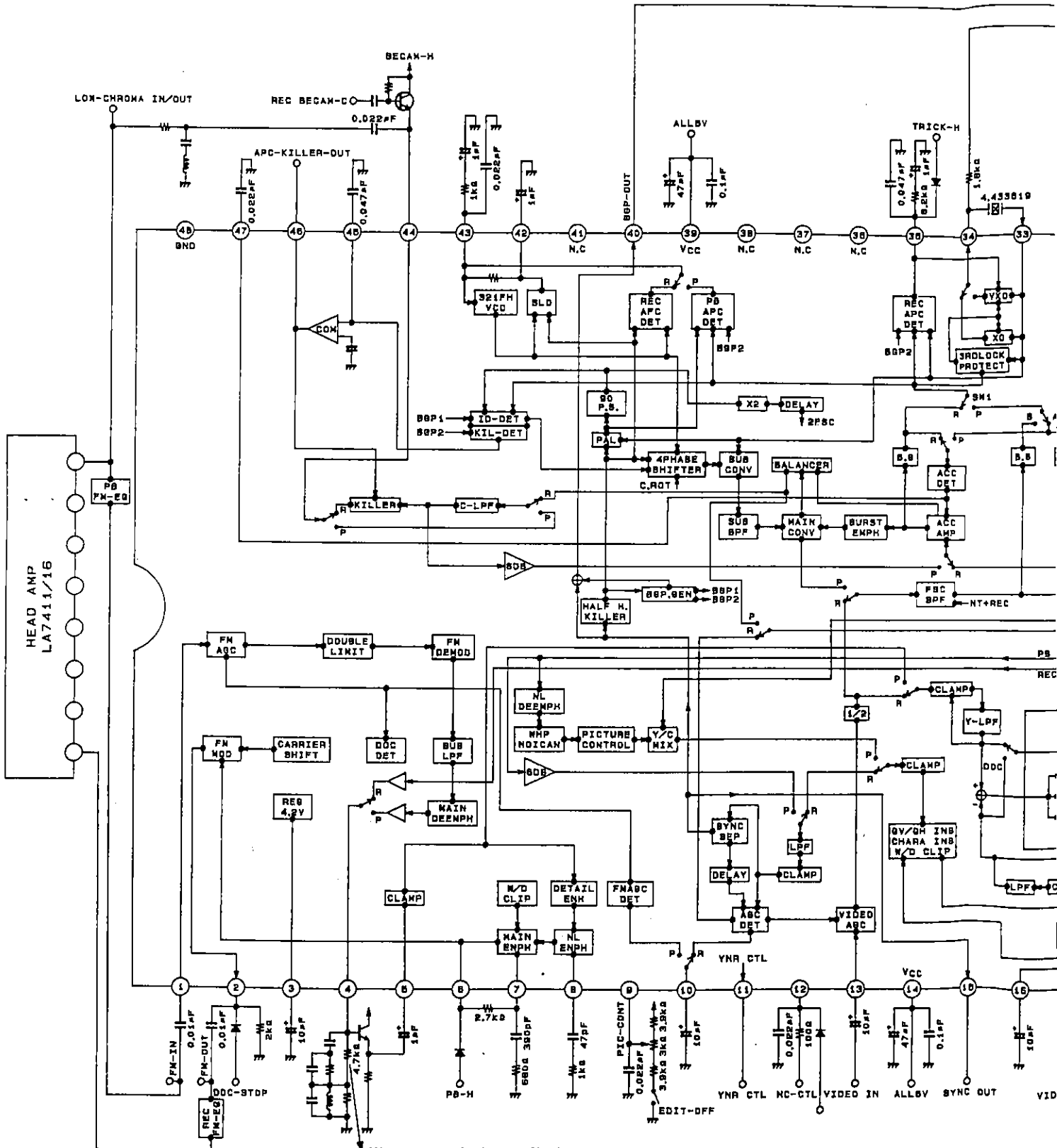
- Note: 1. K1 is the YNR coefficient, K2 is the LNC coefficient
 2. Use the 1/2 f_H carrier shift entries in parentheses when pin 23 is high.
 3. The detail enhancer is off when pin 18 is at the middle level.

LA7449 Test Circuit (DIP)

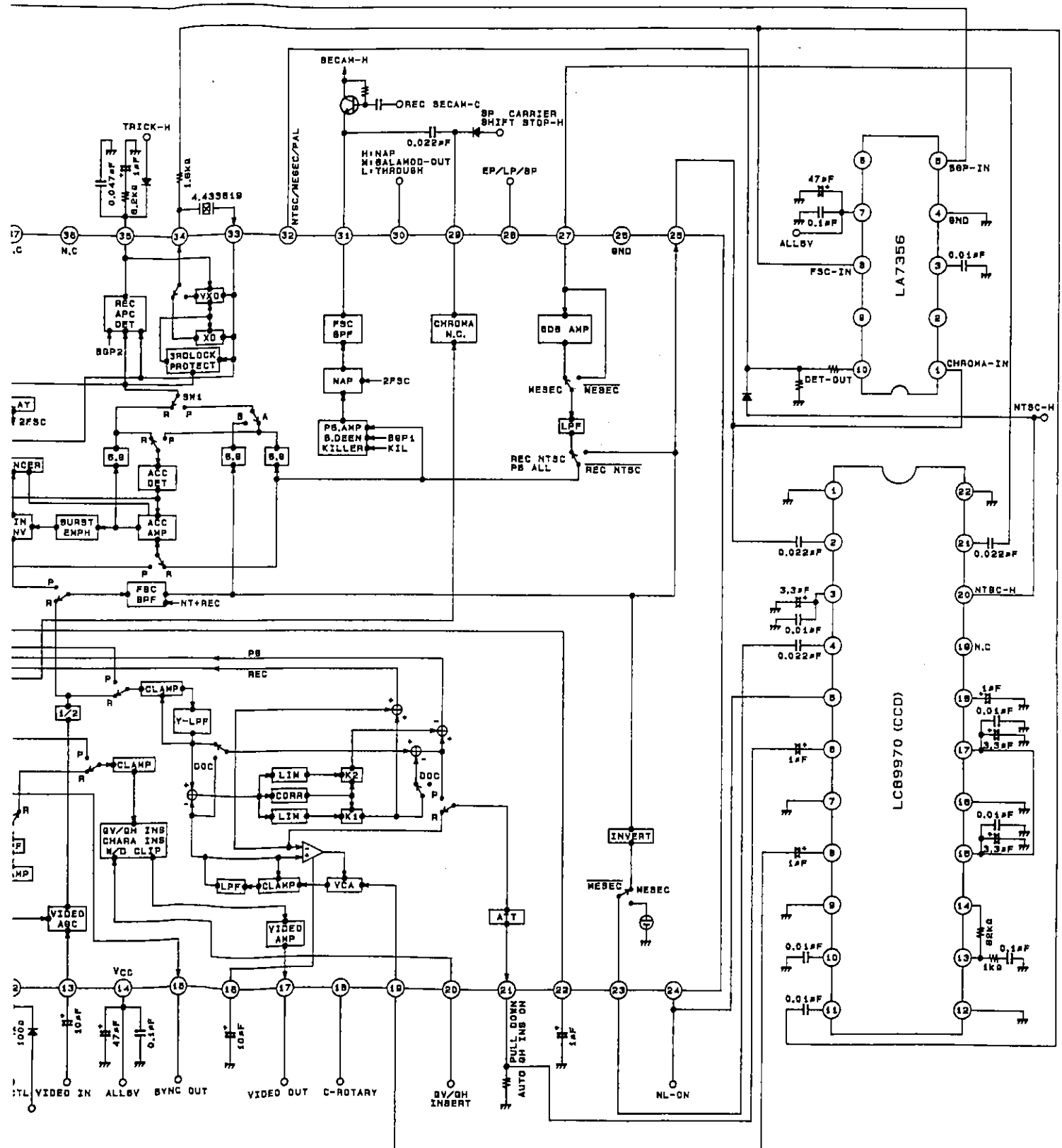




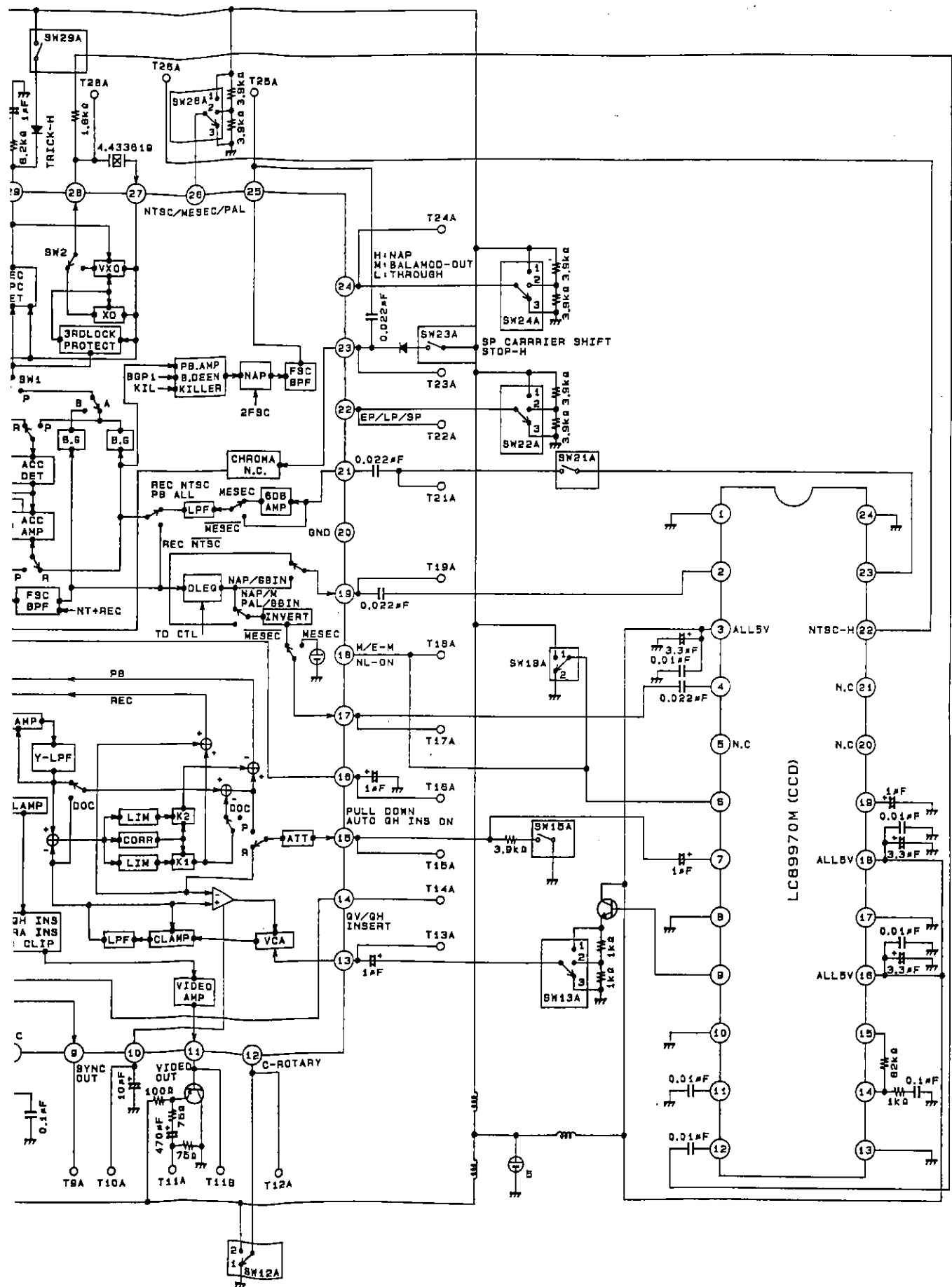
A7449 Block Diagram (DIP)



We recommend using a $\pm 1\%$ tolerance resistor here since this resistor determines the PBY level.



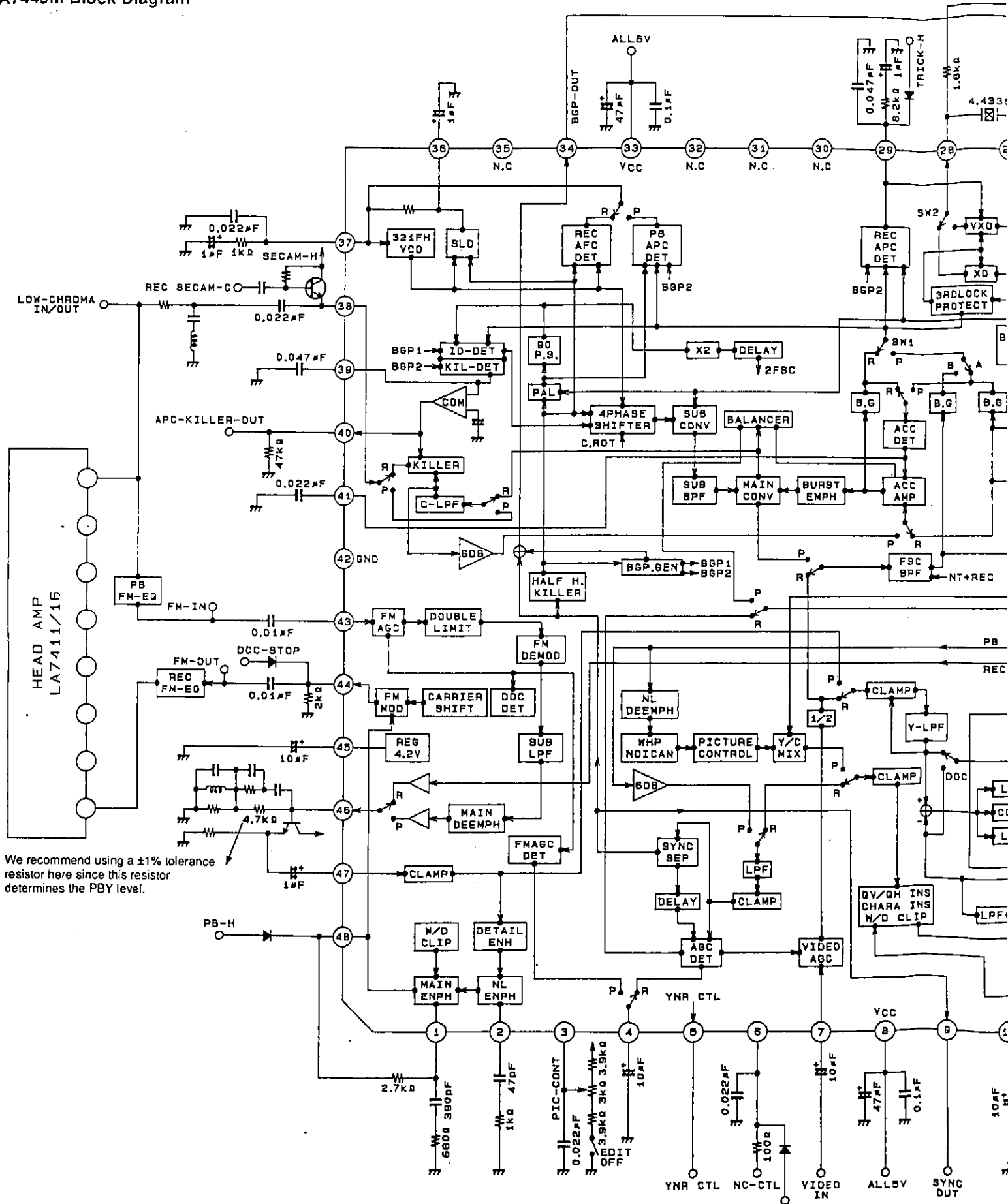
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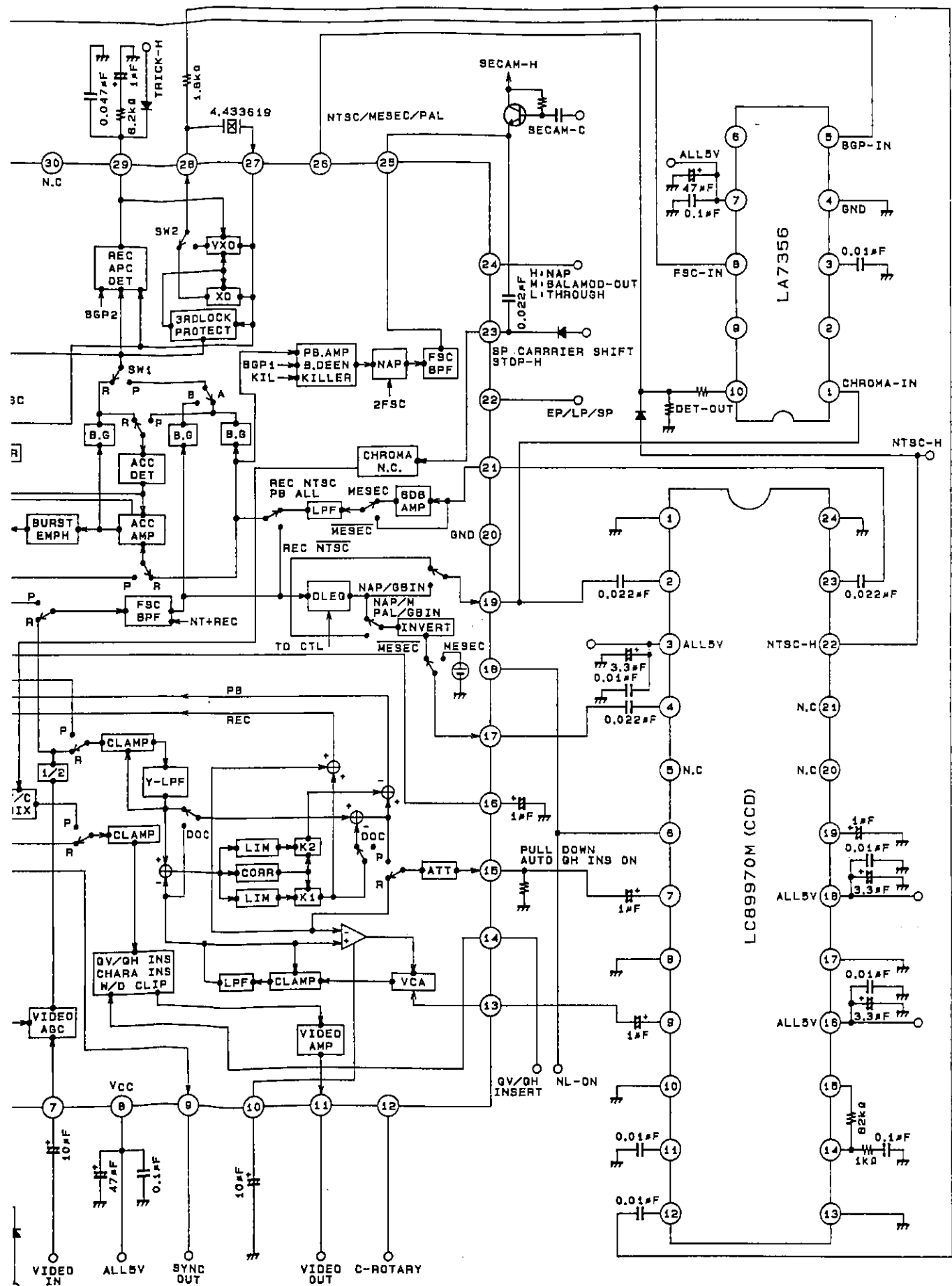
LC89970M (CCD)

1	ALL5V
2	NTSC-H (22)
3	N.C (21)
4	N.C (20)
5	N.C (19)
6	ALL5V (18)
7	ALL5V (17)
8	ALL5V (16)
9	ALL5V (15)
10	ALL5V (14)
11	ALL5V (13)
12	ALL5V (12)
13	ALL5V (11)
14	ALL5V (10)
15	ALL5V (9)
16	ALL5V (8)
17	ALL5V (7)
18	ALL5V (6)
19	ALL5V (5)
20	ALL5V (4)
21	ALL5V (3)
22	ALL5V (2)
23	ALL5V (1)
24	ALL5V (0)

LA7449M Block Diagram



We recommend using a $\pm 1\%$ tolerance resistor here since this resistor determines the PBY level.



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