

TENTATIVE

MULTI-COLOR VIDEO-CHROMA-DEFLECTION

Unit in mm

The TA8659AN is an NTSC/PAL/SECAM video-chroma-deflection sub-system with the teletext interface circuit.

The TA8659AN includes all of the functions required to realize a multi-color CTV in conjunction with a PIF/SIF IC, in a 64 leads shrink type dual-in-line plastic package.

FEATURES

- . Realized a full automatic multi-color processing in conjunction with the TA8615N system switch, with minimal external components.
- . Forced system selection.
- . Automatic system change by a sub-carrier detection.
- . The mode change output can be used for switching the external components or circuits.
- . RGB interface with high switching speed, a half tone control and an independent contrast control.

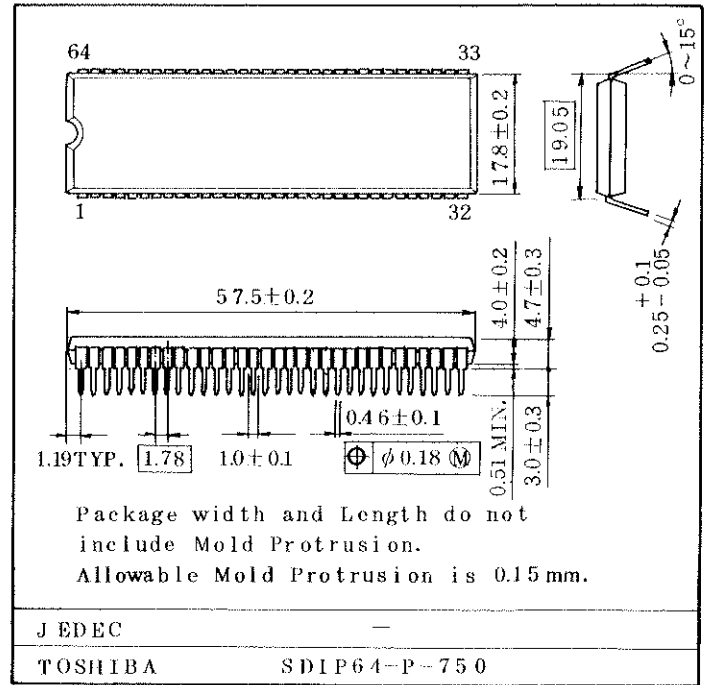
FUNCTIONS

Video Section

- . D.C. controlled 2'nd order differential picture sharpness.
- . Contrast control with Uni-color control.
- . Brightness control with pedestal clamp.
- . Internal vertical blanking.

Chroma Section

- . ACC circuit.
- . Color control/Uni-color control.
- . RGB primary color demodulator outputs.
- . Adjustment free APC circuit.
- . Tint control.



Weight: 8.9g

Package width and Length do not include Mold Protrusion.
Allowable Mold Protrusion is 0.15 mm.

- . PAL/SECAM/NTSC automatic system detection.
- Forced system selection/Automatic sub-carrier detection and switching.

Deflection Section

- . Excellent sync separator performance.
- . Adjustment free H/V oscillator by a count down system.
- . Stable Vertical Sync.
- . Saw tooth type horizontal AFC.
- . Horizontal pre-driver.
- . X-ray protector.
- . Vertical NFB amplifier.
- . 50Hz/60Hz Automatic detection.

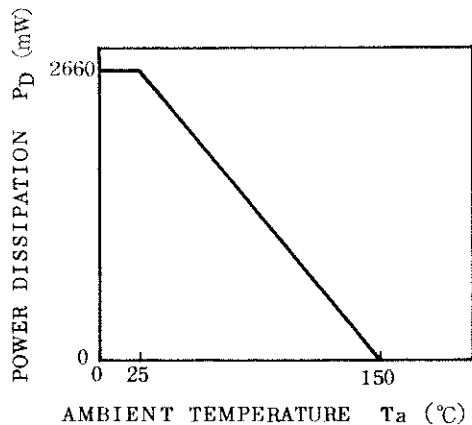
Teletext Interface Section

- . RGB inputs.
- . TV/TEXT switch.
- . Text contrast control.
- . Half tone control.

MAXIMUM RATINGS (Ta=25°C)

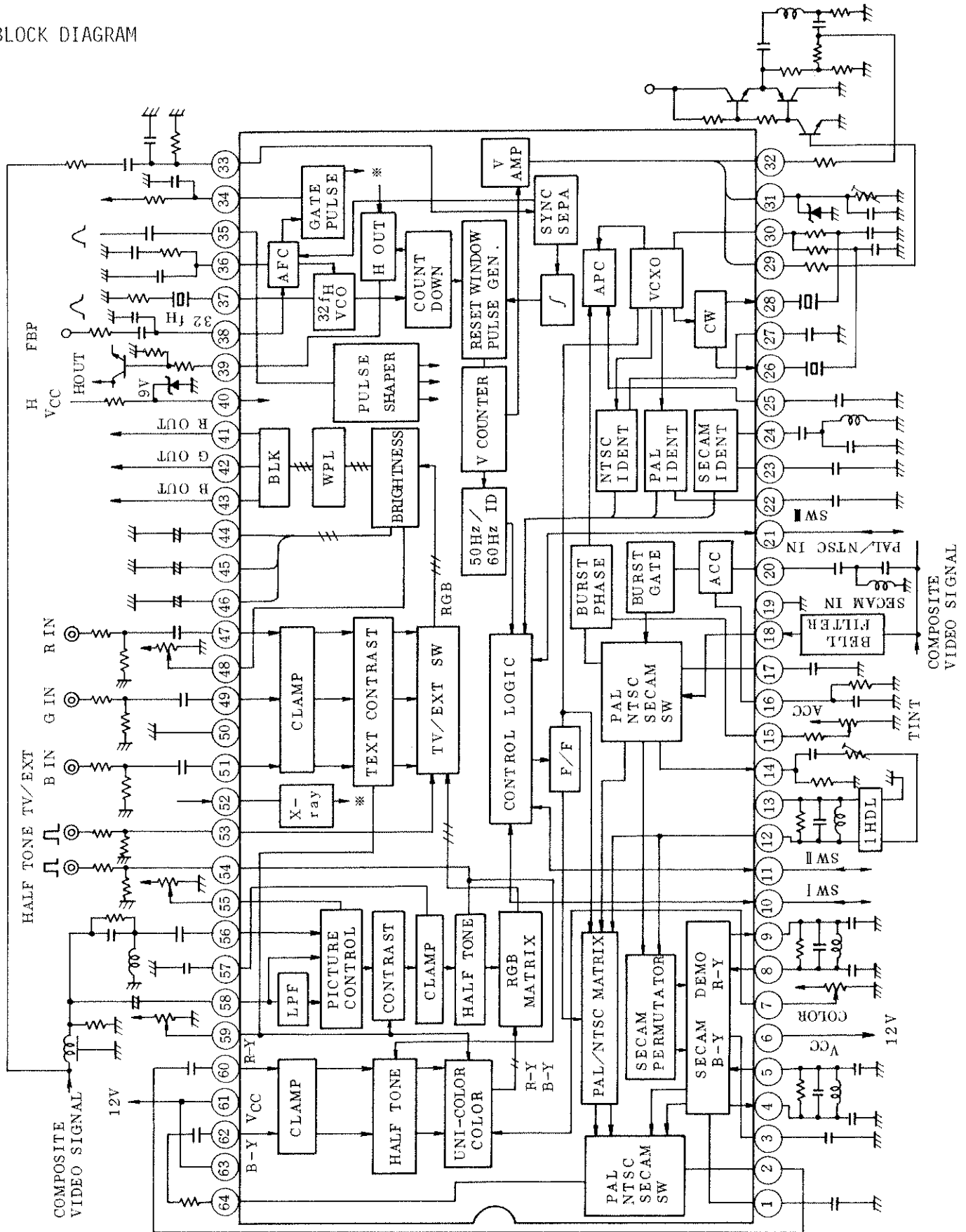
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	VCC	15.0	V
Input Terminal Voltage	Vin	GND-0.3~VCC+0.3	V
Input Signal Level	ein	5.0	Vp-p
Power Dissipation (Note)	Pd	2660	mW
Operating Temperature	Topr	-20~65	°C
Storage Temperature	Tstg	-55~150	°C

Note : Derated above Ta=25°C in the proportion of 21.2mW/°C.



TA8659AN-2
1989-12-20
TOSHIBA CORPORATION

BLOCK DIAGRAM



TA8659AN-3

1989-12-20

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TERMINAL DISCRPTION

#	FUNCTION	#	FUNCTION
1	SECAM B-Y De-Emphasis	33	Sync. Separation Input
2	R-Y OUT	34	Gate Pulse Filter
3	SECAM R-Y De-Emphasis	35	Horizontal BLK Input
4	SECAM B-Y DET	36	AFC Filter
5		37	VCO
6	VCC	38	Horizontal AFC Pulse Input
7	Color Control	39	Horizontal Output
8	SECAM R-Y DET	40	Horizontal VCC
9		41	R Output
10	SW I	42	G Output
11	SW II	43	B Output
12	Delay Line Input	44	R Clamp
13	Bias	45	G Clamp
14	Delay Line Drive	46	B Clamp
15	Tint Control	47	External R Input
16	ACC Filter	48	Brightness Control
17	DC Feed Back	49	External G Input
18	SECAM Input	50	GND
19	GND	51	External B Input
20	PAL/NTSC Input	52	X-ray
21	SW III	53	TV/External SW
22	PAL Ident	54	Half Tone
23	SECAM Ident	55	Picture Sharpness
24	SECAM Reference	56	Differential Signal Input
25	APC Filter	57	Clamp
26	4.43 X'tal	58	Video Input
27	NTSC Ident	59	Contrast Control
28	3.58 X'tal	60	R-Y Input
29	Vertical Drive	61	VCC
30	VCXO	62	B-Y Input
31	Vertical Ramp	63	VCC
32	Vertical NFB Input	64	B-Y Output

LOGIC TABLE AT AUTOMATIC MODE

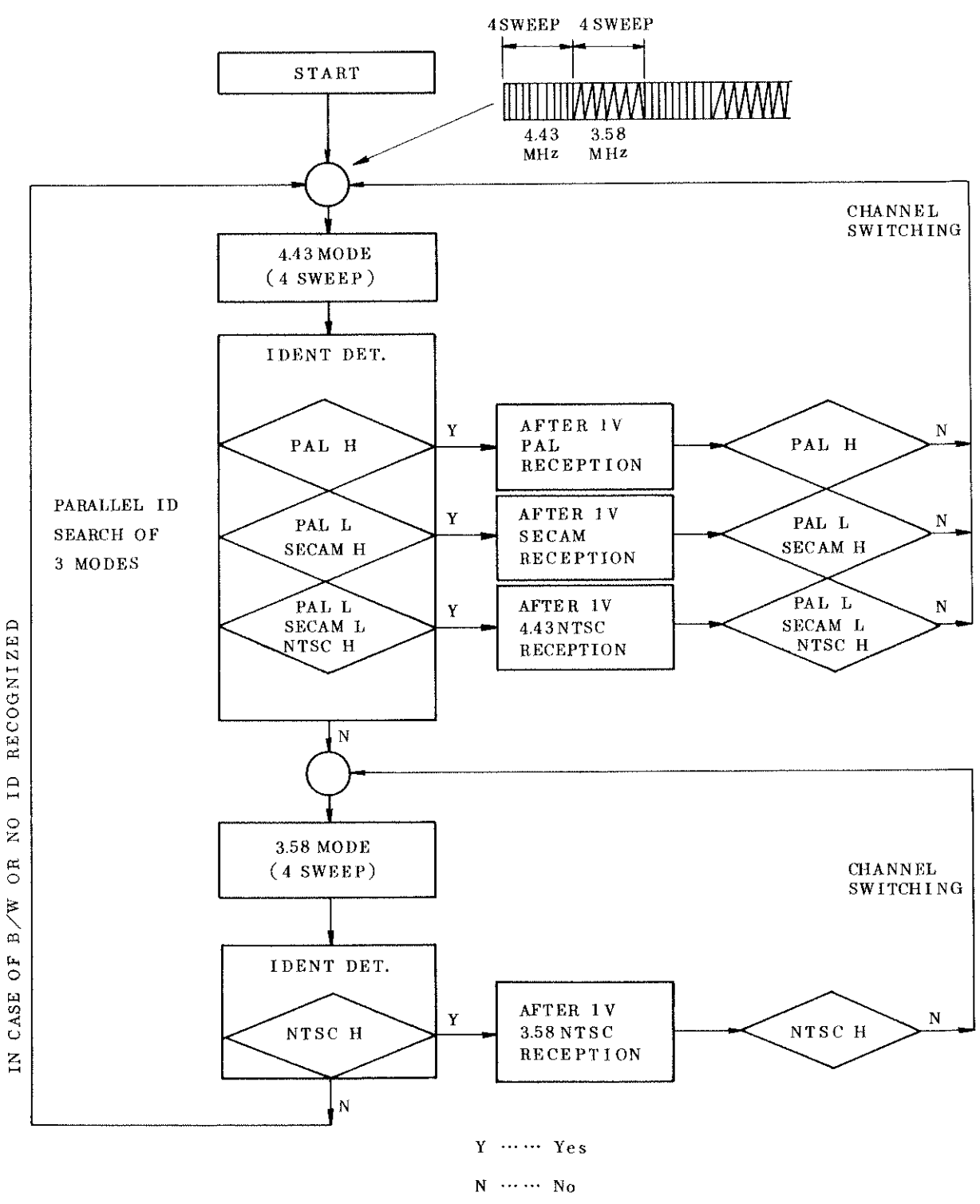
IDENT			X'tal MODE	SW I	SW II	SW III	MODE SELECT
PAL	SECAM	NTSC		#10	#11	#21	
#22	#23	#27					
H	L	H	4.43	H	H	M	PAL
L	H	L	4.43	H	M	M	SECAM
L	L	H	4.43	L	H	M	4.43 NTSC
L	L	H	3.58	L	L	M	3.58 NTSC
L	L	L	4.43/3.58	L	M/L	L	B/W
Output DC Level H → VCC L = 6V			—	Output DC Level H = 6.0V ($\frac{1}{2}$ VCC) M = 2.0V ($\frac{1}{6}$ VCC) L = 0V (Connect to GND through 30kΩ)			

INPUT VOLTAGE AT FORCED (MANUAL) MODE

MODE	SW I	SW II	SW III
	#10	#11	#21
PAL	H	H	H
SECAM	H	L	H
4.43 NTSC	L	H	H
3.58 NTSC	L	L	H

H : 6V
L : 0V

FLOW CHART OF SYSTEM IDENTIFICATION



1. DC VOLTAGE AND CURRENT CHARACTERISTICS

(Ta=25°C, VCC=12V, H.VCC=9V unless otherwise specified)

VOLTAGE CHARACTERISTICS

#	TERMINAL	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE	
1	SECAM B-Y De-Emphasis	V1	8.3	8.65	9.0	V		
2	R-Y OUT	V2	7.4	7.95	8.4			
3	SECAM R-Y De-Emphasis	V3	8.3	8.65	9.0			
4	SECAM B-Y DET	V4	6.0	6.5	7.0			5.5V in SECAM MODE
5		V5	6.0	6.5	7.0			
6	VCC	V6	-	VCC	-			-
7	Color Control	V7	-	-	-			-
8	SECAM R-Y DET	V8	6.0	6.5	7.0			5.5V in SECAM MODE
9		V9	6.0	6.5	7.0			
10	SW I	V10	5.4	6.0	6.6			PAL, SECAM MODE
11	SW II	V11	5.4	6.0	6.6			PAL, 4.43NTSC MODE
12	Delay Line Input	V12	4.8	5.2	5.6			-
13	Bias	V13	4.8	5.2	5.6			-
14	Delay Line Drive	V14	9.9	10.25	10.6			NTSC, B/W MODE 8.0V at P/S MODF
15	Tint Control	V15	5.5	5.9	6.3			-
16	ACC Filter	V16	-	11.3	-			B/W MODE, 10.7V at P/N MODE (100mVp-p Burst)
17	DC Feed Back	V17	3.2	3.55	3.9			-
18	SECAM Input	V18	4.1	4.45	4.8			50Hz MODE, 7.5V at 60Hz MODE
19	GND	V19	-	GND	-			-
20	PAL/NTSC Input	V20	5.5	5.85	6.2			HID MODE 4.8V at VID(15kΩ GND)
21	SW III	V21	1.6	2.0	2.8			PAL, SECAM, NTSC MODE
22	PAL Ident	V22	4.1	4.35	4.8			
23	SECAM Ident	V23	4.1	4.35	4.8			
24	SECAM Reference	V24	5.4	5.8	6.2			
25	APC Filter	V25	-	6.0	-			
26	4.43 X'tal	V26	2.8	3.15	3.5			
27	NTSC Ident	V27	4.1	4.45	4.8			
28	3.58 X'tal	V28	2.8	3.15	3.5			
29	Vertical Drive	V29	-	-	-			
30	VCXO	V30	8.4	9.5	10.6			

VOLTAGE CHARACTERISTICS

#	TERMINAL	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE	
31	Vertical Ramp	V31	-	-	-	V		
32	Vertical NFB Input	V32	-	-	-			
33	Sync. Separation Input	V33	5.4	6.0	6.6			
34	Gate Pulse Filter	V34	-	-	-			
35	H.BLK Input	V35	3.8	4.1	4.4			
36	AFC Filter	V36	7.0	7.5	8.0			
37	VCO	V37	2.7	3.05	3.4			
38	H.AFC Pulse Input	V38	6.3	6.7	7.1			
39	Horizontal Output	V39	-	-	-			
40	H.VCC	V40	-	H.VCC	-			
41	R Output	V41	0.7	1.25	1.8			
42	G Output	V42	0.7	1.25	1.8			
43	B Output	V43	0.7	1.25	1.8			
44	R Clamp	V44	2.5	3.2	3.6			#34: 3.0V #35: 2.5V (through 10kΩ)
45	G Clamp	V45	2.5	3.2	3.6			
46	B Clamp	V46	2.5	3.2	3.6			
47	Ext. R Input	V47	4.7	6.0	7.3			
48	Brightness Control	V48	-	-	-			
49	Ext. G Input	V49	4.7	6.0	7.3			
50	GND	V50	-	GND	-			
51	Ext. B Input	V51	4.7	6.0	7.3			
52	X-ray	V52	-	-	-			
53	TV/EXT. SW	V53	-	-	-			
54	Half Tone	V54	-	-	-			
55	Picture Sharpness	V55	5.0	5.4	5.8			
56	Diff. Input	V56	2.9	3.25	3.6			
57	Clamp	V57	-	5.9	-			
58	Video Input	V58	4.4	4.8	5.2			
59	Contrast Control	V59	-	-	-			
60	R-Y Input	V60	5.8	6.2	6.6			#34: 3.0V #35: 2.5V (through 10kΩ)
61	VCC	V61	-	VCC	-			
62	B-Y Input	V62	5.8	6.2	6.6			
63	VCC	V63	-	VCC	-			
64	B-Y Output	V64	7.4	7.95	8.4			

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CURRENT CHARACTERISTICS

#	TERMINAL	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
6	V _{CC} (CHROMA)	I ₁	30	42	65	mA	
61	V _{CC} (VIDEO, DEF.)	I ₂	25	38	55		
63	V _{CC} (VIDEO)	I ₃	8	10	15		
40	H.V _{CC} (H.DFF.)	I ₄	6	10	15		
V _{CC} Total Current		I _{CC1}	63	90	135		I _{CC1} =I ₁ +I ₂ +I ₃
H.V _{CC} Total Current		I _{CC2}	6	10	15		I _{CC2} =I ₄

2. RECOMMENDED SUPPLY VOLTAGE

SUPPLY TERMINAL	SYMBOL	MIN.	TYP.	MAX.	UNIT
6, 61, 63	V _{CC}	10.8	12.0	13.2	V
40	H.V _{CC}	8.1	9.0	9.9	

3. AC CHARACTERISTICS (Unless otherwise specified, VCC=12V, H.VCC=9V, Ta=25°C)

VIDEO

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT							NOTE
		MIN.	TYP.	MAX.		SW & VR SETTING							
						UNI-COLOR CONTROL	SHARPNESS CONTROL	#54	COLOR CONTROL	BRIGHTNESS CONTROL	#56	#58	
Diff. Input (#56) Input Impedance	Zin56	700	910	1150	Ω	MIN	OPEN		MIN	CENTER	MEASURE	AC GND	Note (1)
Video Input (#58) Input Impedance	Zin58	14	20	24	k Ω						AC MEASURE	AC GND	Note (2)
Dynamic Range of Video Input	Vri	2.9	3.4	-	V			—		ADJ		AC GND	Note (3)
Min Output	Vdo1	0.1	0.3	0.6	V								Note (4)
Max Output	Vdo2	7.7	8.1	8.5	V			OPEN					Note (4)
	Vdo3	7.1	7.5	7.9				GND					

VIDEO

CHARACTERISTIC SYMBOL	LIMIT			UNIT	MEASUREMENT							NOTE
	MIN.	TYP.	MAX.		SW & VR SETTING							
					UNI-COLOR CONTROL	SHARPNESS CONTROL	COLOR CONTROL	BRIGHTNESS CONTROL	#56	#58	#54	
White Peak Limit Level	7.3	7.5	7.7	V	MAX	OPEN	MAX	ADJ	AC GND	AC GND	GND	Note (5)
White Peak Slice Level	7.9	8.1	8.3	V							OPEN	Note (6)
Dynamic Range of 2'nd Order Differential Video Input	0.3	0.4	0.6	V	MIN	MAX	MIN		MEASURE			Note (7)
AC Gain (Y)	5.9	7.7	8.9	Times	MAX	MIN			AC GND	INPUT	-	Note (8)
Frequency Characteristic (Y)	8	10	-	MHz		MAX						Note (9)

VIDEO

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT						NOTE	
		MIN.	TYP.	MAX.		SW & VR SETTING							
						UNI-COLOR CONTROL	SHARPNESS CONTROL	COLOR CONTROL	BRIGHTNESS CONTROL	#56	#58		-
Uni-Color Control Adjust Voltage Range (Y)	ΔV_{UY}	1.0	1.5	2.0	V	ADJ	OPEN	MIN	ADJ	AC GND	IN	-	Note (10)
Gain Variation Range by Uni-Color Adjustment (Y)	ΔG_{UY}	20	21	22	dB								Note (11)
Uni-Color Adjustment Control Range (Y)	V_{UY}^C	3.0	3.3	3.6	V								Note (12)
Uni-Color Control Adjust Voltage Range (U,V)	ΔV_{UC}	1.0	1.4	1.8	V			MAX			AC GND		Note (13)
Gain Variation Range by Uni-Color Adjustment (U,V)	ΔG_{UC}	20	21	22	dB								Note (14)
Uni-Color Adjustment Control Range (U,V)	V_{UC}^C	3.0	3.3	3.6	V								Note (15)

VIDEO

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT						NOTE		
		MIN.	TYP.	MAX.		SW & VR SETTING								
						UNI-COLOR CONTROL	SHARPNESS CONTROL	COLOR CONTROL	BRIGHTNESS CONTROL	#56	#58			
Gain of Picture Sharpness Control	Gps	17.0	18.5	20.0	dB	MAX	MAX	MIN	ADJ	INPUT	AC GND	-	Note (16)	
Picture Sharpness Control Range	4V#55	1.8	2.4	3.0	V	MAX	ADJ			INPUT and AC GND	INPUT and AC GND	-	Note (17)	
Half Tone (Y)	4V3T1	-3.5	-3.0	-2.5	dB		OPEN			AC GND	INPUT	-	Note (18)	
	4V3T2	-6.5	-6.0	-5.5										
Half Tone Switching Level (Y)	SW ^{-3dB}	2.7	3.0	3.3	V							-	Note (19)	
	SW ^{-6dB}	4.8	5.1	5.4										
	ACL SW	0.7	1.0	1.2										
Half Tone (U,V)	VR-Y1	-3.5	-3.0	-2.5	dB							-	Note (20)	
	VB-Y1							MAX						AC GND
	VR-Y2	-6.5	-6.0	-5.5										
	VB-Y2													

VIDEO

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT						NOTE	
		MIN.	TYP.	MAX.		SW & VR SETTING							
						UNI-COLOR CONTROL	SHARPNESS CONTROL	COLOR CONTROL	BRIGHTNESS CONTROL	#56	#58		-
Color Control Variable Range	$\Delta V\#7$	1.0	1.4	1.8	V	MAX	OPEN	ADJ	ADJ	AC GND	#58	-	Note (21)
Color Control Center Voltage	V#7C	3.0	3.3	3.6	V								
AC Gain (R-Y)	GR-Y	7.2	10.4	14.8	times			MAX					Note (22)
AC Gain (B-Y)	GB-Y	13.0	18.5	26.2	times								Note (23)
Relative Amplitude (I) PAL/SECAM	$\frac{G-Y}{R-Y}$	-0.56	-0.51	-0.46	-								Note (24)
	$\frac{G-Y}{B-Y}$	-0.21	-0.19	-0.17	-								Note (25)
Relative Amplitude (II) NTSC	$\frac{G-Y}{R-Y}$	-0.35	-0.32	-0.29	-								Note (26)
	$\frac{G-Y}{B-Y}$	-0.24	-0.22	-0.20	-								Note (27)

VIDEO

CHARACTERISTIC SYMBOL	LIMIT			UNIT	MEASUREMENT						NOTE	
	MIN.	TYP.	MAX.		SW & VR SETTING							
					UNI-COLOR CONTROL	SHARPNESS CONTROL	COLOR CONTROL	BRIGHTNESS CONTROL	#56	#58		
Dynamic Range of R-Y Input	2.6	3.2	4.2	V	MIN	OPEN	MAX	ADJ	AC GND	AC GND	-	Note (28)
Dynamic Range of B-Y Input	1.5	1.8	2.4	V								Note (29)
Frequency Response of Color Differential Signal	3	5	-	MHZ	MAX	MIN					-	Note (30)
	0.9	1.0	1.1		times		OPEN					
Brightness Control Adjust Voltage	2.9	3.2	3.5	V								Note (32)

VIDEO

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT						NOTE		
		MIN.	TYP.	MAX.		SW & VR SETTING								
						UNI-COLOR CONTROL	SHARPNESS CONTROL	COLOR CONTROL	BRIGHTNESS CONTROL	#56	#58			
V-BLK Pulse Output Level	VVR	1.0	1.5	2.0	V	MAX	OPEN	MAX	ADJ	AC GND	AC GND	-	Note (33)	
	VVG													
	VVB													
H-BLK Pulse Output Level	VHR	1.0	1.5	2.0	V							-	Note (34)	
	VHG													
	VHB													
DC Restoration Ratio	TDC	95	98	100	%	ADJ		MIN			INPUT		Note (35)	
Mute SW ON Level	V#56S	0.5	0.7	1.0	V	MAX	ADJ	MAX					Note (36)	

DATA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT						NOTE	
		MIN.	TYP.	MAX.		SW & VR SETTING							
						TEXT CONTRAST CONTROL	S47	V53	COLOR CONTROL	SHARP- NESS CONTROL	V48		-
DATA Contrast Control Voltage Range	ΔV_{TC}	1.1	1.6	2.2	V	ADJ	a ↓ b ↓ c	5V	MAX	CENTER	3V		Note (37)
DATA Contrast Gain Variation Range	ΔG_{TC}	11	12	13	dB								
DATA Contrast Control Center Voltage	V_{TC}^C	3.0	3.3	3.6	V								
Input Dynamic Range	V_{DI}	2.0	-	-	Vp-p	MIN							Note (38)
Input Clamp Level	V_{TIN}^{MIN}	4.0	6.0	8.0	V								Note (39)
	V_{TIN}^{MAX}	6.7	7.4	8.1	V	MAX	d						Note (39)
Gain	GT	16	17	18	dB		a ↓ b ↓ c						Note (40)

DATA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT						NOTE	
		MIN.	TYP.	MAX.		SW & VR SETTING							
						TEXT CONTRAST CONTROL	S47	V53	COLOR CONTROL	SHARP- NESS CONTROL	V48		-
Rise Time	τ_R	-	25	-	ns	MAX	a ↓ b ↓ c	5V	MAX	CENTER	3V	-	Note (41)
Propagation Time (Rising Edge)	tPR	-	25	-	ns								
Fall Time	τ_F	-	25	-	ns								
Propagation Time (Falling Edge)	tPF	-	25	-	ns								
DATA Input ON Level	ON V _{TSW}	1.0	-	-	V		a	ADJ					Note (42)
DATA Input OFF Level	OFF V _{TSW}	-	-	0.5	V								

DATA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT							NOTE
		MIN.	TYP.	MAX.		SW & VR SETTING							
						TEXT CONTRAST CONTROL	S47	V53	COLOR CONTROL	SHARP- NESS CONTROL	V48	-	
Video → DATA Switching Time	t _{SVD}	-	40	-	ns	MAX	a ↓ b ↓ c	ADJ	MAX	CENTER	3V	-	Note (43)
DATA → Video Switching Time	t _{SDV}	-	40	-	ns								
Cross Talk DATA → Video	CTT	-43	-50	-	dB			5V ↓ 0V			5V	-	Note (44)
Cross Talk Video → DATA	CTY	-43	-50	-	dB		d	0V ↓ 5V					Note (45)
Band Width of DATA	FT	14	19	-	MHz		a → b → c	5V					Note (46)

DATA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT						NOTE		
		MIN.	TYP.	MAX.		SW & VR SETTING								
						TEXT CONTRAST CONTROL	S47	V53	COLOR CONTROL	SHARP- NESS CONTROL	V48		-	
Clamp Voltage	V44	2.3	3.3	4.3	V	MAX	d	5V	MAX	CENTER	3V	-	Note (47)	
	V45	1.5	2.0	2.5		V	-	-	0V	-	-	-		Note (48)
	V46	0.76	0.86	0.96			μs	-	-	0V	-	-		
Blanking Input Threshold Voltage	ON VBLK	-	0.35	0.5	μs	-		-	0V	-	-	-	-	Note (49)
	OFF t _{dB} P	0.76	0.86	0.96		-	-	0V	-	-	-	-	-	

CHROMA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT										NOTE
		MIN.	TYP.	MAX.		SW & VR SETTING										
						2&64	13	15	18	20	22	23	27	35		
Chroma Amplitude	V13pc	0.10	0.15	0.22	Vp-p	-	OFF	-	C	B	A	B	A	A	Note (50)	
	V13nc3.58	0.11	0.17	0.25		-	-	-	-	-	B	A	-	-		
ACC Characteristic	eapc	0.03	0.06	-	Vp-p	-	-	-	-	-	A	-	-	-	Note (51)	
	A	0.90	1.00	1.30		-	-	-	-	-	-	-	-	-		
Delay Line Amp Gain	V14pc	0.96	1.20	1.92	Vp-p	-	-	-	-	-	-	-	-	-	Note (52)	
	GDL	15.0	18.0	21.0		-	ON & OFF	-	-	-	-	-	-	-		
Tint Control Voltage	V15	5.50	6.00	6.50	V	ON	ON	ADJ	A	A	B	B	A	Note (53)		
Tint Control Voltage Range	V15	1.50	2.20	2.90		-	-	-	-	-	-	-	-		-	
Tint Control Range	4θ ₁₅ ^{3.58n}	77	101	131	-	-	-	-	-	-	-	-	-	-		
	4θ ₁₅ ^{4.43n}	65	90	121		-	-	-	-	-	-	-	-		-	
Tint Control Symmetricity	4θ ₁ ^{3.58n}	35	51.8	-	-	-	-	-	-	-	-	-	-	-		
	4θ ₁ ^{4.43n}	30	41.9	-		-	-	-	-	-	-	-	-		-	
Tint Control Symmetricity	4θ ₂ ^{3.58n}	35	49.4	-	-	-	-	-	-	-	-	-	-	-		
	4θ ₂ ^{4.43n}	30	47.3	-		-	-	-	-	-	-	-	-		-	

CHROMA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT								NOTE		
		MIN.	TYP.	MAX.		SW & VR SETTING										
						2&64	13	15	18	20	22	23	27		35	
4.43 APC Pull In & Hold Range	f4PH	0.4	0.6	1.0	kHz	ON	ON	OFF	C	B	B	B	OFF	A	A Note (54)	
	f4PL															
	f4HH															
	f4HL															
3.58 APC Pull In & Hold Range	f3PH	0.4	0.6	1.0	kHz										Note (55)	
	f3PL															
	f3HH															
	f3HL															
Frequency Control Sensitivity	β 4.4	3.0	4.2	5.4	Hz/mV						A		A	Note (56)		
	β 3.5	3.0	4.2	5.4						C		B				
APC Pull-In Voltage	V25-4	5.9	6.0	6.1	V					B		OFF	OFF	Note (57)		
	V25-3	5.9	6.0	6.1												
APC Pull-In Sweep Amplitude	SV1	6.35	6.50	6.70	V									Note (58)		
	SV2	5.20	5.45	5.60						C		B	B			
	SV3	0.7	1.0	1.3												
APC Pull-In Sweep Period	t1	7	16	25	ms											
	t2	60	80	100												
	t3	67	96	125												

CHROMA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT								NOTE	
		MIN.	TYP.	MAX.		SW & VR SETTING									
						2&64	13	15	18	20	22	23	27		35
Color Difference Output	V2PR	0.29	0.4	0.62	Vp-p	ON	ON	ON	A	A	A or OFF	B or OFF	A or OFF	B	Note (59)
	V64PB														
	V2nR	0.46	0.68	1.00	-										
	V2NR	0.42	0.61	0.90	-		ADJ								
	V64nB	0.33	0.44	0.65	-										
	V64NB	0.27	0.39	0.57	-										
Relative Amplitude	V2PR	0.85	1.00	1.15	-										Note (60)
	V64PB														
	V2nR	1.32	1.53	1.77	-										
	V2NR														
Relative Phase	θ 2PR	85	90	95	deg										Note (61)
	θ 2nR	102	109	116											
	θ 2NR														
Characteristics of SECAM Limitter	e18	20	30	44											Note (62)
	e13	310	460	670	mVp-p	OFF	OFF	OFF	B	C	B	A	A	B	
	e13	-50	0	50											
SECAM Color Difference Output	V2SR	0.68	1.0	1.47	Vp-p										Note (62)
	V64SB	0.48	0.71	1.04		ON			A	A	B or OFF	A or OFF	B or OFF	B	

CHROMA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT								NOTE	
		MIN.	TYP.	MAX.		SW & VR SETTING									
						2&64	13	15	18	20	22	23	27		35
SECAM Relative Amplitude	V2S ----- V64S	1.00	1.15	1.33	-	ON	OFF & ON	OFF	B	C	B	OFF or A	B	A or OFF	Note (63)
		0.80	1.15	-	MHz										
Band Width of SECAM Demodulated Signal	V2SRC	0.68	1.0	1.47	Vp-p		ON		A	A	B or OFF	A or OFF	B or OFF	B	Note (65)
	V2E	-	-	46	mVp-p										
	RC	30	-	-	dB										
	V64SBC	0.48	0.71	1.04	Vp-p										
	V64E	-	-	33	mVp-p										
SECAM Cross Talk	BC	30	-	-	dB										
	V18-50	4.20	4.50	4.80	V								A or OFF	A or OFF	Note (66)
50/60 Detection	V18-60	7.00	7.30	7.60	V				C						

CHROMA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	MEASUREMENT								NOTE	
		MIN.	TYP.	MAX.		SW & VR SETTING									
						2&64	13	15	18	20	22	23	27		35
IDENT Input Level	PIN B/W	0.6	1.0	1.7	mVp-p	ON	ON	-	C	A	OFF	B	OFF	A	Note (67)
	NIN B/W	0.4	0.7	1.3		OFF	B	C	OFF	B	OFF	B	OFF	B	Note (68)
	SIN B/W	0.6	1.0	1.7		-	C	A	OFF	B	OFF	B	OFF	B	Note (69)
	PIN COLOR	0.6	2.5	4.3		OFF	B	C	OFF	B	OFF	B	OFF	B	Note (70)
	NIN COLOR	0.4	1.8	3.1		-	C	A	OFF	B	OFF	B	OFF	B	Note (71)
	SIN COLOR	0.6	1.0	1.7		-	C	A	OFF	B	OFF	B	OFF	B	Note (72)
IDENT Voltage	PC	-	6.4	-	V	OFF	-	-	C	A	OFF & ADJ	B	OFF A & ADJ	OFF & ADJ	Note (73)
	PS	-	6.4	-		OFF	B	C	OFF	B	OFF & ON ADJ	OFF & ON ADJ	B	Note (73)	
	NC	-	6.4	-		OFF	B	C	OFF	B	OFF & ON ADJ	OFF & ON ADJ	B	Note (73)	
	NS	-	6.4	-		OFF	B	C	OFF	B	OFF & ON ADJ	OFF & ON ADJ	B	Note (73)	
	SC	-	6.4	-											

CHROMA

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	SW10	SW11	SW20	RECEIVING SYSTEM
		MIN.	TYP.	MAX.					
Output Voltage of SW I (#10)	VSI	5.4	6.0	6.6	V	a	a	a	PAL SECAM
		0	0	0.4					
Output Voltage of SW II (#11)	VSI	5.4	6.0	6.6	V				PAL, 4.43NTSC
		1.6	2.0	2.8					
Output Voltage of SW III (#21)	VSI	0	0	0.4	V				SECAM, B/W I
		1.6	2.0	2.8					
Output Voltage of SW III (#21)	VSI	0	0	0.4	V				3.58NTSC, B/W II
		1.6	2.0	2.8					
Output Voltage of SW III (#21)	VSI	0	0	0.4	V				PAL, SECAM, NTSC
		0	0	0.4					

DEFLECTION

CHARACTERISTIC	SYMBOL	LIMIT			UNIT	NOTE
		MIN.	TYP.	MAX.		
Sync Separation Input Current Sensitivity	IIN33	35	50	65	μ A	Note (74)
H.AFC Phase Detection Current	IDET	0.45	0.55	0.7	mA	Note (75)
Phase Detection Masked Period	TC060	-	258.25 ~5.75	-	H	Note (76)
	TC050	-	308.25 ~5.75	-		
32f _H VCO Oscillation Stage Voltage	VON37	3.0	4.0	4.5	V	Note (77)
Horizontal Output Start Voltage	VON39	4.6	5.0	5.4	V	Note (78)
Horizontal Free Running Frequency	f _o	15.475	15.625	15.775	kHz	Note (79)
Horizontal Frequency Oscillation Range	f _{max}	16.40	16.45	16.60	kHz	Note (80)
	f _{min}	14.70	15.00	15.25		Note (81)
Horizontal Frequency Control Sensitivity	β _H	1.8	2.1	2.4	kHz/V	Note (82)
Horizontal Output Duty Ratio	T039	40	42	44	%	Note (83)
X-ray Protection Threshold Voltage	VI52	1.1	1.3	1.5	V	Note (84)
X-ray Protection Hold Voltage	VH52	-	-	2.5	V	Note (85)
X-ray Protector Current Sensitivity	II52	-	-	2.5	μ A	Note (86)
Horizontal Output Voltage	VH39	4.8	5.1	5.4	V	Note (87)
	VL39	-	0	0.1		
Vertical Output Pulse Width	T031	-	10	-	H	Note (88)
Vertical Amplifier Gain	G _v	17	20	23	dB	Note (89)
Vertical Output Dynamic Range	VH29	3.0	3.5	4.0	V	Note (90)
	VL29	-	0	0.1		Note (91)
Max Output Current of Vertical Ramp Generator	I _{max} 31	12	15	-	mA	Note (92)
Pull In Range of Vertical Oscillator	V _{pull}	-	248.5 ~353	-	H	Note (93)
60Hz Detector Ident Range	V _{pull} 60	-	248.5 ~288	-	H	Note (94)
Vertical Blanking Pulse Width	TB60	-	16	-	H	Note (95)
	TB50	-	21	-		Note (96)
Phase of Gate Pulse NTSC/PAL	TPNI	-	0.6	-	μ s	Note (97)
	TPNII	-	3.1	-		
Phase of Gate Pulse SECAM	TSI	-	2.0	-	μ s	Note (98)
	TSII	-	4.8	-		

NOTE(1)

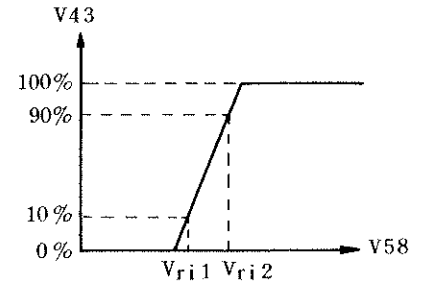
- (1) Measure DC Voltage of #56 (V#56A).
- (2) Measure DC Voltage of #56 connecting 10kΩ to GND (V#56B).
- (3) $Z_{in\#58} = 1 \times 10^4 \times \left(\frac{V\#56A}{V\#56B} - 1 \right)$

NOTE(2)

- (1) Measure DC Voltage of #58 (V#58A).
- (2) Measure DC Voltage of #58 connecting 20kΩ to GND (V#58B).
- (3) $Z_{in\#58} = 2 \times 10^4 \times \left(\frac{V\#58A}{V\#58B} - 1 \right)$

NOTE(3)

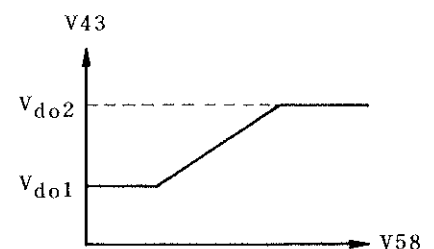
- (1) Adjust Brightness Control V.R. to get 3.0V at #43 during trace period.
- (2) Measure the Voltage of #46, and apply the voltage to #46.
- (3) Measure the Voltage of #57, and apply the voltage to #57.
- (4) Vary the DC Voltage of #58 and measure the changes at #43.
- (5) Measure input voltage at #58, which give 10% (Vri1) and 90% (Vri2) of #43.



$$V_{ri} = V_{ri2} - V_{ri1}$$

NOTE(4)

- (1) Adjust Brightness Control V.R. to get 3,0V at #43 during trace period.
- (2) Measure the Voltage of #46, and apply the voltage to #46.
- (3) Measure the Voltage of #57, and apply the voltage to #57.
- (4) Vary the DC voltage of #58 to change output at #43.
- (5) Measure the Min. Voltage (Vdo1) and Max. Voltage (Vdo2) at #43.
- (6) Measure same voltage of RED and GREEN output same as BLUE.



NOTE(5)

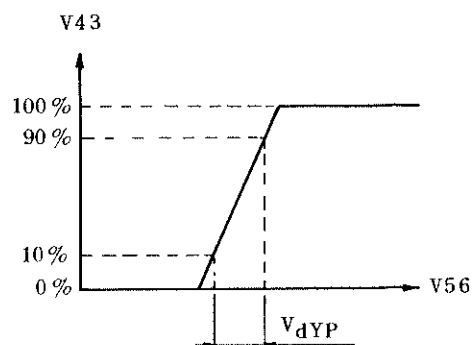
- (1) Adjust Brightness Control V.R. to get 3.0V at #43 during trace period.
- (2) Apply Signal-2 and increase amplitude gradually from 0.
- (3) Read the amplitude of #43 when #59 voltage start to change.

NOTE(6)

- (1) Adjust Brightness Control V.R. to get 3.0V at #43 during trace period.
- (2) Connect #54 to GND.
- (3) Same as above (2).
- (4) Measure the voltage of #43 clipped.

NOTE(7)

- (1) Adjust Brightness Control V.R. to get 3.0V at #43 during trace period.
- (2) Measure the Voltage of #46, and apply the voltage to #46.
- (3) Measure the Voltage of #57, and apply the voltage to #57.
- (4) Vary the DC voltage of #56 to measure the dynamic range at #43.
- (5) Measure the DC voltage of #56 which gives the output voltage of 10% and 90% at #43 respectively.



NOTE(8)

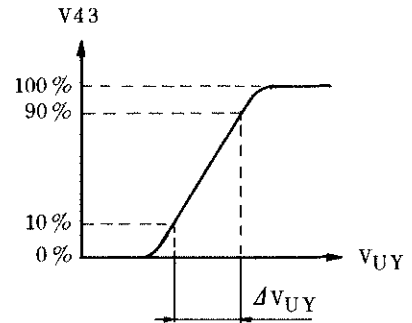
- (1) Adjust Brightness Control V.R. to get 3V at #43 during trace period.
- (2) Apply 0.3Vp-p Input Signal-2 to #58.
- (3) Read the output signal at #43.
- (4) $G_v = V_{43} \times 2$

NOTE(9)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply 0.3Vp-p/100kHz and 0.3Vp-p/8MHz Signal-1 to #58.
- (3) Read the output signal at #43.
- (4) Measure the frequency of -3dB point.

NOTE(10)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply 0.3Vp-p to #58.
- (3) By changing Uni-Color V.R. and measure the dynamic range at #43.
Measure the dynamic range of Uni-Color Control, which give 100% and 90% at #43.



NOTE(11)

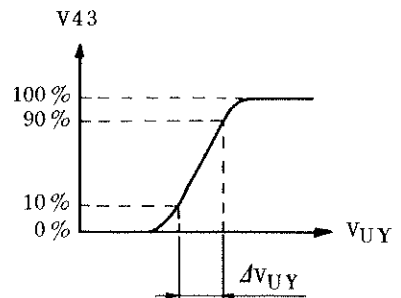
- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply 0.3V Signal-2 to #58.
- (3) Read the output signal of MIN.(V_{43MIN}) and MAX.(V_{43MAX}) at #43.
- (4) $\Delta G_{UY} = 20 \log(V_{43MAX}/V_{43MIN})$ dB

NOTE(12)

- (1) Same as above.
- (2) Same as above.
- (3) Same as above.
- (4) Measure the voltage at #59 which gives output of $(V_{43MAX} + V_{43MIN})/2$ at #43.

NOTE(13)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-2 (0.1Vp-p) to #62.
- (3) Calculate the difference voltage of #59 and 90% of #43 output signal.



NOTE(14)

- (1) Same as above.
- (2) Same as above.
- (3) Read the #43 output signal when set Uni-Color V.R. MAX (V_{43MAX}) and MIN (V_{43MIN}).
- (4) $\Delta G_{UC} = 20 \log(V_{43MAX}/V_{43MIN})$

NOTE(15)

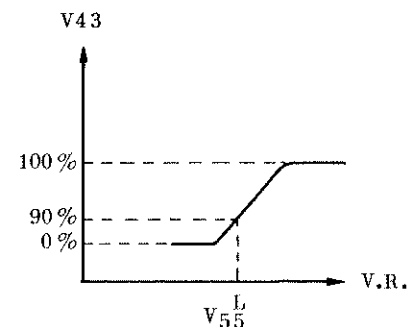
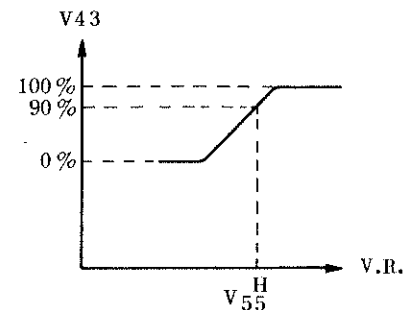
- (1) Same as NOTE (14).
- (2) Same as NOTE (14).
- (3) Same as NOTE (14).
- (4) Measure #59 voltage which gives $(V_{43MAX}+V_{43MIN})/2$ to #43.

NOTE(16)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-3 30mV to #56 through 10 μ F capacitor.
- (3) Measure #43 signal output.
- (4) Calculate Gain g.
- (5) $4G_{ps}=20\log(g/Gy)$ dB

NOTE(17)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-1 (30mV signal during trace period & 10kHz) to #56 and #58 AC grounded.
- (3) Measure #55 Control Voltage which gives 90% level of #43 Output Voltage dynamic range. (V_{55}^H)
- (4) Apply Signal-1 (0.3V, 2.4MHz) to #58 and #56 AC grounded.
- (5) Same as (3), measure #55 Control Voltage which gives 10% level of #43 Output dynamic range. (V_{55}^L)
- (6) $4V_{55}=V_{55}^H-V_{55}^L$



NOTE(18)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-2 (0.3Vp-p) to #58.
- (3) Measure #43 Output Voltage when applied 0V to #54. (V_{43}^1)
- (4) Measure #43 Output Voltage when applied 1V to #54. (V_{43}^2)
- (5) Measure #43 Output Voltage when applied 3V to #54. (V_{43}^3)
- (6) $4V_{3T1}=20\log(V_{43}^2/V_{43}^1)$ dB
- (7) $4V_{3T2}=20\log(V_{43}^3/V_{43}^1)$ dB

NOTE(19)

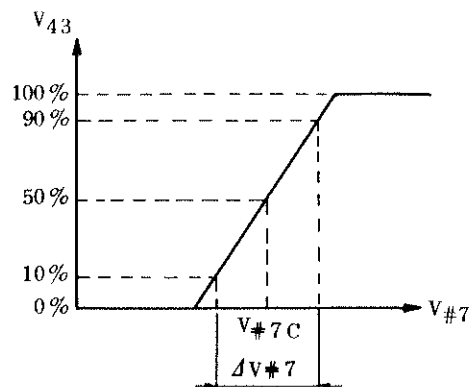
- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-2 (0.3Vp-p) to #58.
- (3) Vary the #54 Control Voltage and measure the #54 voltage which give #43 output voltage down by 3dB. (S_W^{-3dB})
- (4) Vary the #54 Control Voltage and measure the #54 voltage which give #43 output voltage down by 6dB. (S_W^{-6dB})

NOTE(20)

- (1) Set the Brightness Control V.R. to get 3V at #41 during trace period.
- (2) Apply Signal-2 (0.2Vp-p) to #60.
- (3) Measure the #41 Output (V_{41}^1) when applied 0V to #54.
- (4) Measure the #41 Output (V_{41}^2) when applied 1V to #54.
- (5) Measure the #41 Output (V_{41}^3) when applied 3V to #54.
- (6) $\Delta V_{R-Y1} = 20 \log(V_{41}^2/V_{41}^1)$ dB
- (7) $\Delta V_{R-Y2} = 20 \log(V_{41}^3/V_{41}^1)$ dB
- (8) Apply Signal, 0.1Vp-p, to #62.
- (9) As same as (3) measure #43 output (V_{43}^1).
- (10) As same as (4) measure #43 output (V_{43}^2).
- (11) As same as (5) measure #43 output (V_{43}^3).
- (12) $\Delta V_{B-Y1} = 20 \log(V_{43}^2/V_{43}^1)$ dB
- (13) $\Delta V_{B-Y2} = 20 \log(V_{43}^3/V_{43}^1)$ dB

NOTE(21)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-2 (0.1Vp-p) to #62.
- (3) Changing Color V.R. and making MAX output (100%) and MIN output (0%), measure the color control variable range ($\Delta V_{\#7}$) which is the difference of color control voltage between 10% and 90% of its output.



NOTE(22)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-2 (0.2Vp-p) to #60.
- (3) Read the #41 output signal (V_{41}).
- (4) $G_{R-Y} = 20 \log(V_{41}/0.2)$ dB

NOTE(23)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-2 (0.1Vp-p) to #62.
- (3) Read the #43 output signal (V_{43}).
- (4) $G_{B-Y} = 20 \log(V_{43}/0.1)$ dB

NOTE(24)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-3 (0.2Vp-p) to #60.
- (3) Read the output signal at #42 (V_{42}).
- (4) $G-Y = V_{42}/0.2$
- (5) $G-Y/R-Y = -G_{G-Y}/G_{R-Y}$

NOTE(25)

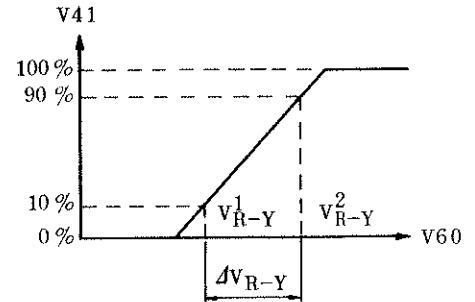
- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-3 (0.1Vp-p) to #62.
- (3) Read the output signal at #42 (V_{42}).
- (4) $G_{G-Y} = V_{42}/0.1$
- (5) $G-Y/B-Y = -G_{G-Y}/G_{B-Y}$

NOTE(26)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-3 (0.2Vp-p) to #60.
- (3) Connect 10k Ω between #22 and GND.
- (4) Read the output signal at #42. (V_{42})
- (5) $G_{G-Y} = V_{42}/0.2$
- (6) $G-Y/R-Y = -G_{G-Y}/G_{R-Y}$

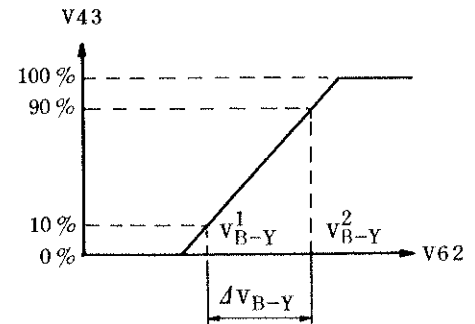
NOTE(27)

- (1) Adjust Brightness V.R. to get 3V at #43 during trace period.
- (2) Apply Signal-3 (0.1Vp-p) to #62.
- (3) Connect 10kΩ between #22 (P-Ident) and GND.
- (4) Read the output signal at #42. (V42)
- (5) $G_{G-Y} = V_{42} / 0.1$
- (6) $G_{-Y/B-Y} = -G_{G-Y} / G_{B-Y}$



NOTE(28)

- (1) Set the Brightness Control V.R. to get 4.0V at #41 during trace period.
- (2) Measure #44 DC Voltage and apply it to #44.
- (3) Vary the #60 DC Voltage.
- (4) Measure #60 DC Voltages, which give DC Voltages of 90% (V_{R-Y}^2) and 10% (V_{R-Y}^1) to #41 of its Dynamic Range.
- (5) $\Delta V_{R-Y} = V_{R-Y}^1 - V_{R-Y}^2$



NOTE(29)

- (1) Set the Brightness Control V.R. to get 4.0V at #43 during trace period.
- (2) Measure #46 DC Voltage and apply it to #46.
- (3) Vary the #62 DC Voltage.
- (4) Measure #62 DC Voltages, which give DC Voltages of 90% (V_{B-Y}^2) and 10% (V_{B-Y}^1) to #43 of its Dynamic Range.

NOTE(30)

- (1) Set the Brightness Control V.R. to get 3.0V at #43 during trace period.
- (2) Apply Signal-1 (0.1V, 100kHz/5MHz) to #62.
- (3) Measure the output signal at #43 (V43).
- (4) Apply same signal as (2) to #60.
- (5) Measure the output at #41 (V41) and #42 (V42).
- (6) Measure the frequency of -3dB point.

NOTE(31)

- (1) Same as NOTE (30).
- (2) Measure #43 voltage when increased Brightness control voltage by 1.0V during trace period ($V_{\#43}$).
- (3) $G_{BR}=20\log((V_{\#43}-3.0)/1.0)$ dB

NOTE(32)

- (1) Same as above.
- (2) Measure the #48 voltage ($V_{\#48}$).

NOTE(33)

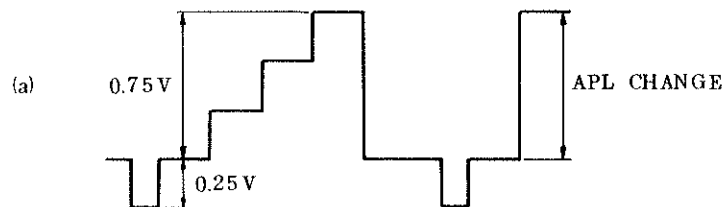
- (1) Measure #41 V-Blanking pulse voltage (V_{VR}).
- (2) Measure #42 V-Blanking pulse voltage (V_{VG}).
- (3) Measure #43 V-Blanking pulse voltage (V_{VB}).

NOTE(34)

- (1) Measure #41 H-Blanking pulse voltage (V_{HR}).
- (2) Measure #42 H-Blanking pulse voltage (V_{HG}).
- (3) Measure #43 H-Blanking pulse voltage (V_{HB}).

NOTE(35)

- (1) Set the Brightness Control V.R. to get 3.0V at #43 during trace period.
- (2) Apply 3-step signal(a) to #58.
- (3) Adjust Uni-color V.R. so that amplitude of output signal(#43) is 1.25V.
- (4) Vary the APL of input signal from 10% to 90%.
- (5) Measure the variation of pedestal level(ΔV_p) with APL change.
- (6) $T_{DC}=(1-\Delta V_p) \times 100$ (%)

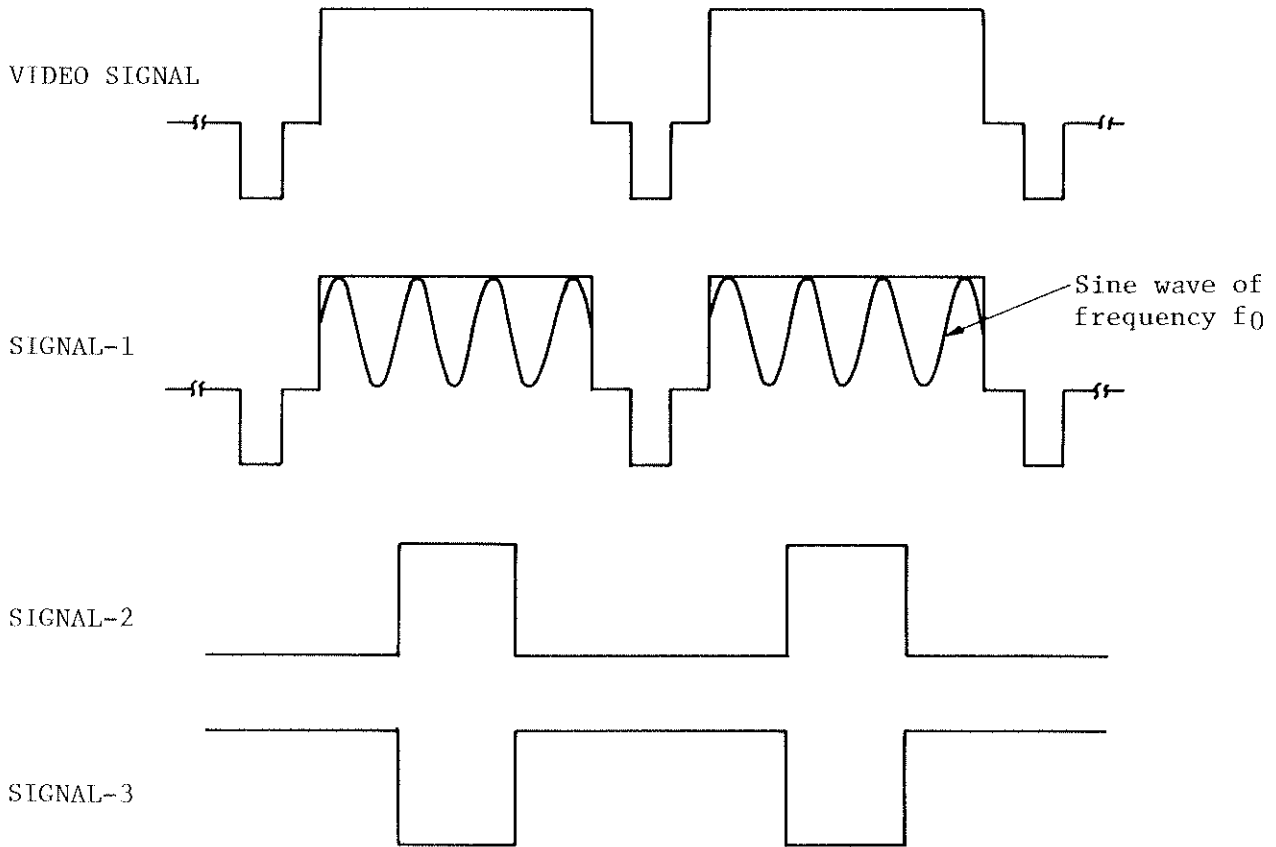


INPUT SIGNAL OF #58

NOTE(36)

- (1) Adjust the Brightness control V.R. to get 3.0V at #43 during trace period.
- (2) Decreasing #55 voltage, read the #55 voltage which causes #59 to start to change.

INPUT SIGNAL WAVE FORM OF VIDEO SECTION



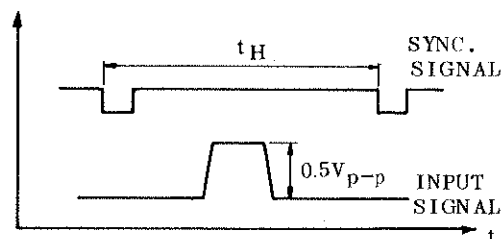
NOTE(37)

- (1) Apply Fig.(a) signal to #47, and measure the output signal at #41.
- (2) Measure the DATA output signal level V_{max} , when DATA contrast maximum, and the V_{min} when DATA contrast minimum. Then calculate the DATA contrast gain variation range.

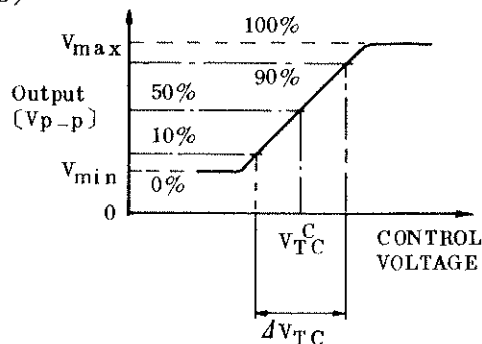
$$\Delta G_{TC} = 20 \log(V_{max}/V_{min})$$

- (3) Calculate the DATA contrast control voltage range ΔV_{TC} and DATA contrast control center voltage V_{TC}^C as Fig.(b).

(a)



(b)



NOTE(38)

- (1) Apply signal of Fig.(a) to #47, #49 and #51.
- (2) Increase the input signal and measure the input signal level when the output signal saturates to increase.
- (3) V_{DI} is the input signal level which gives 90% of output signal.

NOTE(39)

- (1) Measure the DC voltage of #47, #49, #51.

NOTE(40)

- (1) Apply signal of Fig.(a) to #47, #49, #51.
- (2) Measure the output V_0 at #41, #42 and #43.
- (3) $G_T = 20 \log(V_0/0.5)$ dB

NOTE(41)

- (1) Apply DATA input signal of 0.5Vp-p to #47, #49 and #51.
- (2) Measure the τ_R, t_{PR}, τ_F and t_{PF} at #41, #42 and #43 as defined in Fig.(b).

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NOTE(42)

- (1) Apply signal of Fig.(a) (ΔG_{TC}) to #47.
- (2) Read the output signal (V_0) at #41 when applied 5V to #53.
- (3) Increase V_{53} from 0V, and measure the V_{53} (V_{TSW}^{ON}) which gives #41 same voltage as V_0 .
- (4) Then decrease the V_{53} , and measure the V_{53} (V_{TSW}^{OFF}) which gives #41 as 0V.

NOTE(43)

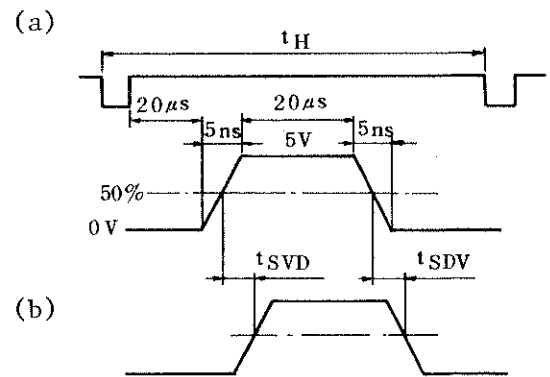
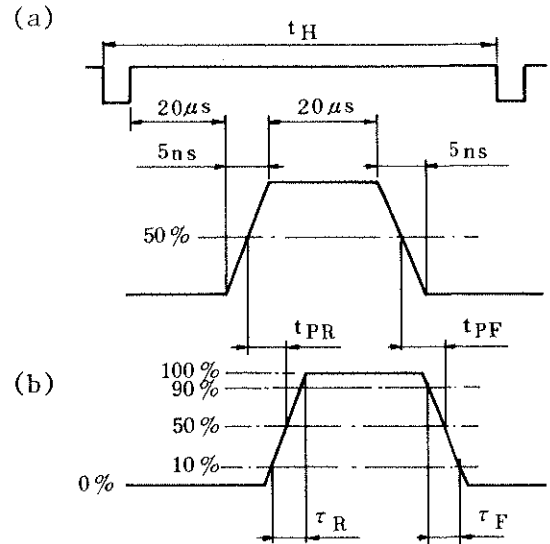
- (1) Measure #47 voltage and apply #47 the voltage +0.5V.
- (2) Apply input signal of Fig.(a) to #53 and measure t_{SVD} and t_{SDV} in Fig.(b) at #41.
- (3) Measure same as (2) with #49,#42 and #51,#43.

NOTE(44)

- (1) Same as above.
- (2) Read #41 output signal (V_{41}) when applied 5V to #53.
- (3) Measure maximum output (V_0) among #41,#42 and #43.
- (4) $CT_T = 20 \log(V_0/V_{\#41})$
- (5) Repeat same procedure changing input to #49 (output #42) and #51 (output #43).

NOTE(45)

- (1) Apply sine wave of 1MHz, 0.5Vp-p to #58.(Y)
- (2) Measure output (V_{or}) at #41,#42 and #43.
- (3) Measure the maximum output (V_{oc}) level among #41,#42 and #43.
- (4) $CT_Y = 20 \log(V_{oc}/V_{or})$



NOTE(46)

- (1) Apply Sine-wave signal (0.5Vp-p, 500kHz) to #47.
- (2) Measure the output level at #41 (V_{41} at 500kHz).
- (3) Vary the input frequency from 500kHz to 30MHz.
- (4) Measure the frequency when the output level is -3dB of V_{41} at 500kHz.
- (5) Measure the -3dB frequencies at #42 and #43 with same manner.

NOTE(47)

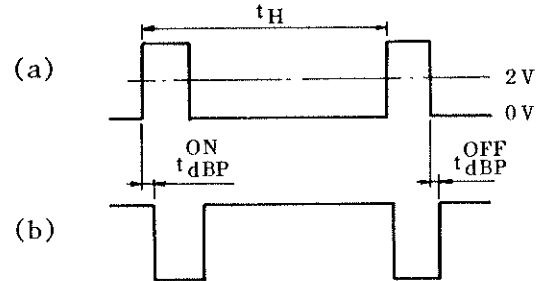
- (1) Measure the DC voltage of #44, #45, and #46.

NOTE(48)

- (1) Increase the height of the BLK pulse at #35 from 0V to 5V and measure the threshold voltage of the BLK pulse when blanking outputs appear at the output terminals #41, #42, and #43.

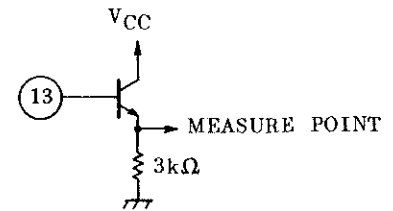
NOTE(49)

- (1) Apply signal of Fig.(a) to #35, and measure t_{dBP}^{ON} and t_{dBP}^{OFF} of the output signal at #41, #42, and #43.



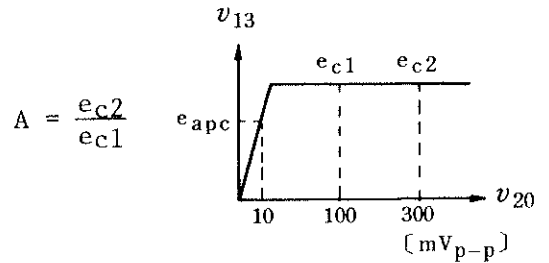
NOTE(50)

- (1) Apply 100mVp-p Burst/Chroma signal to #20 (Chroma:Burst=1:1).
- (2) Color Mode
- (3) In case of PAL mode, connect #14 to VCC.



NOTE(51)

- (1) Apply 10mVp-p, 100mVp-p, and 300mVp-p Burst/Chroma signal to #20 (Chroma: Burst=1:1).
- (2) Measure the output level at #13 for each input.
- (3) PAL Color Mode



NOTE(52)

- (1) Apply 100mVp-p Burst/Chroma signal to #20 (Chroma:Burst=1:1). Measure the output level of #14(V_{14PC}).
- (2) PAL Color Mode
- (3) Measure the output of #14 when the capacitor of #13(1μF) is removed and the line between #12 and #13 is opened.

$$G_{DL} = 20 \log(V_{14PC}/V_{13PC})$$

- (4) In the measurement of V_{14PC}, connect #13 to VCC.

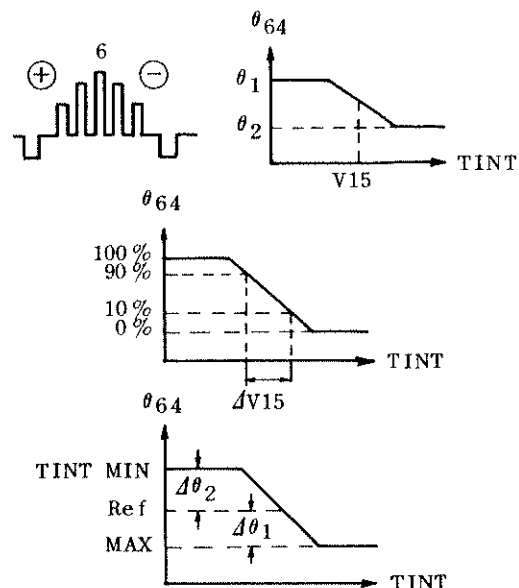
NOTE(53)

- (1) Apply "10" color bar signal (3.58/4.43).
- (2) Adjust Tint control V.R. so that the 6th color bar output of (B-Y) is the maximum.
- (3) Plot the phase change(θ) vs. the tint control voltage V₁₅.

$$V_{15} = \frac{1}{2} (\theta_1 + \theta_2)$$

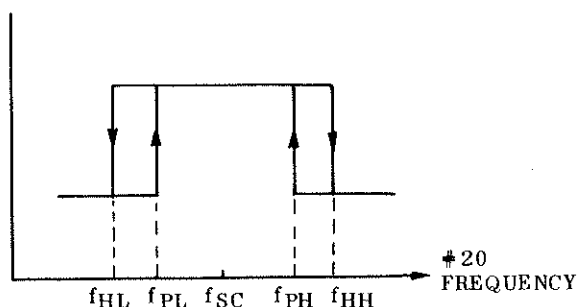
$$\Delta\theta_1 = |\text{Ref} - \text{Tint Max}|$$

$$\Delta\theta_2 = |\text{Tint Min} - \text{Ref}|$$



NOTE(54)

- (1) Apply 4.43MHz 0.1Vp-p CW to #20.
- (2) Increase the CW frequency monitoring the wave shape of the terminal 25 with synchroscope.
- (3) Measure the CW frequency of f_{HH} when the terminal 25 wave shape changes from DC to sweeping.
- (4) Then, decrease the CW frequency of f_{PH} when the terminal 25 wave shape changes from sweeping to DC.
- (5) Continue to decrease the CW frequency and measure the frequency of f_{HL} when the terminal 25 wave shape changes from DC to sweeping again.
- (6) Then increase the CW frequency and measure the frequency of f_{PL} when the terminal 25 wave shape changes from sweeping to DC.



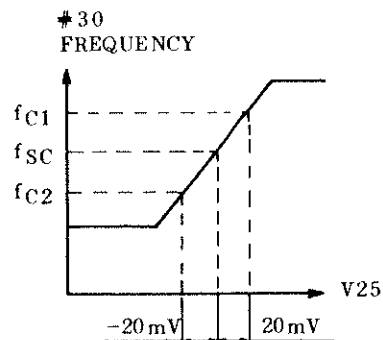
NOTE(55)

- Apply 3.58MHz 0.1Vp-p CW to #25.
Measure f_{HH}, f_{PH}, f_{HL} and f_{PH} with same manner above.

NOTE(56)

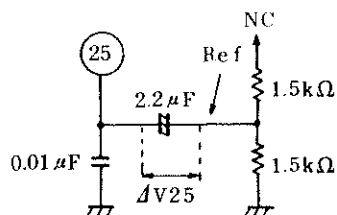
- Apply DC voltage to #25.
Adjust the DC voltage so that #30 frequency is equal to f_{SC} (4.43 or 3.58MHz sub-carrier frequency).
Then change the DC voltage by $\pm 20mV$, and measure the #30 frequency f_{C1} and f_{C2} .

$$\beta_{4.4}(\beta_{3.5}) = \frac{f_{C1} - f_{C2}}{40}$$



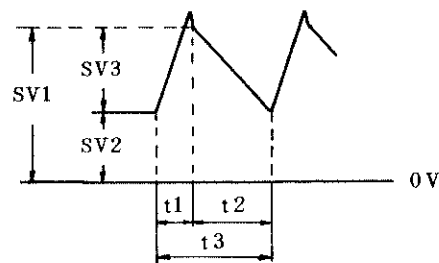
NOTE(57)

- Apply Burst signal (100mVp-p, 4.43/3.58) to #20.



NOTE(58)

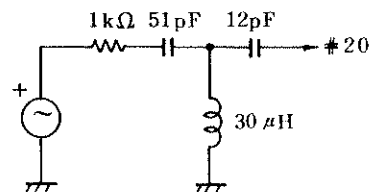
- B/W Mode
- Measure #25 terminal wave form.



NOTE(59)

- Apply "10" color bar signal.
- In case of NTSC, change chroma band pass filter as;

$$n \dots 3.58NTSC \quad N \dots 4.43NTSC$$

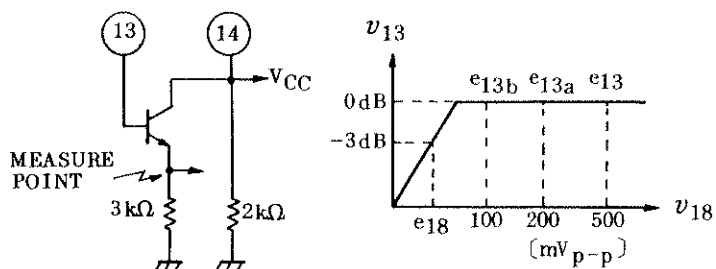


NOTE(60)

- Calculate the ratio of (R-Y) and (B-Y) output signal.
The test condition is same as NOTE(59).
- Adjust Tint control V.R. so that the 6th color bar output of (B-Y) is the maximum.
- Measure phase difference between (R-Y) output and (B-Y) output.

NOTE(61)

- (1) Connect #14 to VCC.
- (2) Apply 4.4MHz CW to #18.
Vary the input level, then measure the output level at #13 through Emitter follower.
- (3) SECAM Mode
e18; Input level for -3dB down from e13.



NOTE(62)

- (1) Apply 75% SECAM standard color bar signal.

NOTE(63)

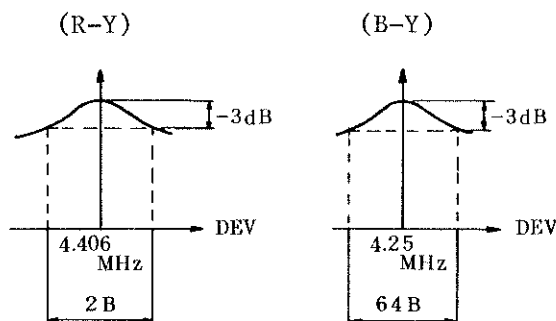
- (1) Apply FM 100kHz deviation, fm 1kHz 100dBμ signal to #18.
- (2) $f_{OR}=4.406\text{MHz}$, $f_{OB}=4.25\text{MHz}$
- (3) H.Pulse is not applied to #35.
- (4) SECAM Mode

* Before measurement, the outputs offset should be removed by adjusting demodulator coils.

NOTE(64)

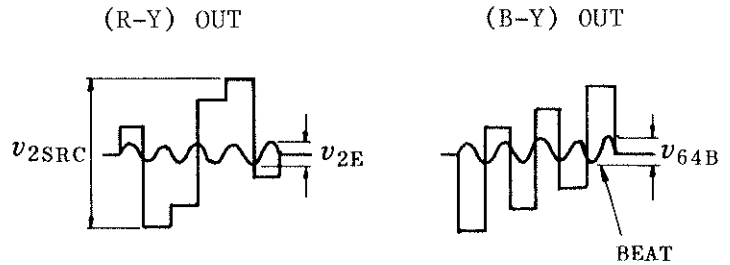
- (1) Apply FM 100kHz deviation, fm 1kHz, 100dBμ signal to #18.
Vary the frequencies of f_{OB} and f_{OR} . Measure -3dB band width at color difference signal outputs.

- (2)-(4) Same as above.



NOTE(65)

- (1) Apply 75% SECAM standard color bar signal to #18.
- (2) Measure v_{2E} , the amplitude of the beat signal ($f_{OR}-f_{OB}$).
- (3) Measure v_{2SRC} , demodurated color signal amplitude.
 $RC=20\log(v_{2E}/v_{2SRC})$

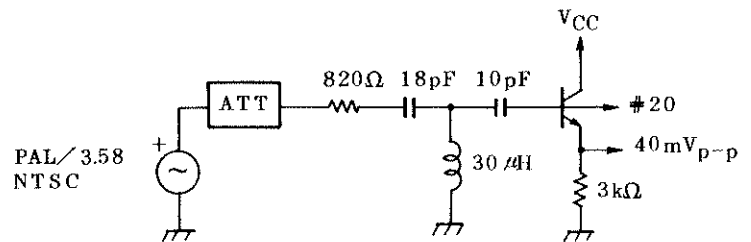


NOTE(66)

- (1) Measure DC voltage at #18.
 V_{18-50} (PAL receiving)
 V_{18-60} (NTSC receiving)

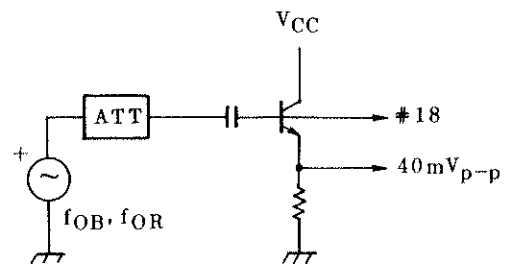
NOTE(67)

- (1) Apply 40mVp-p (0dB) burst signal to #20 through an attenuator, chroma take off coil and Emitter follower.
- (2) Decrease the input level and measure the amplitude when killer operates.



NOTE(68)

- (1) Apply f_{OB}, f_{OR} of 40mVp-p signals to #18.
Measure the amplitude when Color Killer operates.



NOTE(69)

- (1) Test condition is same as PINB/W, NINB/W.
- (2) Attenuate the input burst level up to killer operating level.
Then increase the input burst level and measure the amplitude when the color appears.

NOTE(70)

- (1) Test condition is same as S_{INB}/W .
- (2) Same as NOTE (69).

NOTE(71)

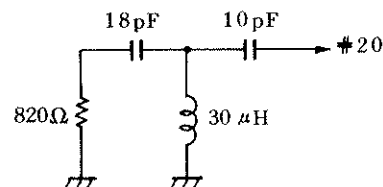
- (1) Change the Chroma and take off coil as follows;
- (2) (a) Connect #27 to V_{CC} through $10k\Omega$.

Apply DC voltage to #22.

Vary the DC voltage from 7V to 5V monitoring the terminal 25 with synchroscope, and measure the voltage(PC) when killer works.

- (b) Apply DC voltage to #22 and #27 simultaneously.

Vary the DC voltage from 7V to 5V monitoring the terminal 25 with synchroscope and measure the DC voltage(PS) when #25 starts sweeping.



NOTE(72)

- (1) Same as above.
- (2) (a) Apply DC voltage to #27.

Vary the DC voltage from 7V to 5V monitoring the terminal 25 with synchroscope, and measure the voltage(NC) when killer works.

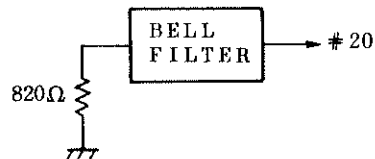
- (b) Apply DC voltage to #27 simultaneously.

Vary the DC voltage from 7V to 5V monitoring the terminal 25 with synchroscope and measure the DC voltage(NS) when #25 starts sweeping.

NOTE(73)

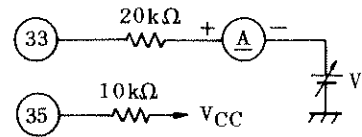
- (1) Change the Bell filter as follows;
- (2) Connect #23

Vary the DC voltage from 7V to 5V monitoring the terminal 25 with synchroscope, and measure the voltage(SC) when killer works.



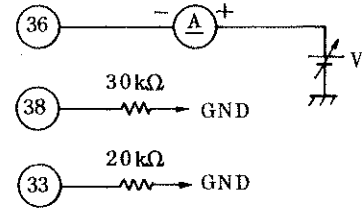
NOTE(74)

- Adjust an external DC voltage (V).
Read the current (A) when the terminal voltage of #35 changes from Low to High.



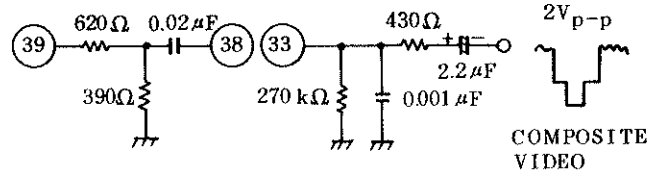
NOTE(75)

- Connect #38 to GND through 30kΩ.
Adjust an external DC voltage (V) so that no current flows.
Measure the current with connecting #33 to GND through 20kΩ.



NOTE(76)

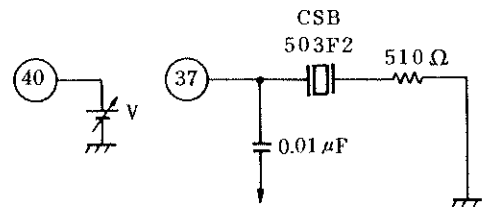
- Apply Composite video signal to #33 through sync sep. filter.
Monitor #36 wave form and measure the V-mask period.



T_{C60} ... (60Hz) T_{C50} ... (50Hz)

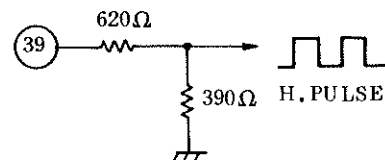
NOTE(77)

- Apply an external DC voltage (V) to #40.
- Monitor #37 wave form through 0.01μF capacitor.
- Increase the DC voltage (V) from 0 to 9V.
- Measure the DC voltage of #40 when the oscillation signal of #37 appears.
V_{CC}(12V) is not applied.



NOTE(78)

- (1)-(3) Same as above.
- Measure the DC voltage of #40 when the H.Pulse appears.



NOTE(79)

- Measure the frequency at #39.

NOTE(80)

- (1) Connect #36 to GND through 30k Ω .
- (2) Measure the frequency at #39.

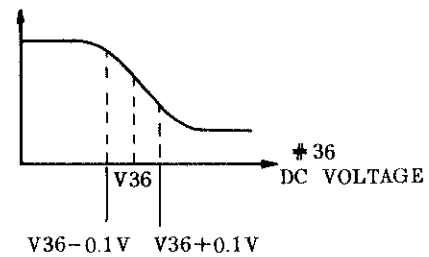
NOTE(81)

- (1) Connect #36 to H.V_{CC} through 10k Ω .
- (2) Measure the frequency at #39.

NOTE(82)

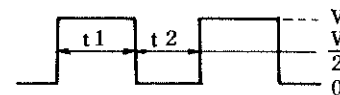
- (1) Measure the open terminal voltage at #36(V₃₆).
- (2) Apply an external DC voltage of V₃₆±0.1V and measure #39 frequency variation.

39 FREQUENCY



NOTE(83)

- (1) Measure t₁ and t₂ by monitoring #39 wave form with a synchroscope.



$$T_{039} = \frac{t_1}{t_1 + t_2} \times 100$$

NOTE(84)

- (1) Apply an external DC voltage (V) to #52 through 100k Ω .
- (2) Increase the DC voltage.
- (3) Measure the DC voltage of #52 when the output pulse of #39 disappears.

NOTE(85)

- (1) H.V_{CC}=9V
- (2) Apply an external DC voltage to #52 through 100k Ω so that H.Pulse at #39 disappears.
- (3) Then set H.V_{CC}=2.5V.
- (4) Check the H.Pulse at #39 still disappears when H.V_{CC} is set 9V again.

NOTE(86)

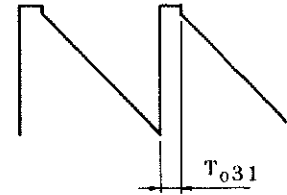
- (1) Apply an external DC voltage (V) to #52.
- (2) Increase the DC voltage.
- (3) Measure the current when #39 is Low.

NOTE(87)

- (1) Measure the high level of #39 wave form (V_{H39}).
- (2) Measure the low level of #39 wave form (V_{L39}).

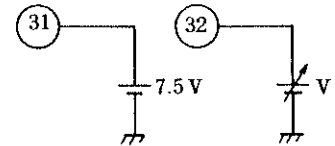
NOTE(88)

- (1) Measure the high state period of #31 wave form.



NOTE(89)

- (1) Apply an external DC voltage (V) to #32.
- (2) Vary the external DC voltage from 7.4V to 7.6V.
- (3) Measure the voltage change at #29.



NOTE(90)

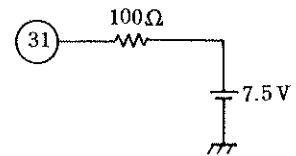
- (1) Test condition is same as NOTE(89).
- (2) Measure the DC voltage at #29 when the external DC voltage of #32 is set to 6.5V.

NOTE(91)

- (1) Same as above.
- (2) Measure the DC voltage at #29 when the external DC voltage of #32 is set to 8.5V.

NOTE(92)

- (1) Monitor the wave form of #31.
- (2) Measure the current of ramp period.



NOTE(93)

- (1) Vary the vertical sync period of the input composite signal.
Test condition is same as NOTE(76).
- (2) Measure the vertical period when the vertical output pulse at #31 synchronizes to the input V sync period.

NOTE(94)

- (1) Test condition is same as NOTE(93).
- (2) Measure vertical period when the DC voltage at #18 is approximately 7.3V.

NOTE(95)

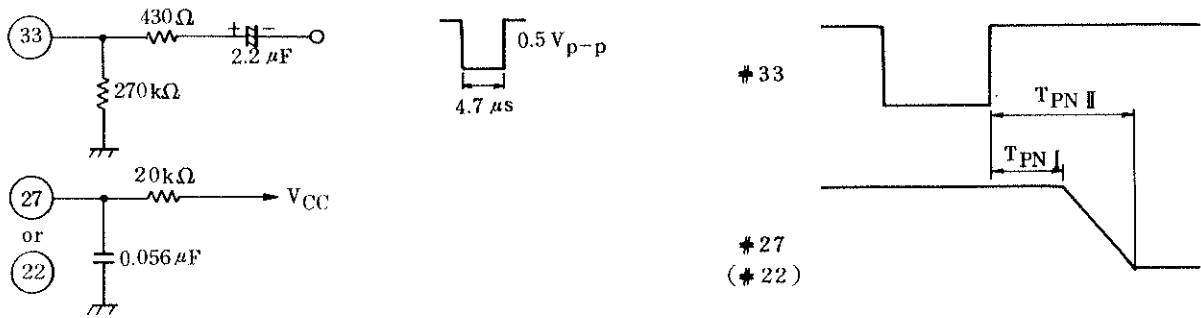
- (1) Measure the vertical blanking width at RGB outputs.
- (2) Vertical frequency of input signal is 60Hz.

NOTE(96)

- (1) Same as above.
- (2) Vertical frequency of input signal is 50Hz.

NOTE(97)

- (1) Measure the $T_{PN I}$ and $T_{PN II}$ at #27 with a synchroscope.

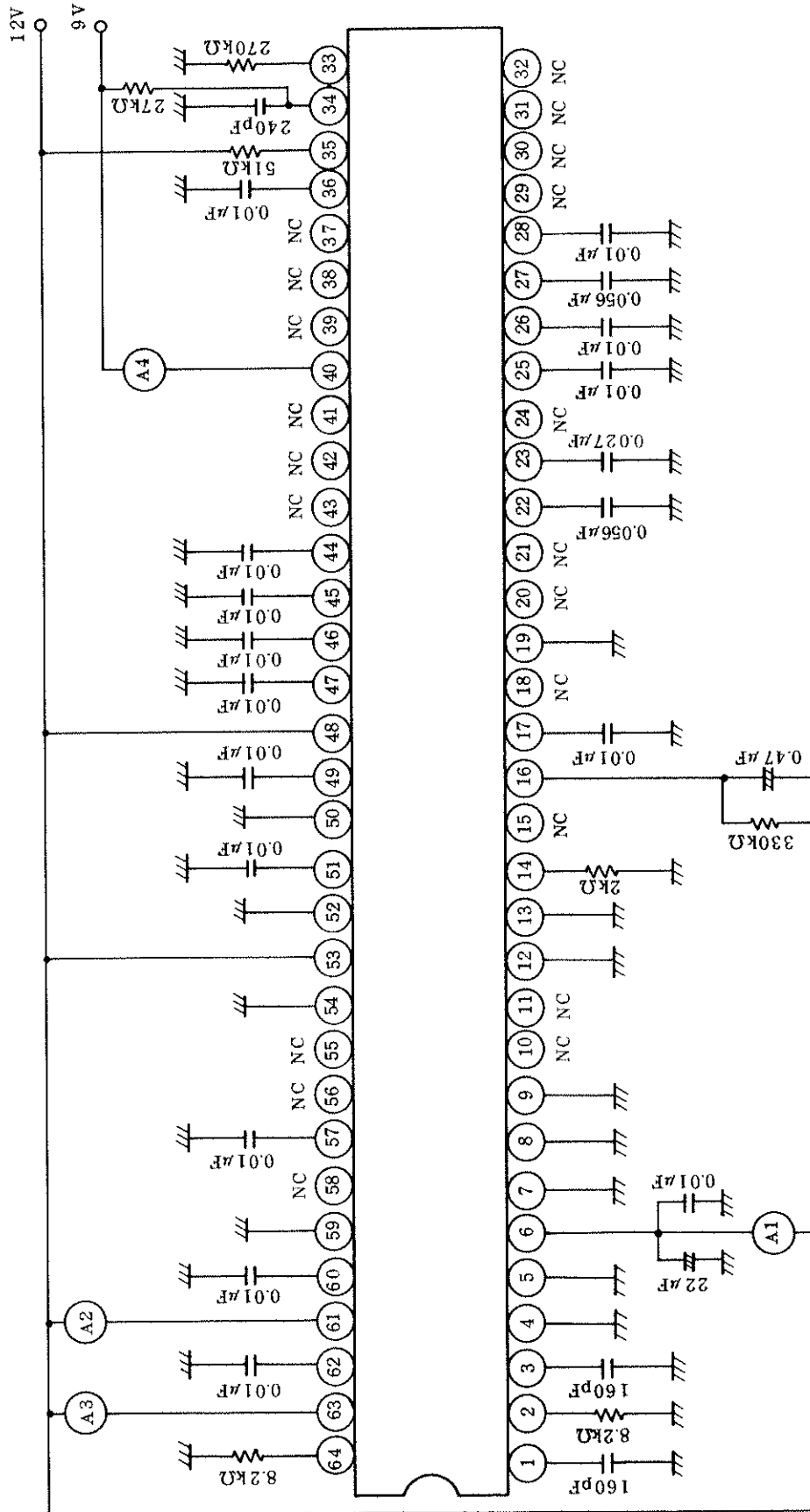


NOTE(98)

- (1) Same as above.



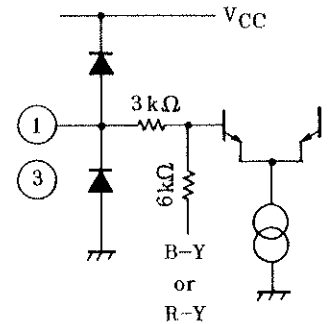
DC TEST CIRCUIT



INTERFACE CIRCUIT OF EACH TERMINALS

#1, #3 SECAM De-emphasis
 Connect a capacitor to GND for SECAM De-emphasis.

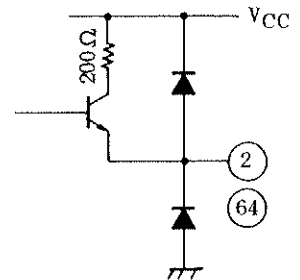
#1 : B-Y
 #3 : R-Y



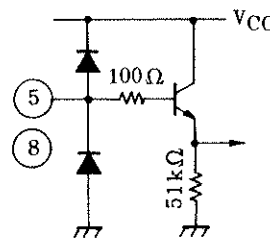
#2, #64 Color differential signal outputs

#2 : R-Y
 #64 : B-Y

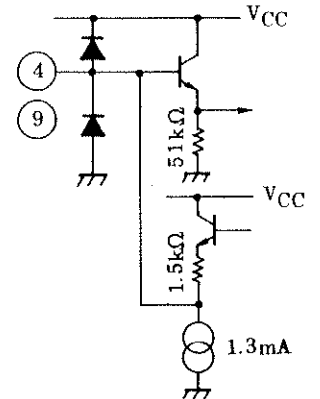
Load resistor of 8.2kΩ is connected to GND.



#4, #5 SECAM B-Y Detector
 A 4.250MHz tuned tank circuit for SECAM B-Y detector is connected.

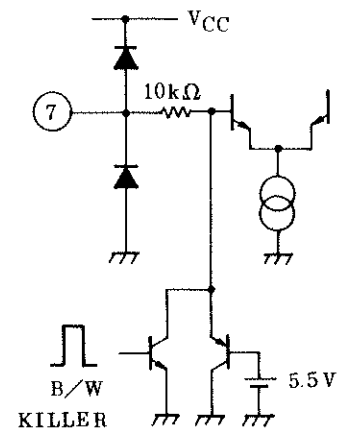


#8, #9 SECAM R-Y Detector
 A 4.406MHz tuned tank circuit for SECAM R-Y detector is connected.



#6 Vcc for chroma stage
 The typical supply voltage is 12.0V.
 Bypass capacitance is connected to the terminal 19.

#7 Color Control
 Color saturation increases when the terminal voltage of #7 increases.
 When the color killer circuit operates, the terminal voltage of #7 turns to low.



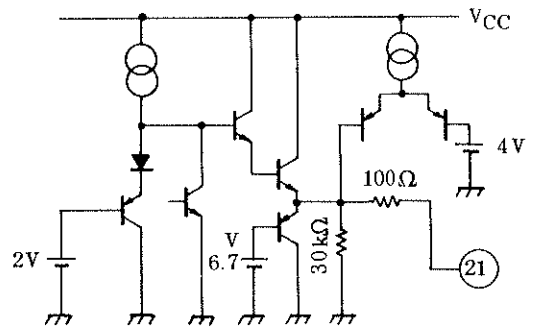
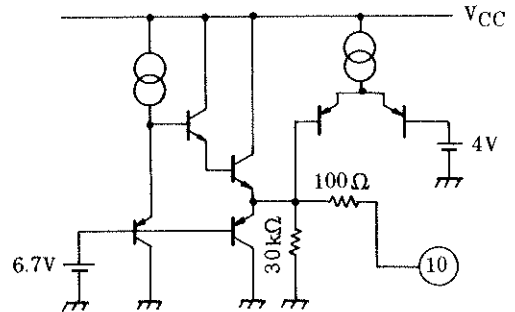
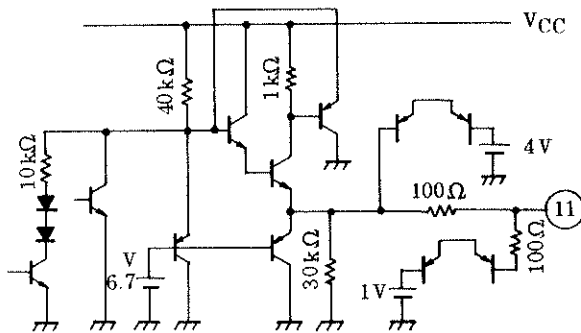
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TOSHIBA CORPORATION

#10, #11, #21 System Logic I/O

This terminal is an output of System Identification Logic circuit and also an input of Manual Select Mode.

- #10 : SW I
- #11 : SW II
- #21 : SW III

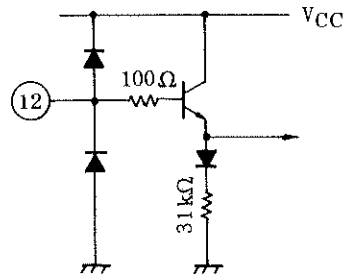
See logic table.



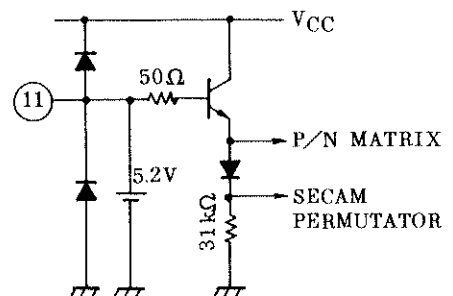
#12 Delayed chroma signal input
 LH delays chroma signal input for PAL/SECAM.

The signal phase shift between terminal #14 and terminal #12 should be less than 5deg.

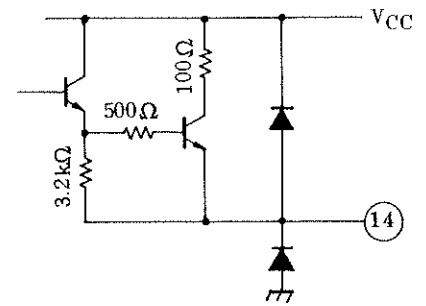
The signal loss of the LH delay line should be 16dB.



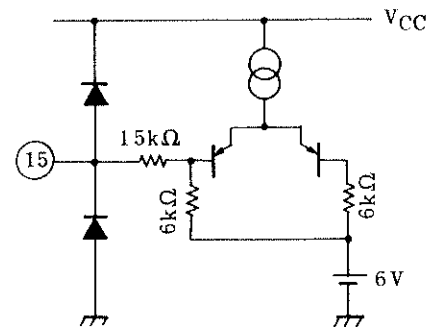
#13 Bypass
 An external capacitor for a bias circuit is connected.



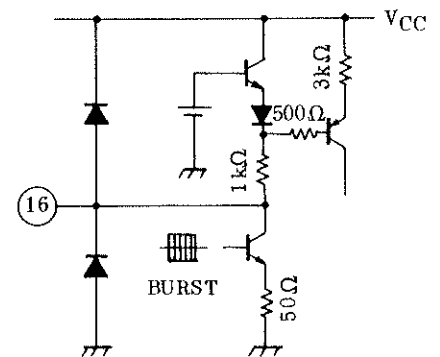
#14 Delay line driver output
The PAL/SECAM chroma signal output for a 1H delays line. Connect a load Resistor of 2kΩ to GND.



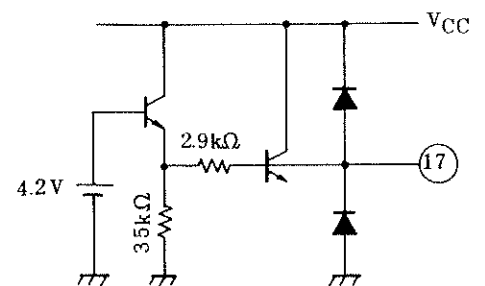
#15 Tint Control (NTSC Mode)
A phase of burst signal is controlled by this terminal in the NTSC mode.



#16 ACC Filter
An external capacitor for ACC filter is connected.



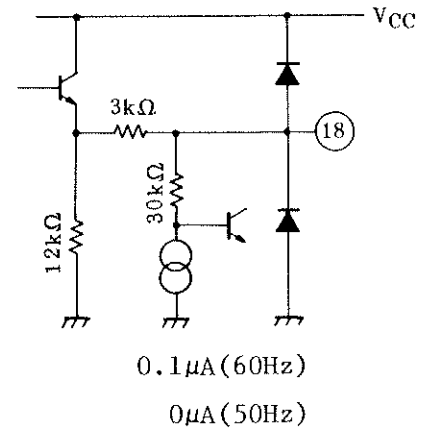
#17 Bypass Filter
An external bypass capacitor for a bias circuit is connected.



#18 SECAM signal input
 SECAM chroma signal is led to this terminal through a Bell filter circuit.
 Terminal DC voltage is changed by the 50/60 identification logic output.

- 7.4V for 60Hz
- 4.4V for 50Hz

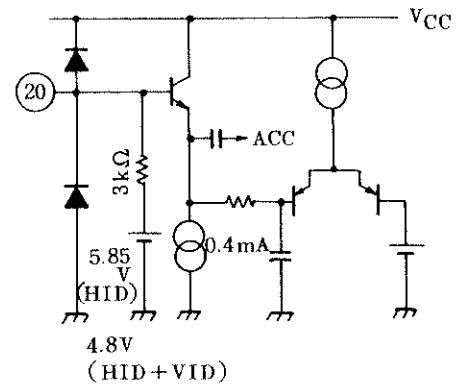
This identification output is useful for changing a vertical size and shifting a horizontal position on the screen.



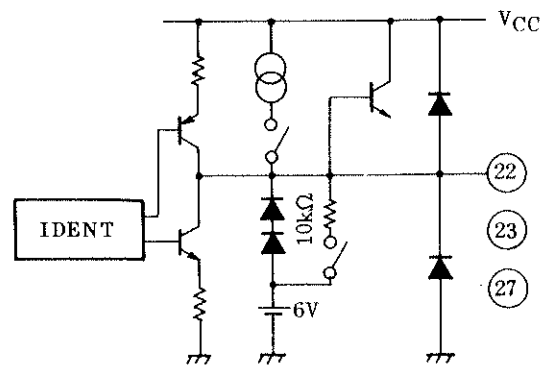
#19 GND of the chroma stage.

#20 PAL/NTSC chroma signal input
 PAL/NTSC chroma signal is led to this terminal through Band pass filter circuit.
 The SECAM identification mode is determined by this terminal DC voltage.

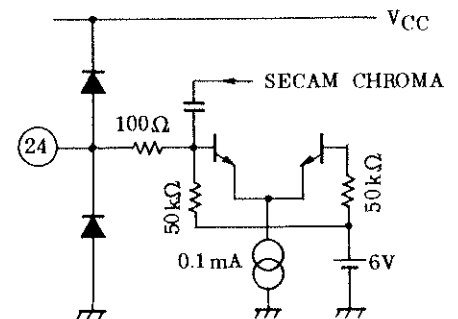
- Open: Line Ident.
- 15kΩ to GND: Line + Frame Ident.



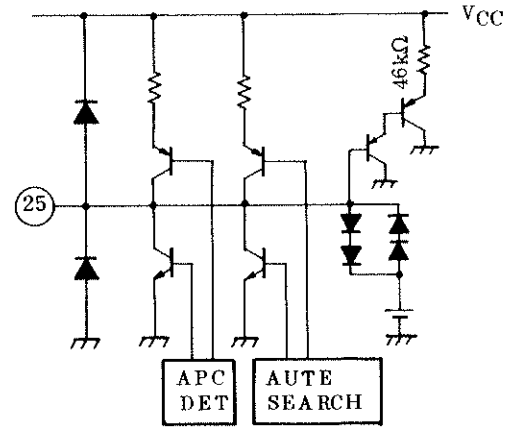
#22 PAL Ident Filter
 #23 SECAM Ident Filter
 #27 NTSC Ident Filter



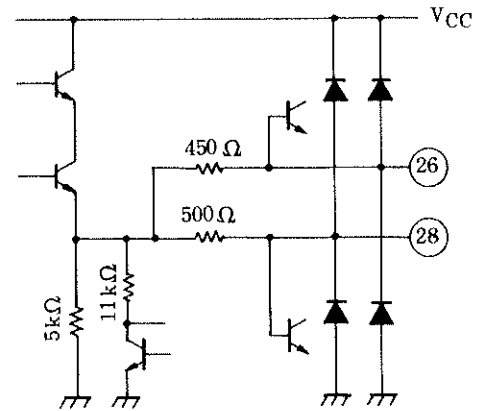
#24 SECAM Ident. discreminator
 A 4.328MHz tuned tank circuit for SECAM Identification is connected.
 Adjust tank coil so that the recovered DC voltage at terminal 23 is maximum value for 4.328MHz.



#25 APC Filter
 APC filter time constant is connected.
 When the killer operates, automatic searching circuits operate to widen the pull in range of the APC circuit. The external time constant also determines the searching speed.

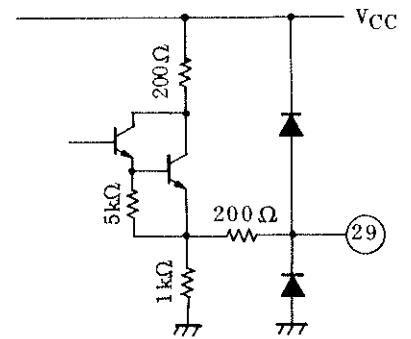


#26 4.43MHz X'tal IN
 4.43MHz X'tal is connected between the terminal 26 and the terminal 30.
 No adjustment is required.

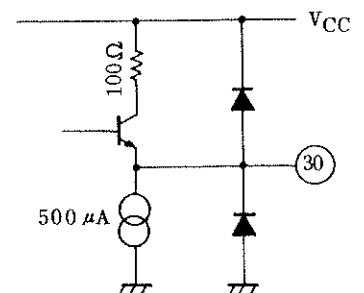


#28 3.58MHz X'tal IN
 3.58MHz X'tal is connected between terminal 28 and the terminal 30.
 During a color system detection, the X'tals are switched every 4 APC Sweep period.
 In case 3.58MHz Mode is not needed, 5.6kΩ is connected between the terminal 28 to GND.

#29 Vertical output
 Output terminal of vertical driver.

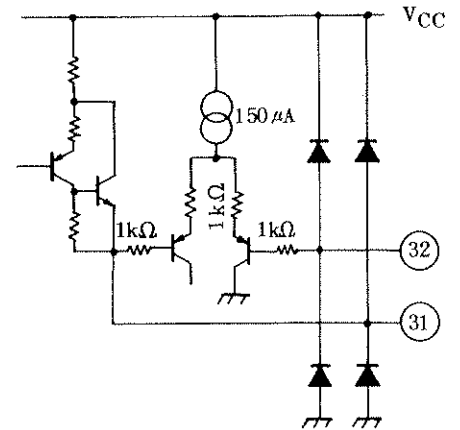


#30 X'tal drive



#31 Ramp Generator

A vertical saw tooth wave generator circuit is composed by a ramp capacitor, a zener diode which determines a saw tooth starting voltage, and a discharge resistor.



#32 Vertical NFB

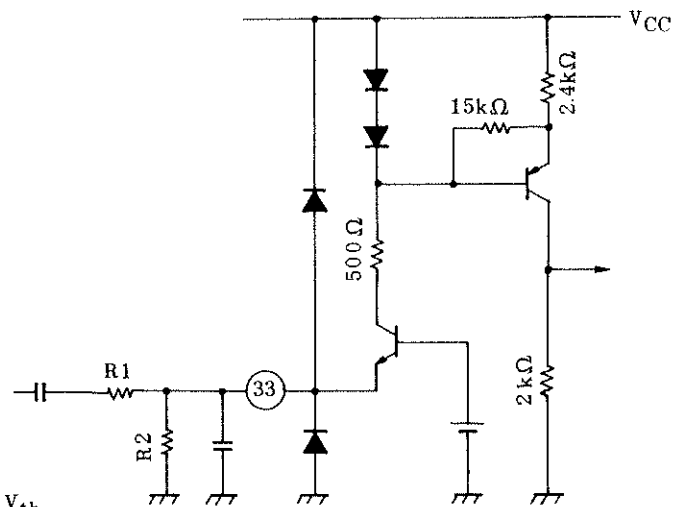
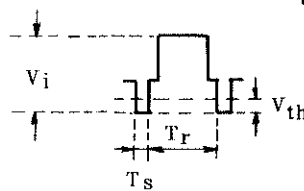
AC and DC Negative Feed Back terminal. The wave form of terminal #32 is equivalent to that of terminal #31 according to internal operational Amplifier.

#33 Sync. Sep. Input

Input terminal of emitter-time constant type sync. separator.

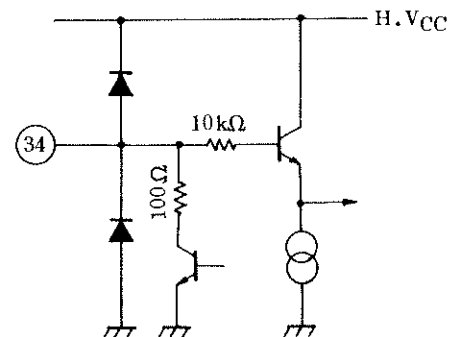
Sync. Sep. level is;

$$V_{th} \approx \frac{(6 + V_i)R_1T_r}{R_1T_r + R_2T_s}$$

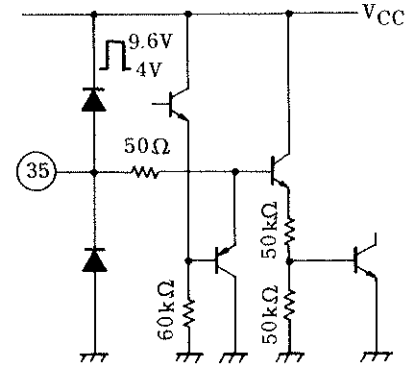


#34 Gate Pulse Filter

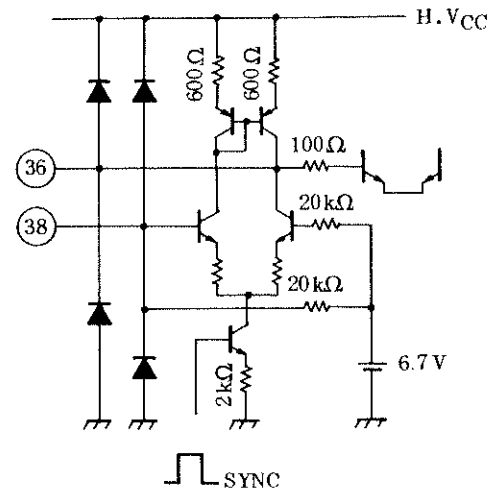
An external filter for a gate pulse is connected.



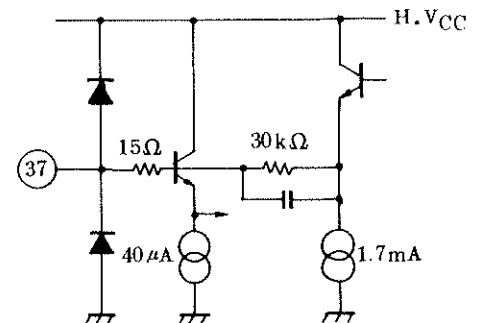
#35 Flyback Pulse input/Sync pulse output
 Flyback Pulse is used as a Horizontal Blanking of color differential signal output (#2,#64), color primary signal output (#41,#42,#43) and LH delay line output (#14), and also used as a masking pulse for a gate pulse generator, PAL matrix switching, and a SECAM permutator switching.
 This terminal is also the output of sync signal. During Sync period, the terminal voltage of #35 turns to high.



#36 AFC Filter
 #38 Integrated Flyback pulse input
 A saw tooth type horizontal AFC circuit is composed. #38 is an input terminal of integrated flyback pulse (saw-tooth). #36 is an AFC filter terminal for 32 f_H VCO. Time constants for integration of flyback pulse should be switched so that a screen position is equivalent for 15.734kHz and 15.625kHz of horizontal frequency.

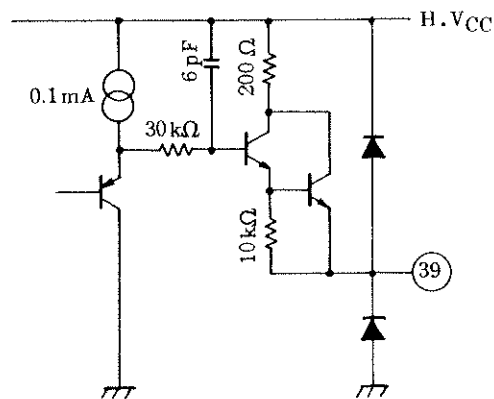


#37 32 f_H VCO
 Adjustment free 32 f_H Voltage Controlled Oscillator.
 A ceramic resonator is connected.
 A wide Pull-in range covers both 15.625kHz and 15.734kHz of horizontal frequency.



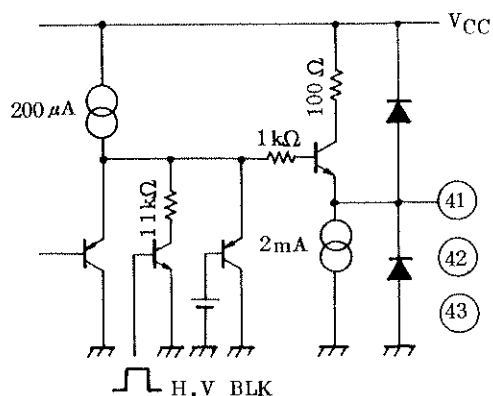
#39 Horizontal drive output
 An emitter follower output of horizontal pre-driver. An external load resistor is required.

#40 H. VCC
 Supply terminal for a horizontal deflection circuit. Recommended supply voltage is 9.0V. (A 9.0V zenner diode is required.)
 A Bypass capacitance is connected to the terminal 50.



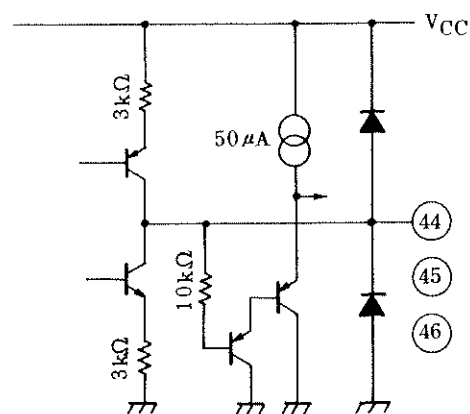
#41, #42, #43 Color primary signal outputs

- #41 R_{out}
- #42 G_{out}
- #43 B_{out}



#44, #45, #46 Clamp Capacitor
 Clamp Capacitor for DC restoration is connected.

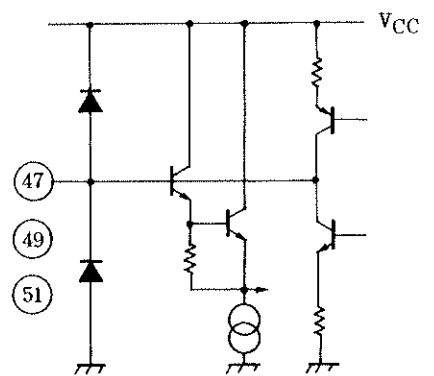
- #44 R
- #45 G
- #46 B



#47, #49, #51 External RGB signal inputs

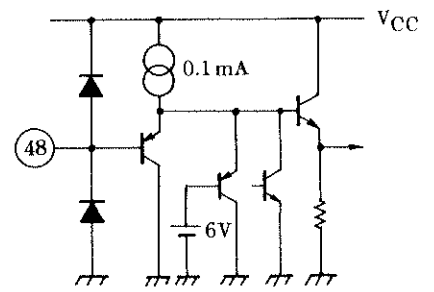
An input decoupling capacitor is used as a clamp capacitor. Input signal level is 0.7Vp-p.

- #47 R input
- #49 G input
- #51 B input



#48 Brightness Control

#50 GND for Video circuit and Deflection circuit

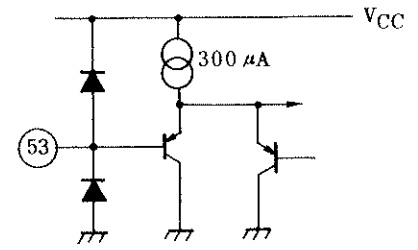
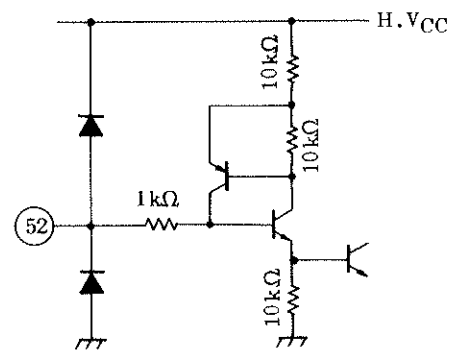


#52 X-ray protector

The input terminal of the X-ray protector. #39 Hor. drive terminal turns to low when the input voltage of this terminal exceeds the specified threshold voltage. (1.3V typ.)

#53 EXT/TV Switching signal Input

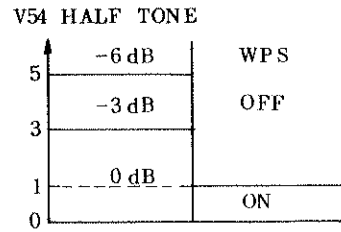
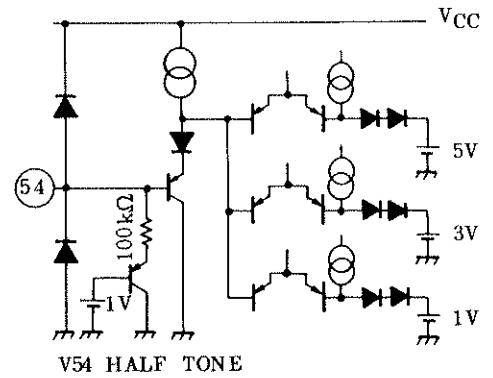
Fast Blanking pulse is acceptable. The threshold level is 1.0V typ.



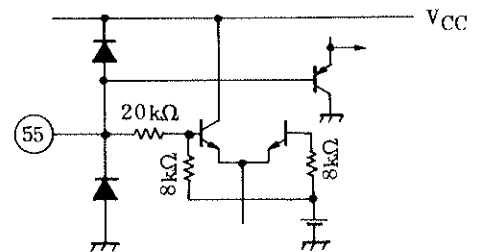
#54 Half tone/Full tone Switching signal Input
When a half tone circuit is active, the TV video signal amplitude becomes smaller than nominal level.

WPS (White peak suppress) Switch
This terminal also switches the white peak suppress circuits. When this circuit is active, in case the RGB output voltage becomes higher than 7.5V, the contrast control terminal voltage is lowered by internal open collector circuit.

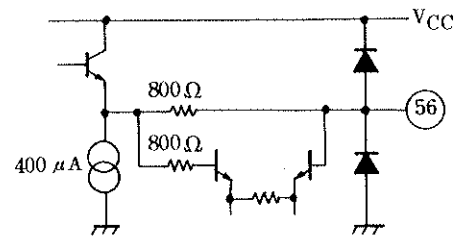
Time constant is determined by external capacitance and variable resistor value at #59.



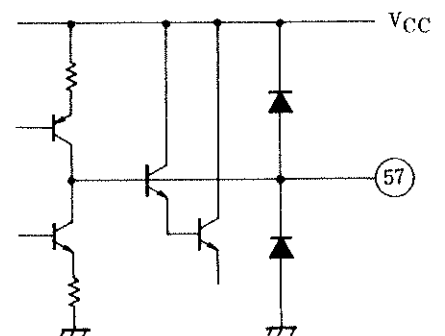
#55 Picture sharpness Control/Mute switch.
When #55 voltage becomes lower than 0.7V, Mute function operates. The brightness control circuit becomes the same condition that 3V is applied at #48, EXT/TV switch turns to TV mode, and the video signal and the color differential signal are cut.



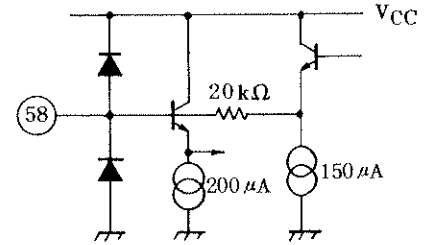
#56 Second order differential video signal input



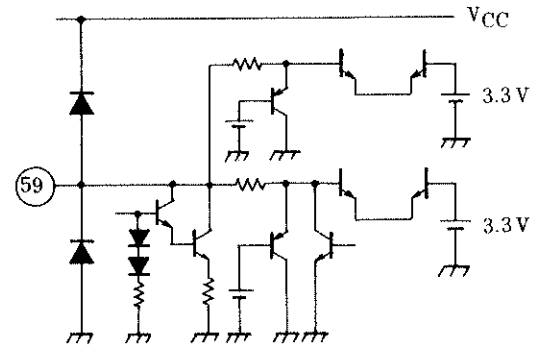
#57 Pedestal Clamp
A terminal for a pedestal clamp capacitor.



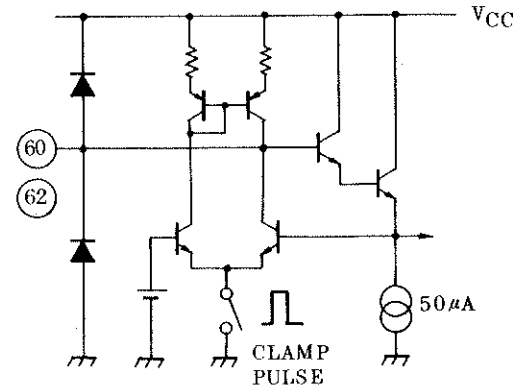
#58 Video input
 A video signal of sync negative going should be applied.



#59 TV contrast control with Uni-Color Control
 Text Contrast Control
 Video gain and color gain are controlled simultaneously. The typical gain control range is -20dB.
 Contrast control terminal for external RGB signal.
 The typical gain control range is -12dB.



#60,#62 Color differential signal input
 The decoupling capacitor is used as a clamp capacitor.
 #60: R-Y input
 #62: B-Y input



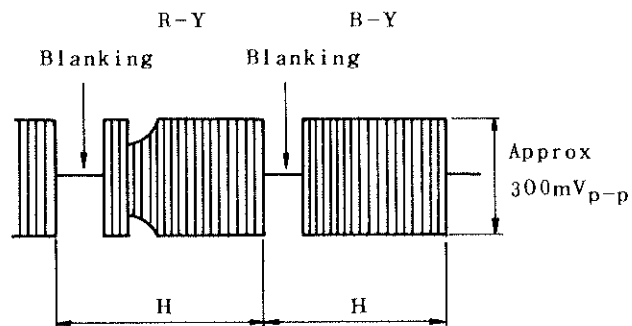
#61 VCC for Video & Vertical Deflection stage. (12V)
 Bypass Capacitor is connected to #50.

#68 VCC for RGB output stage. (12V)
 Bypass capacitor is connected to #50.

ALIGNMENT PROCEDURE

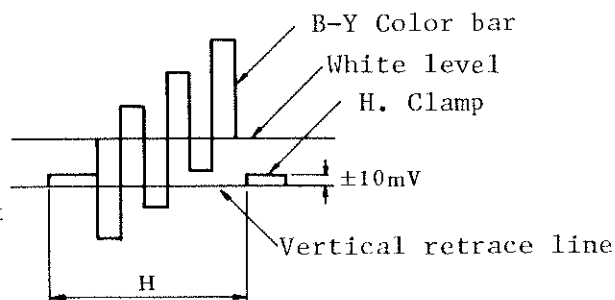
Bell Filter Coil (TRF-5415) Adjustment

1. Receive SECAM color bar signal.
2. Connect the synchroscope to the terminal 18.
3. Adjust Filter Coil for the flat level of amplitude in each color bar waveform on the scope.



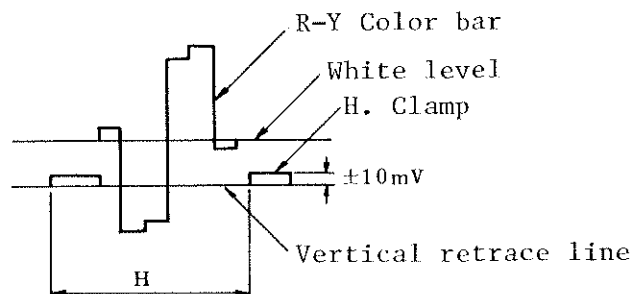
Ident Coil (TRF-5423) Adjustment

1. Receive SECAM color bar signal.
2. Connect the DC voltmeter (Digital Voltmeter) to the Pin 23.
3. Adjust Ident Coil for the maximum indication on the meter.



B-Y, R-Y Demodulator Coil (TRF-5414) Adjustment

1. Receive SECAM color bar signal.
2. Set the Color, Brightness and Contrast Controls free.
3. Connect the synchroscope to the Pin 60.
4. Adjust Coil (B-Y) so that the white level in picture part reaches to the vertical retrace line.
5. Then change the connection of synchroscope from terminal 60 to the terminal 62.
6. Adjust Coil (R-Y) so that the white level in picture part reaches to the vertical retrace line.



PAL MATRIX Adjustment

1. Turn in the color program of Philips pattern.
2. Set the Color Control V.R. to obtain the proper color.
3. If the PAL Matrix adjustment is incorrect, the Venetian Blind would appear in the color bars area. This case needs the adjustment.
4. At the first, adjust DL Phase ADJ. Coil (TRF-5418) to minimize the Venetian Blind.
5. Next adjust LH-DL ADJ. VR to minimize the Blind.
6. If the Venetian Blind still remains, adjust LH-DL Phase ADJ. Coil to minimize the Blind again.
7. Repeat the item 5 and 6 procedures, adjust the VR and Coil until the Blind does not appear.

APPLICATION CIRCUIT

