

SANYO 1/15

SPECIFICATIONS

3 IN 1 MODULATOR, TUNER, IF BLOCK

MODEL SATM1-US2-S
(115-V-D025AS)

SANYO TUNER INDUSTRIES CO., LTD.

TUNER ENGINEERING SECTION

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APPROVED

CHECKED

WRITTEN

Jul. 30, '99
Y. Amano

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1. GENERAL

1-1 Summary

This unit has RF modulator, tuner and VIF circuits in a case.

1-2 Receiving channels and system

USA 181 channels

System	NTSC-M
VHF Low Band	2 ~ B CH
VHF High Band	C ~ W+11 CH
UHF Band	W+12 ~ 69 CH

1-3 Modulator output channels

CH SW Open	3 CH
CH SW GND	4 CH

1-4 Input , output impedance

ANT input impedance	75 Ω unbalanced
ANT output impedance	75 Ω unbalanced

1-5 Permissible maximum voltage

+B	+ 5.5 V
MB, CONTROL	+ 6.0 V
BT	+31.0 V

1-6 Normal voltage

+B	+ 5 V $\pm$ 5 %
MB, CONTROL	+ 5 V $\pm$ 5 %
BT	+30 V $\pm$ 5 %

1-7 Voltage for guaranteeing electrical specification

+B(MB, CONTROL)	+ 5 V $\pm$ 0.1 V
BT	+30 V $\pm$ 0.1 V

1-8 Temperature

Operating temperature	-10 to +60 °C
Storage temperature	-20 to +70 °C

1-9 Humidity

Operating humidity	35 to 85 % RH
Storage humidity	10 to 90 % RH

1-10 Intermediate frequencies

Picture carrier	45.75 MHz
Sound carrier	41.25 MHz

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1-11 Current consumption

	TYP	MAX
+B	150 mA	200 mA
MB	35 mA	50 mA
CONTROL	350 μ A	700 μ A
BT	2.0 mA	5.0 mA

1-12 Terminals

Number	Terminal	Function
1	AUDIO IN	MOD AUDIO INPUT
2	CH. SW	CHANNEL SWITCH (OPEN/GND)
3	MB	MOD. +B (+5V)
4	CONTROL	MOD OUTPUT ON/OFF (+5V/0V)
5	VIDEO IN	MOD VIDEO INPUT
6		
7	N. C.	(RF AGC TP)
8	N. C.	
9	N. C.	
10	CLOCK	CLOCK SIGNAL INPUT
11	DATA	DATA SIGNAL INPUT
12		
13	+B	+B (+5V)
14	X' TAL	3.58 MHz INPUT
15	BT	TUNING (+30V)
16	N. C.	(TU-TP)
17	IF OUT	IF OUTPUT
18	AUDIO OUT	AUDIO OUTPUT
19	N. C.	
20	AFT	AFT OUTPUT
21	VIDEO OUT	VIDEO OUTPUT
22		

1-13 PLL data input signal level(clock, data)

High level input voltage	3.0 to 5.5V
Low level input voltage	1.5V MAX

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(RF MODULATOR SECTION)

2. RF MODULATOR OUTPUT CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
2-1	V. S. W. R.		2	3		ANT out (MOD.ON) 60 ~ 72 MHz
2-2	Picture carrier frequency	-150	fp	150	KHz	
2-3	Sound carrier frequency	-0.007	fp+4.5	0.007	MHz	
2-4	Picture level	63.5	66.5	69.5	dBμ	
2-5	P/S ratio	17	15	13	dB	0 ~ (fp-4.6) MHz. (fp+7.4) ~ 1000 MHz fp ~ (fp+4.5) MHz Video in : None Video in : 3.58 MHz, 0.4 Vp-p Measure the level of fp + 920 KHz
2-6	Spurious level without pass band			36	dBμ	
2-7	Spurious level within pass band			65	dB	
2-8	920 KHz beat		65	-55	dB	
2-9	Terminal leakage		47	54	dBμ	

3. RF MODULATOR VIDEO CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
3-1	Video in impedance	0.7	1.0	1.3	KΩ	0 ~ 4.2 MHz (unbalance) Video in : 1 Vp-p S/(V+S) 0.5 ~ 4.2 MHz (1 MHz base)
3-2	Video modulation	70	77	84	%	
3-3	Sync ratio	27.5	28.5	29.0	%	
3-4	Video frequency characteristics	-2.5	0	2	dB	
3-5	DG		1	7	%	Video in : 1 Vp-p. stair step chroma 20 IRE
3-6	DP		1	7	deg	
3-7	Video S/N ratio	45	48		dB	
3-8	Maximum modulation	87	93	99	%	

4. RF MODULATOR AUDIO CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
4-1	Audio in impedance	10			KΩ	50 Hz ~ 10 KHz (unbalance) Audio in : -6.5 dBs, 1 KHz (±25 KHz deviation : 100 %) 50 Hz ~ 10 KHz (1 KHz base)
4-2	Modulation	64	80	96	%	
4-3	Audio frequency characteristics	-3	-0.5	3	dB	
4-4	Distortion		0.3	1	%	
4-5	Audio S/N ratio	48	60		dB	Audio in : -6.5 dBs, 1 KHz Audio in : -6.5 dBs, 1 KHz Video in : 1 Vp-p, color bar
4-6	Audio buzz	45	55		dB	
4-7	Maximum modulation	128	160	192	%	

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5. SW CIRCUITS CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
5-1	V. S. W. R.			4.5		ANT out (MOD. OFF) 54 ~ 810 MHz
5-2	Insertion loss			6	dB	ANT in - ANT out (MOD. OFF) 54 ~ 810 MHz
5-3	Separation	60	65		dB	ANT in - ANT out (MOD. ON) 60 ~ 72 MHz
5-4	ANT in terminal leakage voltage		0	9.5	dB μ	
5-5	2nd harmonics inter modulation	55	64		dB	
5-6	Cross modulation	55	62		dB	

6. RF MODULATOR THERMAL STABILITY CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
6-1	Video modulation	- 4		4	%	0 ~ 60 °C (25 °C standard)
6-2	Sound modulation	-10		10	%	
6-3	Picture carrier frequency	-80		80	KHz	
6-4	Sound carrier frequency	-12		12	KHz	
6-5	Video output level	-2		2	dB μ	
6-6	P/S ratio	-2.5		2.5	dB	

7. RF MODULATOR STABILITY

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
7-1	Video carrier frequency rise up time	-50		50	KHz	at 3 sec rater
7-2	Audio carrier frequency rise up time	- 3		3	KHz	at 10 sec rater
7-3	Video carrier frequency shift by vcc drift	-10		10	KHz	MB $\pm$ 0.3V shift
7-4	Audio carrier frequency shift by vcc drift	- 2		2	KHz	MB $\pm$ 0.3V shift

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(1 F SECTION)

8. 1F OUT CHARACTERISTICS

	ITEMS		SPECIFICATION				MEASUREMENT TERMS
			MIN	TYP	MAX	UNIT	
8-1	Sensitivity	VHF		50	56	dB μ	B. P. F (100 Hz ~ 4 MHz) Except sync. and chroma signal Note : In case of item 1, 2, 5, 6, 7, 8 and 9, the following additional circuit is to be connected between video out terminal and the measuring instrument. See Fig. 1
		CATV, UHF		53	59	(open)	
8-2	Video S/N ratio	VHF	45	46		dB	
		CATV, UHF	43	45			
8-3	Maximum input	VHF	100			dB μ	Sync ratio 28.57 % standard burst ratio 28.57 % standard
		CATV, UHF	100			(open)	
8-4	Video output level		0.8	1	1.2	Vp-p	
8-5	Sync ratio		26	28.6	30	%	
8-6	burst ratio		16	25	38	%	
8-7	Video frequency characteristics						
		1 MHz	-1.5	0	1.5	dB	JIS C-6101 (500 KHz standard)
		2 MHz	-2	0	2		
		3 MHz	-3.5	-1	2.5		
		3.58 MHz	-4	1.5	2		
		4.2 MHz		12	6		
8-8	DP		-8	5	8	deg	10 steps staircase signal 87.5 % MOD. burst standard (Except 10th step)
8-9	DG		-8	5	8	%	As the above.
8-10	C/L delay		-100	0	100	nsec	Group delay 0.5 MHz versus 3.58 $\pm$ 0.5 MHz
8-11	AGC flatness		-1	0	1	dB	Sensitivity level to maximum input level
8-12	Bar pulse response			5	13	%	C1/D C2/D E1/D E2/D F/D
8-13	AGC speed		70 100	90 300	110 400	% Hz	

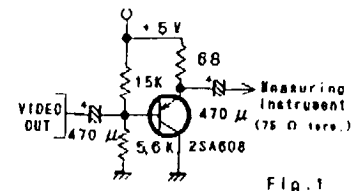
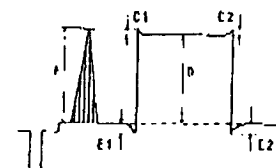


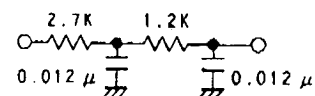
Fig. 1

※ ANT in input level 79 dB μ (75 Ω OPEN) except 8-1, 8-3, 8-11, P/S=10 dB

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9. IF AUDIO OUT CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
9-1	Audio output level	262	370	522	mVrms	400 Hz 100 % MOD. 47 K Ω load under the black burst.
9-2	Audio frequency characteristics					
	20 Hz	-3	0	3	dB	400 Hz 30 % MOD. Under the black burst.
	10 KHz	-6				
9-3	Audio distortion		0.5	2.0	%	1 KHz 100 % MOD. Under the black burst.
9-4	Audio S/N	48	50		dB	Black burst, 400 Hz, 60 % MOD.
9-5	Audio sensitivity					
	VHF		30	36	dB μ	S/N 30 dB
	CATV, UHF		30	40		
9-6	Buzz		10	50	mVp-p	Split color bar signal P/S 10 dB Video sweep 0.5 ~ 4 MHz (Audio non MOD.)
	Color bar			50		
	H-Sweep			50		
	V-Sweep			50		



10. AFT CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
10-1	AFT center voltage	1.8	2.3	2.8	V	10 steps staircase at US 12 CH
10-2	AFT alignment accuracy	50		50	KHz	Alignment center : 2.5V
10-3	AFT output voltage MIN V			1.0	V	
	MAX V	4.0				

※ ANT is input level 79 dB μ (75 Ω open) except 9-5. P/S=10 dB

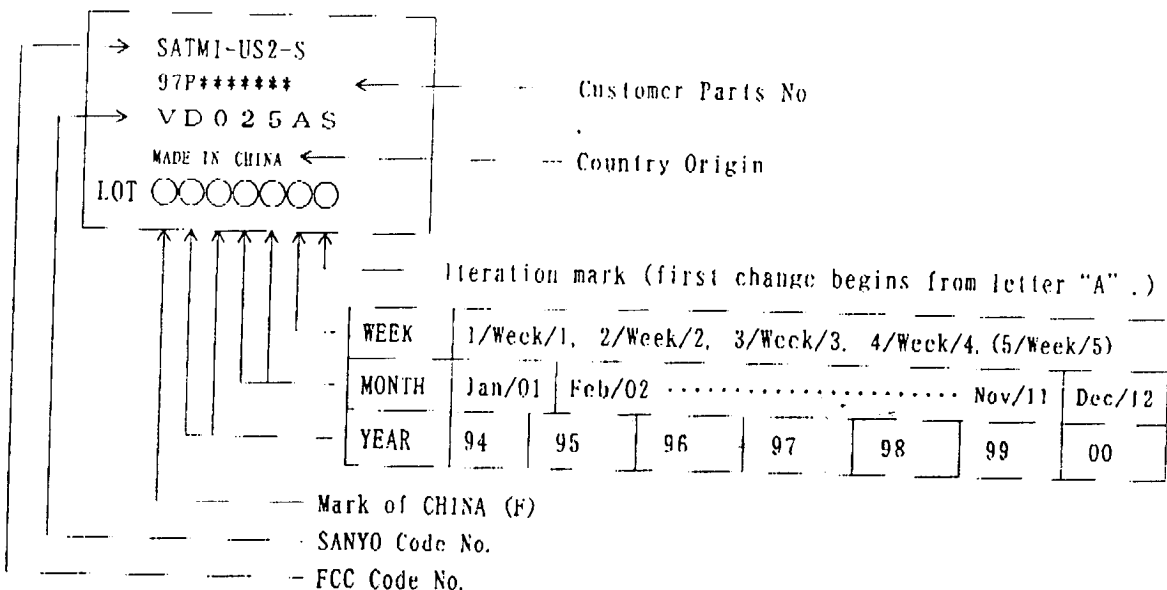
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1 1. IF THERMAL CHARACTERISTICS

	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
11-1	Video output level	-10		10	%	Difference between the measurement value in the standard condition and the value measured in the temperature range of -5 °C to 60 °C
11-2	Burst ratio	-10		10	%	
11-3	Sync ratio	-10		10	%	
11-4	Video S/N	-3		3	dB	
11-5	Video sensitivity	-4		4	dB	
11-6	Audio output level	-2		2	dB	
11-7	Audio S/N	-3		3	dB	
11-8	Audio sensitivity	-4		4	dB	
11-9	AFT center voltage	-2		2	V	

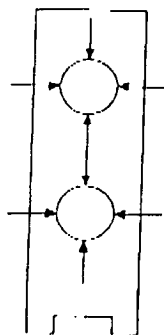
1 2. LABEL MARKINGS



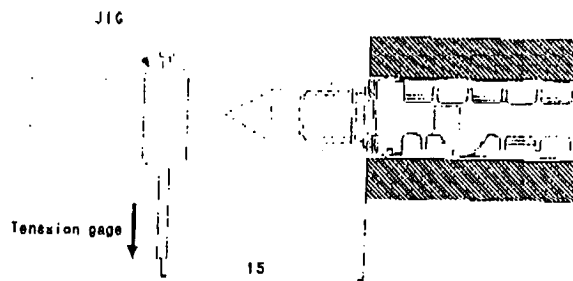
1 3. F CONNECTION STRENGTH

Inclination 3 degree MAX
Tensile 7 Kg × 5 times

F conn. strength (8 direction)



MEASUREMENT TERMS



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(TUNER SECTION)

14. TUNER CHARACTERISTICS

14-1 Tuning voltage range

VHF

0.5 ~ 30 V

UHF

0.5 ~ 30 V

Frequency synthesizer minimum voltage 0.5 V

14-2 Power gain

VHF

MIN 25 dB

UHF

MIN 24 dB

14-3 Noise figure

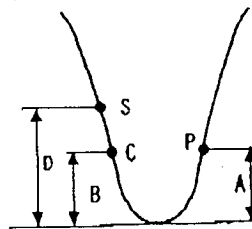
VHF

14 dB MAX

CATV, UHF

14 dB MAX

14-4 IF response (ANT-IF)



4B 5 at 11 CH

A : 0 ~ 2 dB

B : 0 ~ 5 dB

D : 2 ~ 7 dB

14-5 Power gain deviation between channels

VHF

12 dB MAX. TYP 6 dB

UHF

14 dB MAX. TYP 6 dB

14-6 AGC gain reduction

VHF

40 dB MIN

UHF

35 dB MIN

14-7 Image rejection ratio

CH 2 ~ 13

60(50) dB MIN

CH J ~ W+11

50(40) dB MIN

CH W+12 ~ 69

50(40) dB MIN

() ; AGC Range 0 ~ -30 dB

14-8 IF rejection ratio

CH 2 ~ B

50(45) dB MIN

CH C ~ W+11

60(50) dB MIN

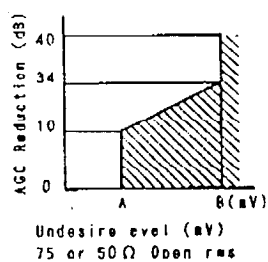
CH W+12 ~ 69

70(40) dB MIN

() ; AGC Range 0 ~ -30 dB

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14-9 1% cross modulation



VHF	A : 5 mV
	B : 70 mV
CATV	A : 3 mV
	B : 70 mV
UHF	A : 5 mV
	B : 50 mV

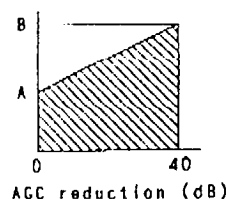
14-10 FM rejection ratio

CH 7 ~ 13
CH 5

60 dB MIN
40 dB MIN (*1)

*1. Des : 5 CH (77.25 MHz) 60 dBμ 75Ω open
Und : 89.1 MHz
s/i = 30 dB
Rej = s/i + (-D/U)

14-11 Input signal level at 10 % distortion



VHF	A : 3 mV
(75Ω open rms)	B : 300 mV
UHF	A : 3 mV
(50Ω open rms)	B : 300 mV

14-12 VHF, UHF rejection ratio

VHF
UHF

70 dB MIN
50 dB MIN

14-13 1/2 IF harmonic rejection ratio

UHF

45 dB MIN

14-14 Inter modulation

VHF

50 dB MIN

14-15 Drift of oscillation frequency

By ± 1 % change of 4B voltage

VHF
UHF

±250 KHz MAX
±250 KHz MAX

By ± 25 °C change from 25 °C

CH 2 ~ 13
CH J ~ W+11
CH W+12 ~ 69

±1000 KHz MAX
±3000 KHz MAX
±3000 KHz MAX

14-16 Local oscillator voltage on the aerial input terminals

300 MHz MAX
300 ~ 1000 MHz
1000 ~ 1694 MHz

34 dBμ V MAX
50 dBμ V MAX
51.8 dBμ V MAX

USA CHANNEL FREQUENCY TABLE (181CH) P13

P IF=45.75MHz

C IF=42.17MHz

S IF=41.25MHz

UNIT: MHz

BAND	CHANNEL	P CARRIER	S CARRIER	LOCAL
VHF Low	2	55.25	59.75	101
	3	61.25	65.75	107
	4	67.25	71.75	113
	5	77.25	81.75	123
	6	83.25	87.75	129
	A-6	85.25	89.75	131
	A-5	91.25	95.75	137
	A-4	97.25	101.75	143
	A-3	103.25	107.75	149
	A-2	109.25	113.75	155
VHF High	A-1	115.25	119.75	161
	A	121.25	125.75	167
	B	127.25	131.75	173
	C	133.25	137.75	179
	D	139.25	143.75	185
	E	145.25	149.75	191
	F	151.25	155.75	197
	G	157.25	161.75	203
	H	163.25	167.75	209
	I	169.25	173.75	215
	7	175.25	179.75	221
	8	181.25	185.75	227
	9	187.25	191.75	233
	10	193.25	197.75	239
	11	199.25	203.75	245
	12	205.25	209.75	251
	13	211.25	215.75	257
	J	217.25	221.75	263
	K	223.25	227.75	269
	L	229.25	233.75	275
	M	235.25	239.75	281
	N	241.25	245.75	287
	O	247.25	251.75	293
	P	253.25	257.75	299
	Q	259.25	263.75	305
	R	265.25	269.75	311
	S	271.25	275.75	317
	T	277.25	281.75	323
	U	283.25	287.75	329
	V	289.25	293.75	335
	W	295.25	299.75	341
	W+1	301.25	305.75	347
	W+2	307.25	311.75	353
	W+3	313.25	317.75	359
	W+4	319.25	323.75	365
	W+5	325.25	329.75	371
	W+6	331.25	335.75	377
	W+7	337.25	341.75	383
	W+8	343.25	347.75	389
	W+9	349.25	353.75	395
	W+10	355.25	359.75	401

BAND	CHANNEL	P CARRIER	S CARRIER	LOCAL
UHF	W+11	361.25	365.75	407
	W+12	367.25	371.75	413
	W+13	373.25	377.75	419
	W+14	379.25	383.75	425
	W+15	385.25	389.75	431
	W+16	391.25	395.75	437
	W+17	397.25	401.75	443
	W+18	403.25	407.75	449
	W+19	409.25	413.75	455
	W+20	415.25	419.75	461
	W+21	421.25	425.75	467
	W+22	427.25	431.75	473
	W+23	433.25	437.75	479
	W+24	439.25	443.75	485
	W+25	445.25	449.75	491
	W+26	451.25	455.75	497
	W+27	457.25	461.75	503
	W+28	463.25	467.75	509
	W+29	469.25	473.75	515
	14	471.25	475.75	517
	15	477.25	481.75	523
	16	483.25	487.75	529
	17	489.25	493.75	535
	18	495.25	499.75	541
	19	501.25	505.75	547
	20	507.25	511.75	553
	21	513.25	517.75	559
	22	519.25	523.75	565
	23	525.25	529.75	571
	24	531.25	535.75	577
	25	537.25	541.75	583
	26	543.25	547.75	589
	27	549.25	553.75	595
	28	555.25	559.75	601
	29	561.25	565.75	607
	30	567.25	571.75	613
	31	573.25	577.75	619
	32	579.25	583.75	625
	33	585.25	589.75	631
	34	591.25	595.75	637
	35	597.25	601.75	643
	36	603.25	607.75	649
	37	609.25	613.75	655
	38	615.25	619.75	661
	39	621.25	625.75	667
	40	627.25	631.75	673
	41	633.25	637.75	679
	42	639.25	643.75	685
	43	645.25	649.75	691
	44	651.25	655.75	697
	45	657.25	661.75	703

USA CHANNEL FREQUENCY TABLE (181CH) P14

P I F = 45.75 MHz
C I F = 42.17 MHz
S I F = 41.25 MHz

UNIT: MHz

BAND	CHANNEL	P CARRIER	S CARRIER	LOCAL
UHF	46	663.25	667.75	709
	47	669.25	673.75	715
	48	675.25	679.75	721
	49	681.25	685.75	727
	50	687.25	691.75	733
	51	693.25	697.75	739
	52	699.25	703.75	745
	53	705.25	709.75	751
	54	711.25	715.75	757
	55	717.25	721.75	763
	56	723.25	727.75	769
	57	729.25	733.75	775
	58	735.25	739.75	781
	59	741.25	745.75	787
	60	747.25	751.75	793
	61	753.25	757.75	799
	62	759.25	763.75	805
	63	765.25	769.75	811
	64	771.25	775.75	817
	65	777.25	781.75	823
	66	783.25	787.75	829
	67	789.25	793.75	835
	68	795.25	799.75	841
	69	801.25	805.75	847

