DAEWOO ELECTRONIC COMPONENT COMPANY

DAEWOO CORPORATION

SPECIFICATION

FOR ELECTRONIC TUNER

MODEL : DTMI-5NF01

PREPARED	CHECKED	APPROVED	ISSUED DATE : DECEMBER. 07. 1998.
			PAGE : 25

1. General

1.1 Summary

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

1.2 Receiving channels

USA 181 channels

Channel	AIR	CATV
VHF Low Band	2~6 channel	(A-8) A-5~B channel
VHF High Band	7~13 channel	C~w+11 channel
UHF	14~69 channel	W+12~W+84 channel

1.3 Sending system

USA standard M-system (NTSC)

	Terminal NO.2
3CH	OPEN
4CH	GND

1.4 Tuner channel selection system

PLL tuning system

1.5 Detection system

PLL synchronization detection system

Inter Carrier sound receiving system

1.6 Nominal input impedance (Modulator)

RF IN	75Ω	unbalanced
VIDEO IN	1KΩ.	
AUDIO IN	30KΩ min.	
CONTROL	100KΩ min.	

1.7 Output load impedance (IF)

RF OUT	75Ω	unbalanced
VIDEO OUT	10kΩ	
AUDIO OUT	100kΩ	

1.8 Intermediate frequencies

Picture carrier	45.75MHz
Sound carrier	41.25MHz

1.9 Semiconductors

Section	Item	Std.	Maker	Remark
TUNER	Mixer + PLL IC (I2C Type)	TUA6014S	Siemense	Same or Equivalence
	Tuning Diode	BB659C	Siemense	
	RF amplifier FET	BF1005SR	Siemense	
	Band Swiching Diode	BA892	Siemense	
		MCL4148	Temic	
	IF amplifier TR	BF799W	Siemense	
MODULATOR	Modulator IC	HA11585FP	Hitach	
	RF amplifier TR	2SC4713K	Rohm	
	Resonator	L/C 발진		
IF	IF IC	M52761FP	Misubishi	
	Saw Filter	M1865D	Siemense	
	Ceramic Trap Filter	TPS4.5MD	Murata	
	Ceramic Filter	SFSH4.5MD	Murata	

1.10 Normal supply voltages

BM	5V
BT	32V
B+	5V

1.11 Permissible Maximum Voltage

BM	6V
BT	35V
B+	5.5V
CONTROL	6V
SCL, SDA	+B MAX

(NOTE) Within "B+" supply voltage at enable, data, clock terminal

1.12 Power Dissipation

BM	-	Typ. 140mW	182mW max.
BT	-	Typ. 75mW	170mW max.
B+	494mW min.	Typ. 655mW	824mW max.
CONTROL	-	Typ. 0.24mW	0.9mW max.

1.13 Test conditions

BM	5V±0.1V
BT	32V±0.1V
B+	5V±0.1V
Ambient temperature	25℃±5℃
Relative humidity	65%RH±10%RH

1.14 Current consumption

BM	(Typ. 23mA)	35mA max.
BT	(Typ. 1.5mA)	5mA max.
B+	(Typ. 170mA)	200mA max.
Control	(Typ. 60㎂)	200㎂ max.

1.15 Storage temperature and Humidity

-20℃ ~ +75℃ , 90%RH

1.16 Operating temperature and Humidity

-10℃ ~ +60℃ , 80%RH

1.17 Weight

82 ± 10gr

1.18 Terminals

No.	Terminal	Function
1	AUDIO IN	MOD. AUDIO INPUT
2	CH. SW	CHANNEL SWITCH (OPEN, GND)
3	BM	MOD. +B (+5V)
4	CONTROL	MOD. OUTPUT ON/OF (+5V, 0V)
5	VIDEO IN	MOD. VIDEO INPUT
6	RF AGC	
7	N.C	
8	ARS	CHIP ADDRESS SELECT
9	SCL	CLOCK INPUT (I^2C BUS)
10	SDA	DATA INPUT/OUTPUT(I^2C BUS)
11	B+	+B (+5V)
12	N.C	
13	BT	TUNNING(+32V)
14	N.C	
15	IF OUT	IF OUTPUT
16	AUDIO OUT	AUDIO SIGNAL OUTPUT
17	GND	GROUND
18	AFT	AFT OUTPUT
29	VIDEO OUT	VIDEO SIGNAL OUTPUT

2. Mechanical characteristics

2.1 Appearance

No appreciable defects in appearance

2.2 Shape and Dimensions

As per attached outline drawing

2.3 Mounting on PC board

Must insert easily into PC board tuner holes as shown in the attached drawing.

3. Electrical characteristics

3.1 RF MODULATOR SECTION

3.1.1 RF MODULATOR OUTPUT CHARACTERISTICS

NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	Picture carrier frequency deviation	-100	fp	+100	kHz	Video in : None
2	Sound carrier frequency deviation	-7	4500	+7	kHz	Audio in : None
3	Picture Carrier Level	63	66	69	dBμ	Video in : None
4	P/S ratio(Picture/Sound)	13	15.5	17	dB	Video in : None
5	Spurious level without pass band	-	-	39.5	dBμ	0~(fp-4.6) MHz, (fp+7.4) ~ 1000 MHz
6	Spurious level within pass band	65	-	-	dB	0 ~ (fp+4.6) MHz, Video in : None
7	920 kHz beat	55	65	-	dB	Video in : 3.58 MHz, 1.0 Vp-p Measure the level of fp + 920 kHz
8	Terminal Leakage	-	47	54	dBμV	

3.1.2 RF MODULATOR VIDEO CHARACTERISTICS

NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	Video modulation	76	80	84	%	Video in : 1 Vp-p stair-steps
2	Maximum video modulation	87	93	99	%	Video in : 1.5Vp-p, stair-steps
3	Video amplitude frequency characteristics	-2.5	-0.5	2	dB	0.5~4.2㎒ (0.5㎒ base)
4	DG	-	1	7	%	Video in : 1 Vp-p, 10 stair-steps chrominance : 20 IRE
5	DP	-	1	7	deg	Video in : 1 Vp-p, 10 stair-steps chrominance : 20 IRE
6	Video S/N	45	52	-	dB	Video in : 1 Vp-p, White 100% Audio in : None HPF : 100㎑, LPF : 4.2㎒ SC TRAP : ON
7	Sync ratio	27.5	28.5	29.0	%	Video in : 1 Vp-p,White V : S = 10 : 4

※ Measured By Standard Demodulator (,3,4,5,6,7)

3.1.3 RF MODULATOR AUDIO CHARACTERISTICS

NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	Audio modulation	32 (64)	40 (80)	48 (96)	㎑ (%)	Audio in: -6.5dBs, 1㎑ (100% mod. = ±25㎑ dev.)
2	Audio maximum modulation	150 (300)	220 (440)	- -	㎑ (%)	Audio in: 1㎑ The input should be adjusted to the level just before the saturation of the modulation
3	Audio amplitude frequency characteristics	-3	0	+3	dB	Audio in: -6.5dBs, 1㎑ (±7.5㎑ dev.) 50Hz~12㎑ (1㎑ base)
4	Audio Distortion	-	0.3	1	%	Audio in : -6.5dBs, 1㎑ Video in: 1 Vp-p color bar De-emphasis on (75㎲)
5	Audio S/N	48	60	-	dB	Audio in : -6.5dBs Video in: Sync only De-emphasis on (75㎲)
6	Audio Buzz	45	50	-	dB	Audio in : 1㎑ (MOD. OFF) Video in: Sync only De-emphasis on (75㎲)

※ Measure By Demodulator (3,4,5,6)

3.1.4 SW CIRCUITS CHARACTERISTICS

NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	V.S.W.R.	-	-	4.5 3	-	ANT IN (MOD. OFF) 50㎒ ~ 850㎒ ANT OUT (MOD. OFF) 50㎒ ~ 850㎒
		-	-	3	-	ANT IN (MOD. ON) 61㎒ ~ 72㎒
2	Insertion Loss	-	-	6.0	dB	ANT in to ANT out (MOD. OFF) 50~850㎒
3	ANT IN Leakage -Modulator -Tuner OSC	 - -	 - 47	 9.5 54	 dBμV dBμV	(MOD. ON) RF-MOD.section : none input Tuner OSC Leakage
4	Isolation	60	65	-	dB	ANT In ~ ANT out (MOD. ON) 61~72㎒
5	2nd Harmonics inter modulation	55	64	-	dB	f1/(f1+f2) ratio MOD. OFF f1 : 91.25㎒ 100dBμV f2 : 103.25㎒ 100dBμV Both f1 and f2 are not modulated.
6	Cross Modulation	55	62	-	dB	

3.1.5 RF MODULATOR STABILITY CHARACTERISTICS

NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	Picture carrier frequency rise up time	-50	-	+50	kHz	within 3 second
2	Sound carrier frequency rise up time	-3	-	+3	kHz	within 10 second
3	Picture carrier frequency shift by supply voltage drift	-10	-	+10	kHz	by ±0.3V shift of the supply voltage
4	Sound carrier frequency shift by supply voltage drift	-5	-	+5	kHz	by ±0.3V shift of the supply voltage

3.1.6 RF MODULATOR THERMAL STABILITY CHARACTERISTICS

Measurement temperature range : -10℃ ~ 60℃

Humidity range : 45%RH ~ 85%RH

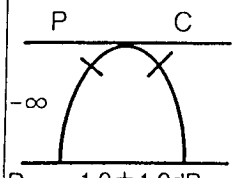
Test measurement order and time :

25℃ → -10℃(2H) → 10℃(1H) → 25℃(1H) → 45℃(1H) → 60℃(2H)

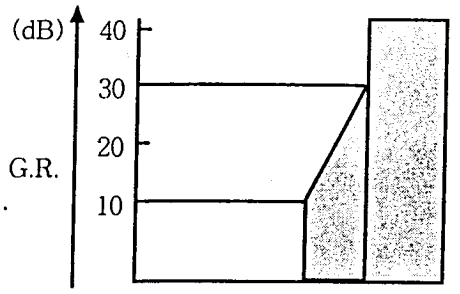
NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	Video modulation	-10	-	10	%	Based on the temperature of 25℃
2	Audio modulation	-10	-	10	%	Based on the temperature of 25℃
3	Picture carrier frequency	-100	-	100	kHz	Based on the temperature of 25℃
4	Sound carrier frequency	-12	-	12	kHz	Based on the temperature of 25℃
5	Video output level	-2	-	2	dBμV	Based on the temperature of 25℃
6	P/S ratio	-2.5	-	2.5	dB	Based on the temperature of 25℃ But 13dB min.

3.2 TUNER SECTION

3.2.1 ELECTRICAL CHARACTERISTICS

NO	ITEMS	SPECIFICATION					MEASUREMENT TERMS
		CHANNEL		MIN	TYP	MAX	UNIT	
1	VSWR	UHF			3.0	5.0		Measured at worst point on or between picture and sound carriers
		VHF (except 6)			3.0	6.0		
		CH 6				7.0		
2	Noise figure	UHF	69~14			9.5	dB	
			W+29~W+12			10.0		
		VHF CATV				9.5		
		VHF AIR				8.0		
3	Power gain	UHF		28.0	37.0		dB	
		VHF High		28.0	38.0			
		VHF How		28.0	41.0			
4	Gain Deviation	UHF	AIR	-	7	12	dB	
			CATV	-	7	12		
			UHF	-	7	12		
5	Gain taper	UHF			6.0	120.	dB	
		VHF			6.0	12.0		
6	Gain reduction	UHF		35.0			dB	AGC : 0.5V
		VHF AIR		50.0				
		VHF CATV		50.0				
7	Input/output characteristics	ALL BANDS		98.0	103.0		dBμV	75Ω Terminate
8	IF output characteristics	11		 P = -1.0±1.0dB C = -2.0±1.0dB				From ANT to IF IF cable : 3C-5V 20cm Scope sensitivity : 2㎷p-p/cm Detector : 75Ω

NO	ITEMS	SPECIFICATION					MEASUREMENT TERMS
		CH		MIN	TYP	MAX / UNIT	
8	IF rejection	UHF		70.0	90.0	dB	max gain : Worst point at 41.25㎒ to 45.75㎒
		VHF High		70.0	90.0		
		VHF Low		50.0	70.0		
		UHF		50.0	70.0	dB	-30dB G.R.
		VHF High		50.0	70.0		
		VHF Low		50.0	65.0		
9	Image rejection	UHF		45.0	52.0	dB	max gain : Worst point at image band
		VHF	W+11~J	50.0	65.0		
			13 ~ 2	60.0	65.0		
		UHF		40.0	40.0	dB	-30dB G.R.
		VHF	W+11~J	45.0	55.0		
			13 ~ 2	45.0	55.0		
10	920㎑ color beat rejection	UHF		55.0		dB	75Ω Terminate Gain : 11CH 출력일정 P : 54dBμV C : 38dBμV S : 48dBμV
		VHF		55.0			
11	CH 6 Beat rejection	6		45.0		dB	75Ω Terminate Gain : 11CH 출력일정 Des. 54dBμV
12	CH A-5 Beat rejection	A-5		50.0		dB	75Ω Terminate Gain : 11CH 출력일정 Des. 54dBμV
13	Tuning Voltage Range	VHF		0.5		30 (V)	
		UHF		0.5		30	

NO	ITEMS	SPECIFICATION CH	MIN	TYP	MAX	UNIT	MEASUREMENT TERMS
13	1% Cross modulation	 Undesired signal(dBμV) 75Ω Terminate					

CH		A (dBμV)	B (dBμV)
UHF		64	84
CATV		64	81
VHF	W+11 ~ J	59	84
	13 ~ 2	64	84

Cross modulation value should be within shaded area.
Tuner should be measured for 1% cross modulation with ±2 channel undesired signal.

NO	ITEMS	CH		min	typ	max	unit	MEASUREMENT TERMS
14	Margin	UHF	High-end	5.0			MHz	
			Low-end	2.0				
		VHF HIgh	High-end	5.0				
			Low-end	2.0				
		VHF Low	High-end	3.0				
			Low-end	2.0				
15	OSC instability	UHF				± 90	kHz	
		VHF				± 90		
16	OSC stop voltage	UHF				4.5	V	MB voltage
		VHF				4.5		
17	ANT leakage	30 ~ 300MHz				34	dBμV	75Ω Terminate
		300 ~ 1694MHz				46		
18	IF leakage	UHF				80	dBμV	75Ω Terminate
		VHF				95		

3.2.2 PLL data

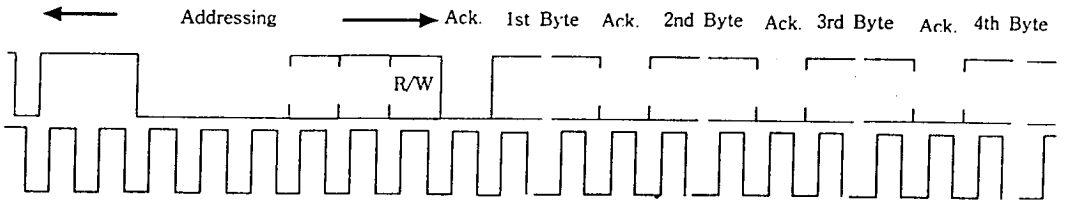
3.2.2.1 Input signal level (Clock, Data)

VIH (High - level input voltage) min : 3.0V max : 5.5V

VIL (Low - level input voltage) max : 1.5V

3.2.2.2 I^2C Bus Timing Diagram

I^2C Bus Timing Diagram



Note: SDA ——— SCL ———

Telgram examples:

Start-Addr-DR1-DR2-CW1-CW2-Stop

Start-Addr-CW1-CW2-DR1-DR2-Stop

Start-Addr-DR1-DR2-Stop

Start-Addr-CW1-CW2-Stop

Start = start condition
Addr = address byte
DR1 = prog, divider byte 1
DR2 = prog, divider byte 2
CW1 = control bype 1
CW2 = control bype 2
Stop = stop condition

3.2.2.2.1 Bit Allocation Read / Write

Byte	MSB	bit6	bit5	bit4	bit3	bit2	bit1	LSB	Ack	Remarks
Write data										
Address Byte	1	1	0	0	0	MA1	MA0	0	A	
Progr. Divider Byte 1	0	n14	n13	n12	n11	n10	n9	n8	A	
Progr. Divider Byte 2	n7	n6	n5	n4	n3	n2	n1	n0	A	
Control Byte 1	1	51	T1	T0	1	RSA	RSB	OS	A	
Control Byte 2	X	X	X	X	P3	P2	P1	P0	A	
Read Data										
Address Byte	1	1	0	0	0	MA1	MA0	1	A	
Status Byte	POR	FL	X	11	10		A1	A0	A	

3.2.2.2.2 Charge Pump Current

CP	Unit	
0	μA	50
1	μA	250

3.2.2.2.3 Reference Divider

RSA	RSB	
*	0	80
0	1	128
1	1	64

3.2.2.2.4 Tuning Frequency

Locked frequency is calculated as follows

fosc = fr X 8 x N

fosc : Locked frequency

fr : Reference Frequency (4.0㎒/512)

N : 14bit binary code

$N=2^{14}Xn14+2^{12}Xn1+.....+2^{3}Xn3+2^{2}Xn2+2^{1}Xn+n0$

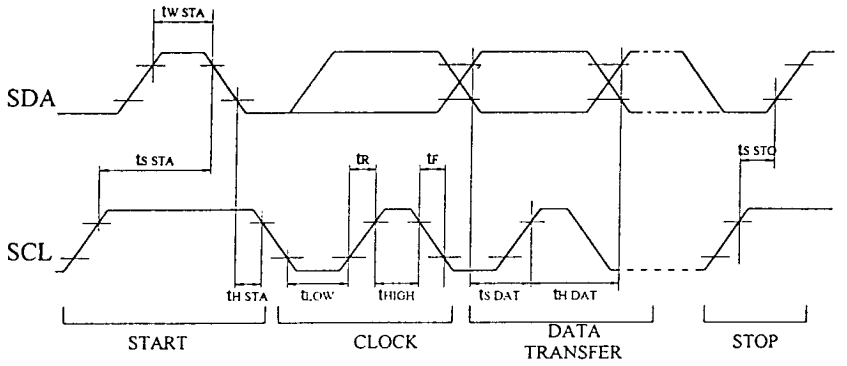
3.2.2.2.5 Band buffers output

BAND	BS4	BS3	BS2	BS1
UHF	1	0	0	0
VHF HIGH	0	0	1	0
VHF LOW	0	0	0	1
CH6	0	1	0	1

3.2.2.2.6 Address selection

MA1	MA0	Voltage at CAS
0	0	(0 ~ 0.1) *Vcc
0	1	open circuit
1	0	(0.4 ~ 0.6) *Vcc
1	1	(0.9 ~ 0.1) *Vcc

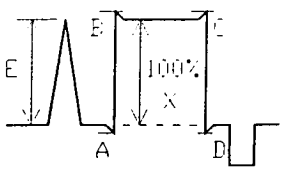
3.2.2.3 I²C Bus Timing Chart



Item	Unit	Min.	Typ.	Max.
fSCL(SCL clock frequency)	㎑	0	-	400
tS STA(Start Set-up time)	μ sec	0.6	-	-
tW STA(Start Waiting time)		1.3	-	-
tH STA(Start Hold tmie)		0.6	-	-
tLOW(LOW clock pulse width)		1.3	-	-
tHIGH(HIGH clock pulse width)		0.6	-	-
tS DAT(Data Set-up time)		0.1	-	-
tH DAT(Data Hold time)		0	-	-
tS STO(Stop Set-up time)		0.6	-	-
tR(Rise time)		-	-	0.3
tF(Fall time)		-	-	0.3

3.3 IF SECTION

3.3.1 IF VIDEO OUT CHARACTERISTICS

NO	ITEMS	SPECIFICATION MIN	TYP	MAX	UNIT	MEASUREMENT TERMS
1	Noise Limited Sensitivity VHF CATV, UHF	- -	- -	53 53	dBμV	White:50% HPF:100Hz LPF:4.2MHz Sc trap : ON, S/N : 30dB
2	Video S/N VHF UHF , AIR UHF , CATV	 45 43 43	 47 47 47	 - - -	dB	fp:70dBμV, White:50% HPF:100Hz LPF:4.2MHz Sc trap : ON
3	Maximum input VHF CATV, UHF	 100 100	 - -	 110 110	dBμV	
4	Video output level	0.9	1	1.1	Vp-p	fp:70dBμV,Standard color bar
5	Sync ratio	26	28.5	30	%	fp:70dBμV, SMPTE color bar
6	Burst ratio	23.6	28.6	30.0	%	fp:70dBμV,Standard color bar
7	Video frequency characteristics 1.0MHz 2.0MHz 3.0MHz 3.58MHz 4.1MHz	-2 -2 -2 -3 -	0 0 0 -2 -12	+2 +2 +2 +2 -6	dB	fp : 70dBμV, Multi burst Based on 0.5MHz
8	Differential Gain	-5	0	+5	%	fp : 90dBμV 10 stair-steps signal APL=10~90%
9	Differential Phase	-5	0	+5	deg	fp : 90dBμV, 10 stair-steps signal APL=10~90%
10	C/L delay	-100	0	+100	ns	Group delay 0.5MHz versus 3.58±0.5MHz
11	AGC flatness	-1	0	+1	dB	Sensitivity level to maximum input level
12	AGC speed	-	100	300	Hz	Sensitivity level to maximum input level
13	Bar Pulse Response					
		A B C D E	- - - - 90	3 3 3 3 100	13 13 13 13 -	%	$Sin^2$2T pulse & Bar (A,B,C,D,E) / X

3.3.2 IF AUDIO OUT CHARACTERISTICS

NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	Audio output level	320	370	420	mVrms	1㎑ / ±25㎑ dev. Standard color bar De-emp. ON
2	Audio frequency characteristics 50Hz ~ 8.0㎑ 8.1㎑ ~ 12㎑	 -3 -3	 0 -2	 2 2	dB	Based on 1㎑ / ±7.5㎑ dev. Standard color bar De-emp. ON
3	Audio distortion	-	0.5	2	%	1㎑ / ±25㎑ dev. Standard color bar De-emp. ON
4	Audio S/N	45	-	-	dB	1㎑ / ±25㎑ dev. Standard color bar De-emp. ON
5	Audio Sensitivity VHF UHF,AIR UHF,CATV	- - -	30 30 30	36 36 40	dBμV	1㎑ / ±25㎑ dev. Standard color bar S/N 30 dB , De-emp. ON
6	Audio sync buzz Color bar H sweep V sweep	 - - -	 - - -	 50 50 50	mVp-p	1㎑ / ±25㎑ dev. ,P/S 17dB De-emp. ON

3.3.3 AFT CHARACTERISTIC

NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	AFT Center Voltage	1.8	2.3	2.8	V	10 steps staircase at NTSC 10ch
2	AFT Range	1.0	-	4.0		
3	AFT alignment accuracy	-50	0	+50	㎑	

3.3.4 IF THERMAL CHARACTERISTICS

NO	ITEMS	SPECIFICATION				MEASUREMENT TERMS
		MIN	TYP	MAX	UNIT	
1	Video output level	-10	0	10	%	Difference between the Measurement value in the standard condition and the value measured in the temperature range of -10℃ to 60℃
2	Burst ratio	-10	0	10	%	
3	Sync ratio	-10	0	10	%	
4	Video S/N	-3	0	3	dB	
5	Video sensitivity	-4	0	4	dB	
6	Audio output level	-2	0	2	dB	
7	Audio S/N	-3	0	3	dB	
8	Audio sensitivity	-4	0	4	dB	
9	AFT center voltage	-3	0	3	V	
10	DG	-3	0	3	%	
11	DP	-3	0	3	deg	

4. Reliability Test

4.1 Local oscillator frequency drift (change in temperature : 25℃±35℃)

4.1.1 RF output

	Typical	Limits
Video carrier frequency	±50㎑	±100㎑ max.
Sound carrier center frequency	±10㎑	± 15㎑ max.

4.1.2 Video output

Shall maintain the normal receiving condition without correcting the tuning after the temperature is changed within the range between -10℃ and +60℃.

4.1.3 OSC Frequency

Drift of OSC Freq by Temperature Shift

W+12~69	-1000	1000
W+11~J	-3000	3000
13~2	-3000	3000

4.2 Local oscillator frequency drift (change in supply voltage)

(5V±0.2V, 9V±0.5V)

4.2.1 RF output

	Typical	Limits
Video carrier frequency	±10㎑	±50㎑ max.
Sound carrier center frequency	± 1㎑	± 3㎑ max.

4.2.2 Video output

Shall be problem-free in operation.

4.3 On-load test in a high temperature, high humidity environment (40℃, 90%RH, 168H)

	Limits
Picture output level	±0.1Vp-p max.
Sound output level	±30% max.
Others	shall be problem-free in operation.

4.4 On-load test in a high temperature environment (70℃, 168H)

Shall satisfy the requirement stated in Section 4.3.

4.5 Shelf test in a low temperature environment (-20℃, 168H)

Shall satisfy the requirement stated in Section 4.3.

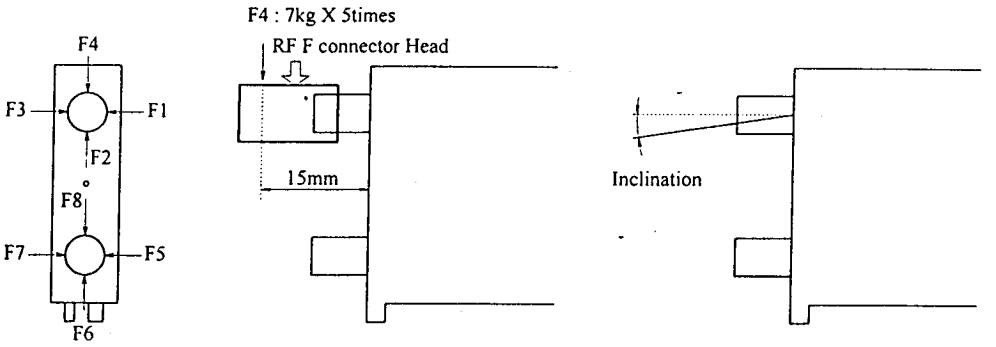
4.6 Impact test (79G on 6planes, 3times each)

Shall satisfy the requirement stated in Section 4.3.

4.7 Vibration test

(in 3different directions, for 15minute with peak to peak amplitude of 2mm at a rate of 25Hz)

4.8 F Connector Strength



Item	Unit	SPEC		
		MIN	TYP	MAX
Inclination	degree	-	-	3

5. Others

5.1 Terminal affinity to solder

Sample terminals to be soldered shall be dipped in methanol (as per JIS-K-1501) into which rosin (as per JIS-K-5902) is dissolved to a concentration of 1~7% for about 5 seconds, then dipped in a solder bath containing molten solder (JIS-Z-3282H, 63A) maintained at 230℃±5℃ for 3±0.5 seconds. After removal from the solder bath, each sample terminal tested shall show solder adhering over 90% of the submerged portions along the entire circumference.

5.2 Tolerance to hot solder

Sample terminals inserted to a PC board shall be dipped in a molted solder maintained at 350℃±5℃ for 3~4 seconds, or in a molten solder maintained at 260℃±5℃ for 9~11 seconds. After being removed from the molted solder, and kept in a room temperature for 1 hour, the tested terminals and PC board shall show no abnormality in appearance and electrical characteristics.

5.3 Breakdown Voltages

No.	Terminal name	Breakdown static voltage
1	AUDIO IN	± 400V min.
2	CH. SW	± 400V min.
3	BM (5V)	± 150V min.
4	CONTROL	± 400V min.
5	VIDEO IN	± 400V min.
6	BT (32V)	± 400V min.
7	SCL	± 400V min.
8	SDA	± 400V min.
9	ARS	± 400V min.
10	NC	± 400V min.
11	IF	± 400V min.
12	+B (5V)	± 150V min.
13	AUDIO OUT	± 400V min.
14	GND	———
15	AFT	± 400V min.
16	VIDEO OUT	± 400V min.
17	RF-IN	±15KV min
18	RF-OUT	±15KV min

5.4 Applicable Standards

FCC Standard

5.5 Channel display

Display	Channels
VHF	2 ~ 13 CH, A-5 ~ W+11 CH
VHF LOW	2 ~ B CH
VHF HIGH	C ~ W+11 CH
VHF AIR	2 ~ 13 CH
VHF CATV	A-5 ~ I CH, J ~ W+11 CH
UHF	W+12 ~ W+29 CH, 14~ 69 CH
UHF AIR	14 ~ 69CH

6. Marking method

1) Customer Model Name : DWTMI-US1-S
2) Customer Part No. : 97P760XXXX
3) DECC Model Name : DTMI-5NF01
4) Lot No. : □□□□. □□. □□
   년 월 일
5) Producting District : Made in □ □ □ □ □
   - KOREA
   - N/ILAND
   - MEXICO
   - CHINA

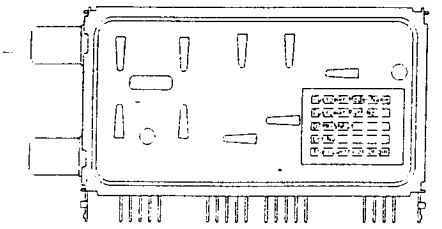
4) Label size

DWTMI-US1-S
97P760XXXX
DTMI-5NF01
□□□□.□□.□□
Made in □□□□□

18mm

27mm

5) Label attach



Frequency Table

1. AIR CHANNEL

ch No	Center freq.	Freq. range	fp	fs	fosc.	Image freq.	ch No	Center freq.	Freq. range	fp	fs	fosc.	Image frequ.
2	57	54-60	55.25	59.75	101	146.75	43	647	644-650	645.25	649.75	691	736.75
3	63	60-66	61.25	65.75	107	152.75	44	653	650-656	651.25	655.75	697	742.75
4	69	66-72	67.25	71.25	113	158.75	45	659	656-662	657.25	661.75	703	748.75
5	79	76-82	77.25	81.75	123	168.75	46	665	662-668	663.25	667.75	709	754.75
6	85	82-88	83.25	87.75	129	174.75	47	671	668-674	669.25	673.75	715	760.75
7	177	174-180	175.25	179.75	221	266.75	48	677	674-680	675.25	679.75	721	766.75
8	183	180-186	181.25	185.75	227	272.75	49	683	680-686	681.25	685.75	727	772.75
9	189	186-192	187.25	191.75	233	278.75	50	689	686-695	687.25	691.75	733	778.75
10	195	192-198	193.25	197.75	239	284.75	51	695	692-698	693.25	697.75	739	784.75
11	201	198-204	199.25	203.75	245	290.75	52	701	698-704	699.25	703.75	745	790.75
12	207	204-210	205.25	209.75	251	296.75	53	707	704-710	705.25	709.75	751	796.75
13	213	210-216	211.25	215.75	257	302.75	54	713	710-716	711.25	715.25	757	802.75
14	473	470-476	471.25	475.75	517	562.72	55	719	716-722	717.25	721.75	763	808.75
15	479	476-482	477.25	481.75	523	568.75	56	725	722-728	723.25	727.75	769	814.75
16	485	482-488	483.25	487.75	529	574.75	57	731	728-734	729.25	733.75	775	820.75
17	491	488-494	489.25	493.75	535	580.75	58	737	734-740	735.25	739.75	781	826.75
18	497	494-500	495.25	499.75	541	586.75	59	743	740-746	741.25	745.75	787	832.75
19	503	500-506	501.25	505.75	547	592.75	60	749	746-752	747.25	751.75	793	838.75
20	509	506-512	507.25	511.75	553	598.75	61	755	752-758	753.25	757.75	799	844.75
21	515	512-518	513.25	517.75	559	604.75	62	761	758-764	759.25	763.75	805	850.75
22	521	518-524	519.25	523.75	565	610.75	63	767	764-770	765.25	769.75	811	856.75
23	527	524-530	525.25	529.75	571	616.75	64	773	770-776	771.25	775.75	817	862.75
24	533	530-536	531.25	535.75	577	622.75	65	779	776-782	777.25	781.75	823	868.75
25	539	536-542	537.25	541.75	583	628.75	66	785	782-788	783.25	787.75	829	874.75
26	545	542-548	543.25	547.75	589	634.75	67	791	788-794	789.25	793.75	835	880.75
27	551	548-554	549.25	553.75	595	640.75	68	797	794-800	795.25	799.75	841	886.75
28	557	554-560	555.25	559.75	601	646.75	69	803	800-806	801.25	805.75	847	892.75
29	563	560-566	561.25	565.75	607	652.75							
30	569	566-572	567.25	571.75	613	658.75							
31	575	572-578	573.25	577.75	619	664.75							
32	581	578-584	579.25	583.75	625	670.75							
33	587	584-590	585.25	589.75	631	676.75							
34	593	590-596	591.25	595.75	637	682.75							
35	599	596-602	597.25	601.75	643	688.75							
36	605	602-608	603.25	607.75	649	694.75							
37	611	608-614	609.25	613.75	655	700.75							
38	617	614-620	615.25	619.75	661	706.75							
39	623	620-626	621.25	625.75	667	712.75							
40	629	626-632	627.25	631.75	673	718.75							
41	635	632-638	633.25	637.75	679	724.75							
42	641	638-644	639.25	643.75	685	730.75							

2. CABLE CHANNEL

Ch No	Center freq.	Freq. range	fp	fs	fosc.	Image freq.	Ch No	Center freq.	Freq. range	fp	fs	fosc.	Image freq.
2	57	54-60	55.25	59.75	101	146.75	W+2	309	306-312	307.25	311.75	353	398.75
3	63	60-66	61.25	65.75	107	152.75	W+3	315	312-318	313.25	317.75	359	404.75
4	69	66-72	67.25	71.75	113	158.75	W+4	321	318-324	319.25	323.75	365	410.75
5	79	76-82	77.25	81.75	123	168.75	W+5	327	324-330	325.25	329.75	371	416.75
6	85	82-88	83.25	87.75	129	174.75	W+6	333	330-336	331.25	335.75	377	422.75
A-6	87	84-90	85.25	89.75	131	176.75	W+7	339	336-342	337.25	341.75	383	428.75
A-5	93	90-96	91.25	95.75	137	182.75	W+8	345	342-348	343.25	347.75	389	434.75
A-4	99	96-102	97.25	101.75	143	188.75	W+9	351	348-354	349.25	353.75	395	440.75
A-3	105	102-108	103.25	107.75	149	194.75	W+10	357	354360	355.25	359.75	401	446.75
A-2	11	108-114	109.25	113.75	155	200.75	W+11	363	360-366	361.25	365.75	407	452.75
A-1	117	114-120	115.25	119.75	161	206.75	W+12	369	366-372	367.25	371.75	413	458.75
A	123	120-126	121.25	125.75	167	212.75	W+13	375	372-378	373.25	377.75	419	464.75
B	129	126-132	127.25	131.75	173	218.75	W+14	381	378-384	379.25	383.75	425	470.75
C	135	132-138	133.25	137.75	179	224.75	W+15	387	384-390	385.25	389.75	431	476.75
D	141	138-144	139.25	143.75	185	230.75	W+16	393	390-396	391.25	395.75	437	482.75
E	147	144-150	145.25	149.75	191	236.75	W+17	399	396-402	397.25	401.75	443	488.75
F	153	150-156	151.25	155.75	197	242.75	W+18	405	402-408	403.25	407.75	449	494.75
G	159	156-162	157.25	161.75	203	248.75	W+19	411	408-414	409.25	413.75	455	500.75
H	165	162-168	163.25	167.75	209	254.75	W+20	417	414-420	415.25	419.75	461	506.75
I	171	168-174	169.25	173.75	215	260.75	W+21	423	420-426	421.25	425.75	467	512.75
7	177	174-180	175.25	179.75	221	266.75	W+22	429	426-432	427.25	431.75	473	518.75
8	183	180-186	181.25	185.75	227	272.75	W+23	435	432-438	433.25	437.75	479	524.75
9	189	186-192	187.25	191.75	233	278.75	W+24	441	438-444	439.25	443.75	485	530.75
10	195	192-198	193.25	197.75	239	284.75	W+25	447	444-450	445.25	449.75	491	536.75
11	201	198-204	199.25	203.75	245	290.75	W+26	453	450-456	451.25	455.75	497	542.75
12	207	204-210	205.25	209.75	251	296.75	W+27	459	456-462	457.25	461.75	503	548.75
13	213	210-216	211.25	215.75	257	302.75	W+28	465	462-468	463.25	467.75	509	554.75
J	219	216-222	217.25	221.75	263	308.75	W+29	471	468-474	469.25	473.75	515	560.75
K	225	222-228	223.25	227.75	269	314.75	W+30	477	474-480	475.25	479.75	521	566.75
L	231	228-234	229.25	233.75	275	320.75	W+31	483	480-486	481.25	485.75	527	572.75
M	237	234-240	235.25	239.75	281	326.75	W+32	489	486-492	487.25	491.75	533	578.75
N	243	240-246	241.25	245.75	287	332.75	W+33	495	492-498	493.25	497.75	539	584.75
O	249	246-252	247.25	251.75	293	338.75	W+34	501	498-504	499.25	503.75	545	590.75
P	255	252-258	253.25	257.75	299	344.75	W+35	507	504-510	505.25	509.75	551	596.75
Q	261	258-264	259.25	263.75	305	350.75	W+36	513	510-516	511.25	515.75	557	602.75
R	267	264-270	265.25	269.75	311	356.75	W+37	519	516-522	517.25	521.75	563	608.75
S	273	270-276	271.25	275.75	317	362.75	W+38	525	522-528	523.25	527.75	569	614.75
T	279	276-282	277.25	281.75	323	368.75	W+39	531	528-534	529.25	533.75	575	620.75
U	285	282-288	283.25	287.75	329	374.75	W+40	537	534-540	535.25	539.75	581	626.75
V	291	288-294	289.25	293.75	335	380.75	W+41	543	540-546	541.25	545.75	587	632.75
W	297	294-300	295.25	299.75	341	386.75	W+42	549	546-552	547.25	551.75	593	638.75
W+1	303	300-306	301.25	305.75	347	392.75	W+43	555	552-558	553.25	557.75	599	644.75

Ch No	Center freq.	Freq. range	fp	fs	fosc.	Image freq.	Ch No	Center freq.	Freq. range	fp	fs	fosc.	Image freq.
W+44	561	558-564	559.25	563.75	605	650.75							
W+45	567	564-570	565.25	569.75	611	656.75							
W+46	573	570-576	271.25	575.75	617	662.75							
W+47	579	576-582	577.25	581.75	623	668.75							
W+48	585	582-588	583.25	587.75	629	674.75							
W+49	591	588-594	589.25	593.75	635	680.75							
W+50	597	594-600	595.25	599.75	641	686.75							
W+51	603	600-606	601.25	605.75	647	692.75							
W+52	609	606-612	607.25	611.75	653	698.75							
W+53	615	612-618	613.25	617.75	659	704.75							
W+54	621	618-624	619.25	623.75	665	710.75							
W+55	627	624-630	625.25	629.75	671	716.75							
W+56	633	630-636	631.25	635.75	677	722.75							
W+57	639	636-642	637.25	641.75	683	728.75							
W+58	645	642-648	643.25	647.75	689	734.75							
W+59	651	648-654	649.25	653.75	695	740.75							
W+60	657	654-660	655.25	659.75	701	746.75							
W+61	663	660-666	661.25	665.75	707	752.75							
W+62	669	666-672	667.25	671.75	713	758.75							
W+63	675	672-678	673.25	677.75	719	764.75							
W+64	681	678-684	679.25	683.75	725	770.75							
W+65	687	684-690	685.25	689.75	731	776.75							
W+66	693	690-696	691.25	695.75	737	782.75							
W+67	699	696-702	697.25	701.75	743	788.75							
W+68	705	702-708	703.25	707.75	749	794.75							
W+69	711	708-714	709.25	713.75	755	800.75							
W+70	717	714-720	715.25	719.75	761	806.75							
W+71	723	720-726	721.25	725.75	767	812.75							
W+72	729	726-732	727.25	731.75	773	818.75							
W+73	735	732-738	733.25	737.75	779	824.75							
W+74	741	738-744	739.25	743.75	785	830.75							
W+75	747	744-750	745.25	749.75	791	836.75							
W+76	753	750-756	751.25	755.75	797	842.75							
W+77	759	756-762	757.25	761.75	803	848.75							
W+78	765	762-768	763.25	767.75	809	854.75							
W+79	771	768-774	769.25	773.75	815	860.75							
W+80	777	774-780	775.25	779.75	821	866.75							
W+81	783	780-786	781.25	785.75	827	872.75							
W+82	789	786-792	787.25	791.75	833	878.75							
W+83	795	792-798	793.25	797.75	839	884.75							
W+84	801	798-804	799.25	803.75	845	890.75							