

Set-Top Box

4000 pro

SERVICE MANUAL

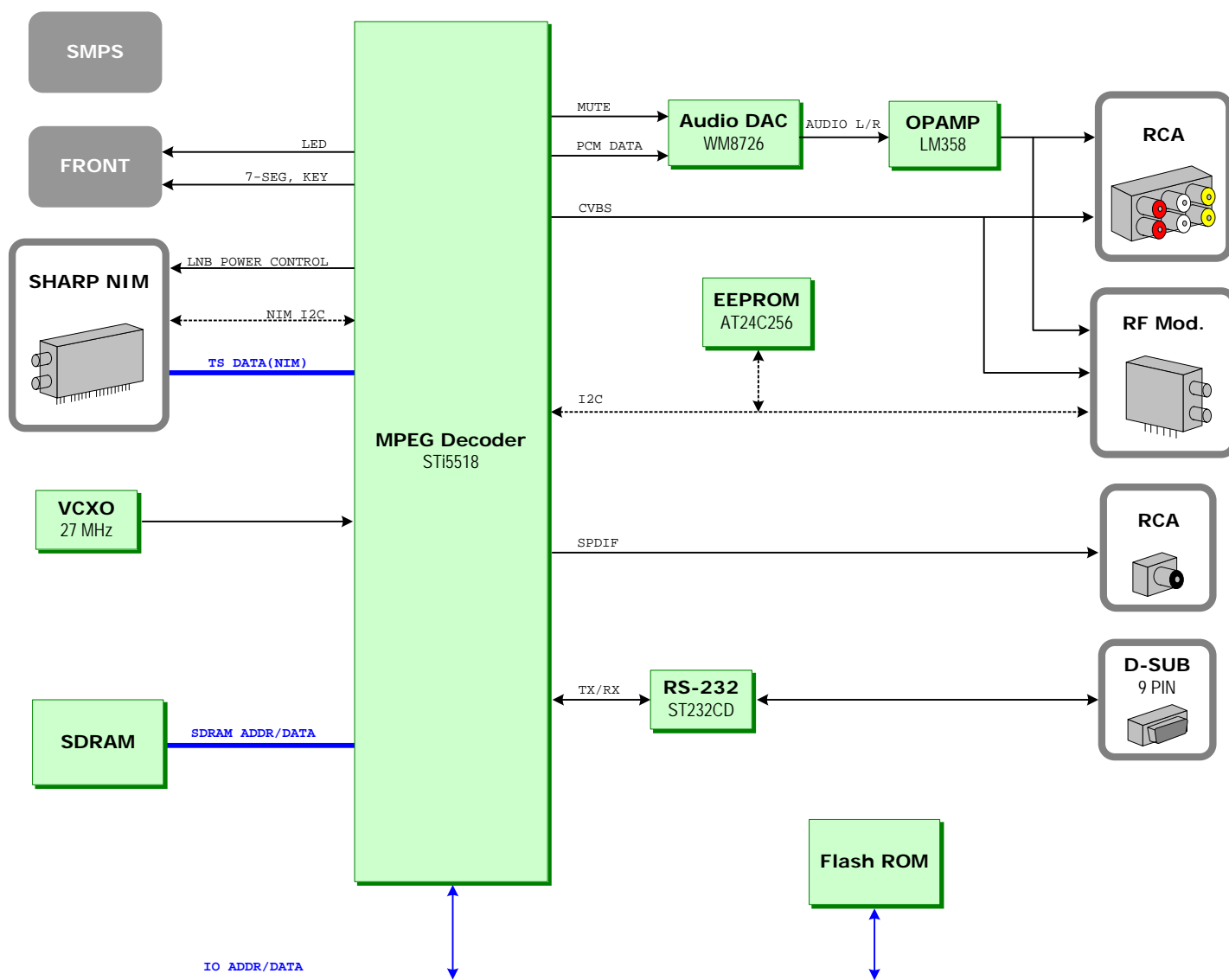


4000 pro

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1. BLOCK DIAGRAM



2. TECHNICAL SPECIFICATION

Tuner & QPSK Demodulator(NIM)

- LNB IF input : F type Female(IEC169-24)
- LNB IF loop-through output : F type Female(IEC169-24)
- Input frequency range : 950MHz to 2150MHz
- RF input signal level : -25dBm to -65dBm
- RF impedance : 75 ohms
- LNB power : 13.5 / 18.5 Vdc +/- 5%, 0.5Amax and Overload Protected
- DiSEqC : Version 1.2, Tone burst A/B
- Demodulation : QPSK
- Symbol rate : 2Msps to 45Msps, SCPC/MCPC

MPEG Decoder

- Transport stream : MPEG-2 TS Specification(ISO/IEC 13818)
- Input rate : Max. 60Mbit/s
- VIDEO : MPEG-2 MP@ML
- AUDIO : MPEG-1/2 Audio layer 1,2
- Aspect Ratio : 4:3 or 16:9
- Video resolution : 720x576(PAL), 720x480(NTSC)
- Audio mode : Stereo, Dual channel, Joint stereo, Mono
- Audio sampling frequency : 32/44.1/48KHz

Audio/Video & Data In/Out

- RCA jack : CVBS(Yellow), Audio L(White), Audio R(Red) output x 2
S/PDIF output(Black)
- Serial port : RS232C DSUB-9 pin Male type

Memory

- Flash ROM : 2Mbyte
- SDRAM : 8Mbyte
- EEPROM : 256Kbit

RF Modulator

- TV Standard : PAL G/I/K selectable by menu setting
- Audio output : Mono with volume control
- Preset channel : Default CH 36. Can be modified by menu screen

Power Supply

- Input voltage range : 90Vac ~ 250Vac(SMPS)
- Input frequency range : 50Hz ~ 60Hz
- Power consumption : Max 20W
- Protection : Separate internal fuse, the input shall have lightning protection

Physical Specification & Environmental Condition

- Weight : 1.8KG
- Size (W x H x D) : 260mm x 54mm x 232mm
- Operating temperature : 0 ~ 45
- Storage temperature : -10 ~ 70
- Operating humidity range : 10% ~ 85% RH, Non-condensing
- Storage humidity range : 5% ~ 90% RH, Non-condensing

3. TROUBLE SHOOTING

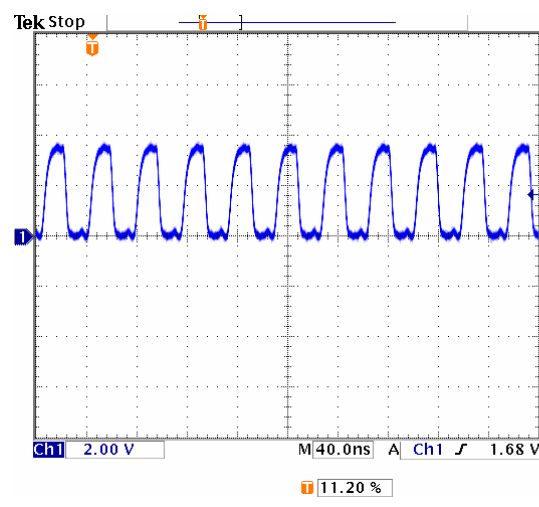
3.1 Exterior Test

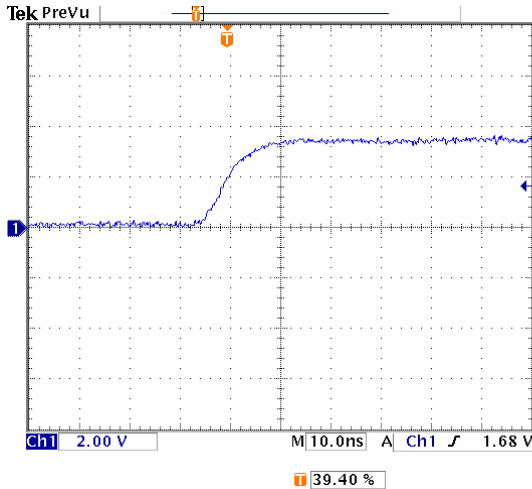
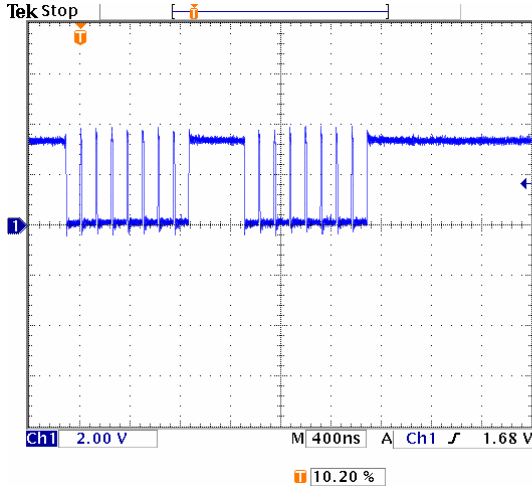
Check the condition of install, joining of connectors, broken or bending PCB, cold-soldering or short of components and problem of part, etc.

3.2 Power Test

Check power supply(SMPS)	Concerned part : SMPS																								
Symptom : The system doesn't work and there's no action in front display after power on.																									
Solution :																									
<p>In this case, check the connection of power supply connector whether it is connected to the board correctly or not. And check the power supply from SMPS. At CON901, the normal voltage of each pin is shown below.</p>																									
<table border="1"> <thead> <tr> <th>Pin No.</th><th>Value</th></tr> </thead> <tbody> <tr> <td>Pin 1</td><td>5V</td></tr> <tr> <td>Pin 2</td><td>3.3V</td></tr> <tr> <td>Pin 3</td><td>5V</td></tr> <tr> <td>Pin 4</td><td>GND</td></tr> <tr> <td>Pin 5</td><td>8V</td></tr> <tr> <td>Pin 6</td><td>12V</td></tr> <tr> <td>Pin 7</td><td>23V</td></tr> <tr> <td>Pin 8</td><td>N.C.</td></tr> <tr> <td>Pin 9</td><td>GND</td></tr> <tr> <td>Pin 10</td><td>N.C.</td></tr> <tr> <td>Pin 11</td><td>GND</td></tr> </tbody> </table>		Pin No.	Value	Pin 1	5V	Pin 2	3.3V	Pin 3	5V	Pin 4	GND	Pin 5	8V	Pin 6	12V	Pin 7	23V	Pin 8	N.C.	Pin 9	GND	Pin 10	N.C.	Pin 11	GND
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Pin 7	23V																								
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Pin 10	N.C.																								
Pin 11	GND																								
<p>If there's no voltage or incorrect value($\pm 10\%$), replace SMPS.</p>																									

3.3 System Test

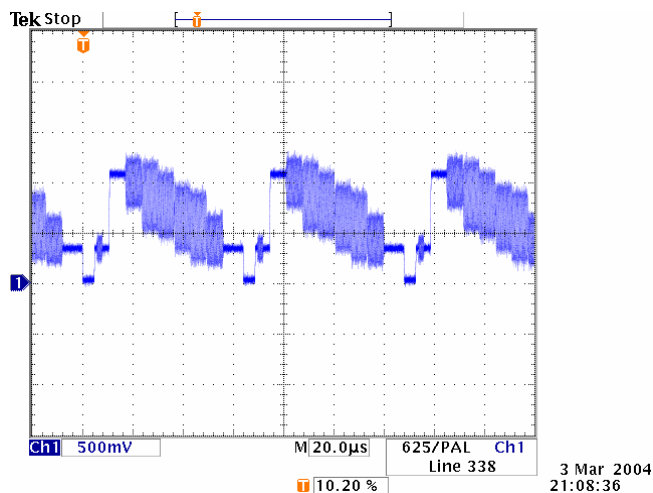
Check main system clock	Concerned Part : VCXO(U203)
Symptom : The system doesn't boot or intermittently acting after power on.	
<p>Solution :</p> <p>Basically, the system uses 27MHz VCXO clock. CPU(U201) gets 27MHz system clock, and then generates other clocks for system use. If this clock is abnormal, the system doesn't work correctly.</p> <p>To verify this clock, check R227.</p> <div data-bbox="204 846 745 969" style="border: 1px solid blue; padding: 5px; margin: 10px 0;"> <p>27MHz Clock Check Point : R227</p> </div> <div data-bbox="798 716 1465 1220" style="text-align: right;">  <p>Ch1 Freq 27.19MHz</p> </div> <p>If the clock shape is unlike as shown above, it is possible that VCXO(U203) is damaged. Check power supply of VCXO(3.3V), soldering state, direction of part insertion etc. If you can't find any problem, replacement of VCXO is required.</p>	

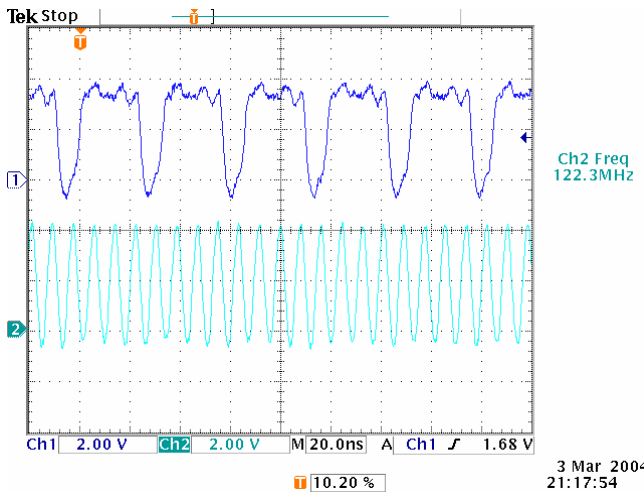
Test for Boot sequence	Concerned part : CPU(U201), Flash-ROM(U302)
Symptom : The system doesn't boot or intermittently acting after power is on.	
Solution :	
<p>Generally, system starts boot sequence after that power is on. If power supply of a set is normal and the set doesn't start boot sequence, it is possible that signals between CPU and Flash-ROM are abnormal.</p> <p>Check the reset and chip enable signal of Flash-ROM(U302).</p>	
<div>Reset signal</div> <div>Check Point : <i>Pin 12 of U302</i></div>	 <p>3 Mar 2004 21:00:05</p>
<div>Chip enable signal</div> <div>Check Point : <i>Pin 26 of U302</i></div>	 <p>3 Mar 2004 21:05:32</p>
<p>Or, you can solder again major chips concerned with boot sequence. That is, CPU(U201), Flash-ROM(U302) and SDRAM(U301). Be cautious, when replacing or re-soldering components. The static of soldering may damage the components. Check the general install, soldering condition and wrong or reverse insertion of parts.</p>	

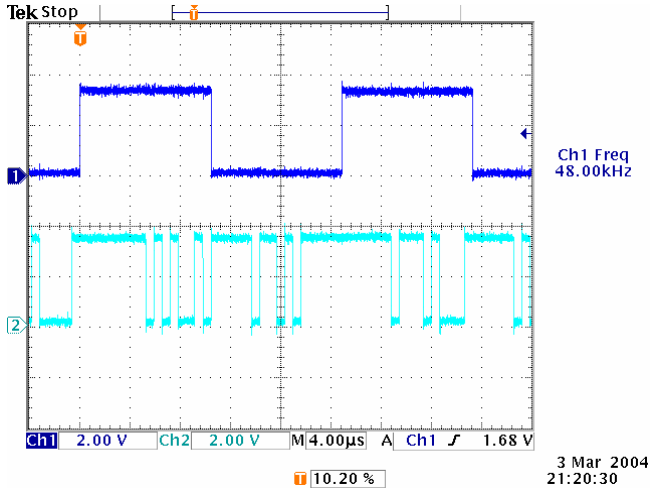
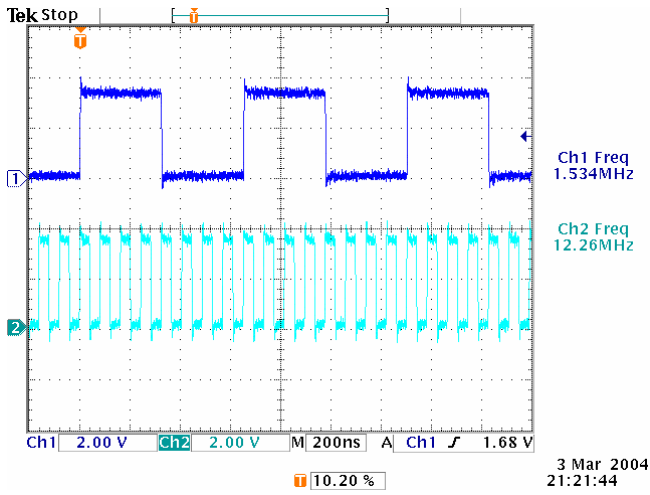
Software download	Concerned part : Flash-ROM(U302)
Symptom : The system doesn't work.	
<p>Solution :</p> <p>When you want to download new software, or software seems to work abnormal, just follow below directions.</p> <ol style="list-style-type: none">(1) Connect a RS-232 cable between your set and PC.(2) Execute software download program in your PC that is offered by manufacture.(3) Click on '<u>B</u>rowse' to select firmware which is downloaded.(4) Click on '<u>C</u>onnect'.(5) Power on your set, then firmware downloading procedure start automatically. <p>There is an alternative way to download software. If you have another set that is working correctly and there's no PC to use, Set-to-Set copy is possible. With this method, you can copy the software from normal set(SET A) to abnormal set(SET B). Follow below directions.</p> <ol style="list-style-type: none">(1) Connect RS-232 cable between SET A and SET B.(2) Power on SET A.(3) Press MENU and select 'System Information'. Press OK.(4) Select 'Firmware' and press OK.(5) Power on SET B.(6) After initialize procedure, firmware is downloaded automatically.	

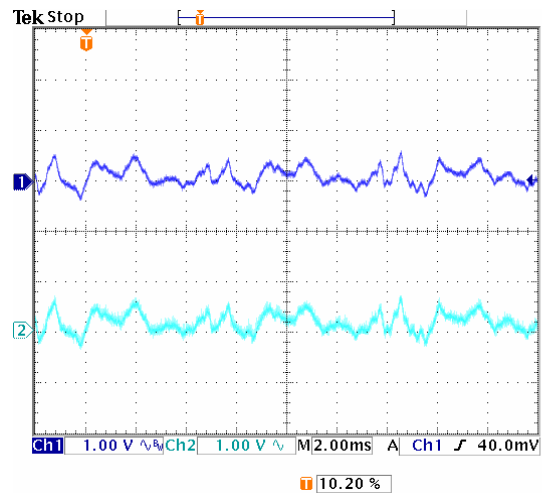
3.4 MPEG and A/V Test

Check the path of MPEG signal from MPEG decoder(CPU) to A/V output. Check the output port function(RF-Modulator, RCA-jack, etc) at rear panel.

MPEG decoder test	Concerned part : MPEG decoder(U201 , is also CPU)
Symptom : System is normal, but video signal does not appear.	
<p>Solution :</p> <p>MPEG decoder has video outputs CVBS and RGB. The picture shown down below is the output pattern by using 100% color bar signal.</p> <div data-bbox="221 909 459 990" style="border: 1px solid black; padding: 5px; width: fit-content;"> CVBS Check Point : L601 </div> <div data-bbox="802 741 1458 1232">  </div> <p>If there's no signal at these check points, resoldering of the MPEG decoder is required. If there's no video signal at output port(RCA jack, RF-modulator etc) but MPEG decoder outputs are normal, trace the circuit related RCA, RF. And check the waves of each part. If you can't solve the problem with these method, it is possible that replace the MPEG decoder(U201).</p>	

SDRAM test	Concerned part : SDRAM(U301)
Symptom : Screen shows entirely green or seriously broken.	
<p>Solution :</p> <p>Basically, CPU uses SDRAM as MPEG decoding memory. Therefore, abnormal working of SDRAM causes broken video screen or wholly green. In this case, check the SDRAM control signal as below.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p>SDRAM chip select</p> <p>Check Point : Pin 19 of U301</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p>SDRAM clock</p> <p>Check Point : R220</p> </div> <div style="text-align: center;">  <p>Ch1 2.00 V Ch2 2.00 V M 20.0ns A Ch1 1.68 V</p> <p>Ch2 Freq 122.3MHz</p> <p>10.20 %</p> <p>3 Mar 2004 21:17:54</p> </div> </div>	
<p>The frequency of SDRAM clock signal is about 120MHz. If the above signals are okay, examine the signal for all address and data pins. If you can't find any problem with this test, check the short of pins, soldering error, cold-soldering, etc.</p> <p>Replacing chip should be the last option.</p>	

Check Audio DAC	Concerned part : Audio DAC(U601)
Symptom : Audio signal not generating	
<p>Solution :</p> <p>If the system is normal, but audio signal does not appear by RCA jack, RF modulator etc, check digital audio input of audio DAC(U601). Refer to below waveform diagrams. If digital audio signal is normal, trace the route of analog audio signal from audio DAC output to RCA jack, RF modulator etc. And check the signal.</p> <p>If the Audio Main clock MCLK(8.192MHz ~12.288MHz) is acting unstably, check the soldering state of CPU(U201). And check the VCXO(U203) clock(27 MHz). If CPU and VCXO are okay, then check the signals into Audio DAC(U601). All signals to Audio DAC are likely to as shown below.</p>	
<div>LRCLK</div> <div>Check Point : <i>Pin 1 of U601</i></div>	
<div>SCLK</div> <div>Check Point : <i>Pin 3 of U601</i></div>	
<div>MCLK</div> <div>Check Point : <i>Pin 14 of U601</i></div>	
<p>If the signals into audio DAC are not much the same as above shape, CPU can be replaced. These signals are all correct, but there's no audio, you can check the output of audio DAC.</p> <p>The picture below shows the output waveform of audio DAC at normal operation.</p>	

Left AudioCheck Point : *Pin 9 of U601***Right Audio**Check Point : *Pin 6 of U601*3 Mar 2004
22:02:11

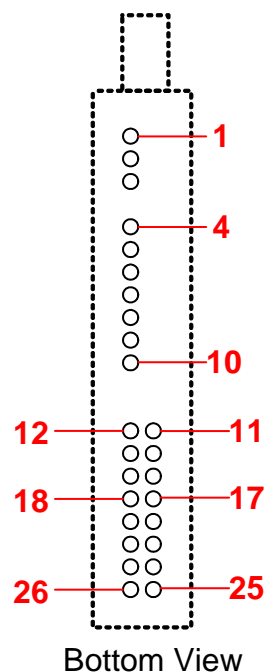
If there are no signals, audio DAC maybe broken. Then you can try to replace the audio DAC.

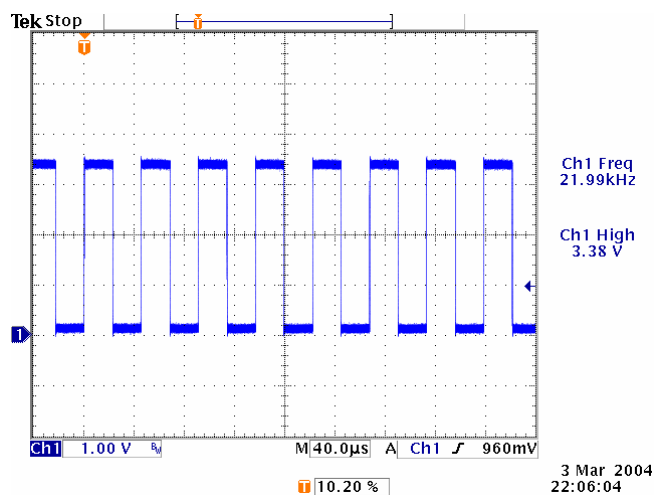
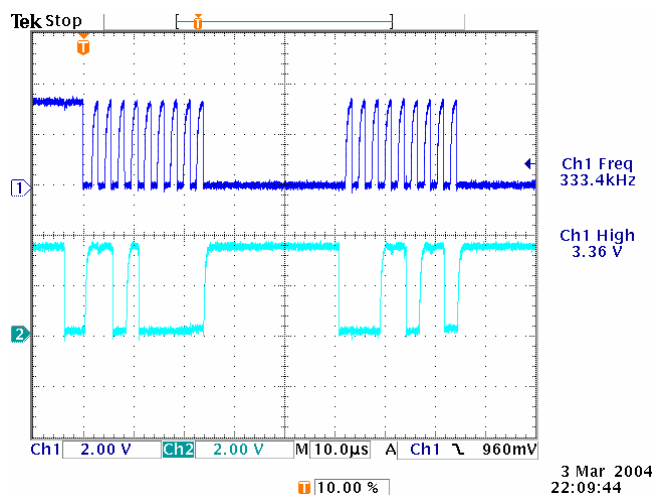
If the output of audio DAC is normal, trace each circuit to find the problem spot.

Like video, audio is a part of analog, so most failures are probably found in soldering and poor components.

3.5 Channel Test

Check power and control signal on tuner	Concerned part : QPSK Tuner(TU101)
Symptom : You can't scan channels and signal strength bar is very low.	
<p>Solution :</p> <p>First of all, make sure antenna cable is connected correctly. If that is correct, check below points of LNB power control part.</p> <ul style="list-style-type: none"> • 14V(vertical) or 18V(Horizontal) at BD106(If there's no voltage, check U103) • 3.3V at BD101, BD102(If there's no voltage, check U101) • 1.8V at BD103(If there's no voltage, check U104) <p>If all of these powers are correct and the set still have problem, check all of signals associated with tuner(TU101).</p> <ul style="list-style-type: none"> • Pin 2 : 14V(vertical) or 18V(Horizontal) • Pin 3,4 : 3.3V • Pin 8 : I²C data(3.3V pick-to-pick) • Pin 9 : I²C clock(3.3V pick-to-pick) • Pin 11 : 3.3V • Pin 12 : 22KHz pulse output • Pin 13 : 1.8V • Pin 14~21 : TS data0~7 • Pin 22 : TS clock • Pin 23 : TS valid • Pin 24 : TS sync • Pin 25 : TS error • Pin 26 : Tuner reset 	



22KHz pulse outputCheck Point : **Pin 12 of TU101****I²C clock for Tuner**Check Point : **Pin 9 of TU101****I²C data for Tuner**Check Point : **Pin 8 of TU101**

Any of these signal is unlike with reference, check the trace of associate value.

All these values are correct, it is possible that tuner is damaged. In this case, replace the tuner.

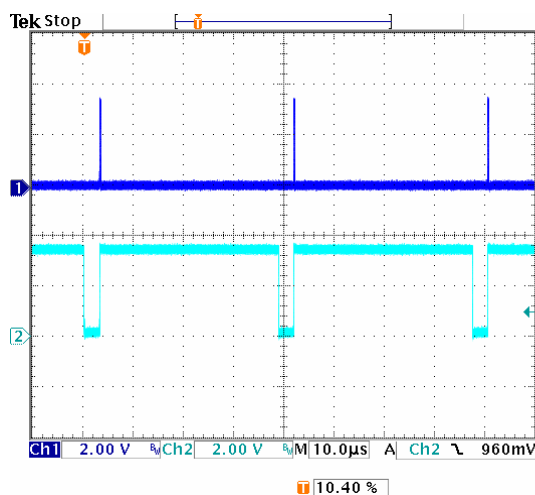
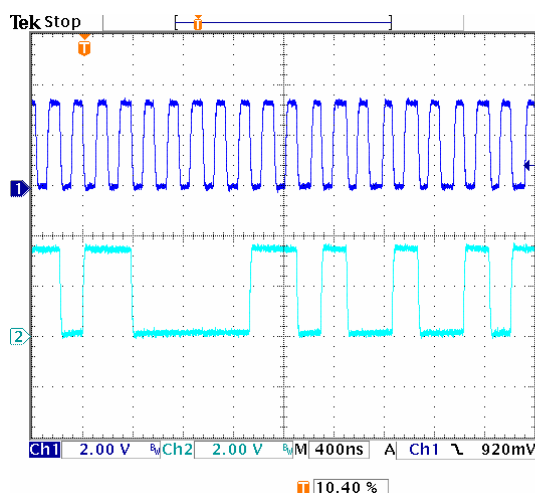
Check TS Stream

Concerned part : Tuner(**TU101**)

Symptom : Channel is locked, but 'no signal' displayed.

Solution :

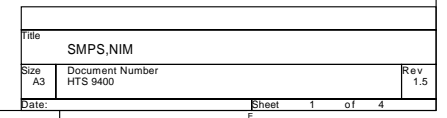
Check following points.

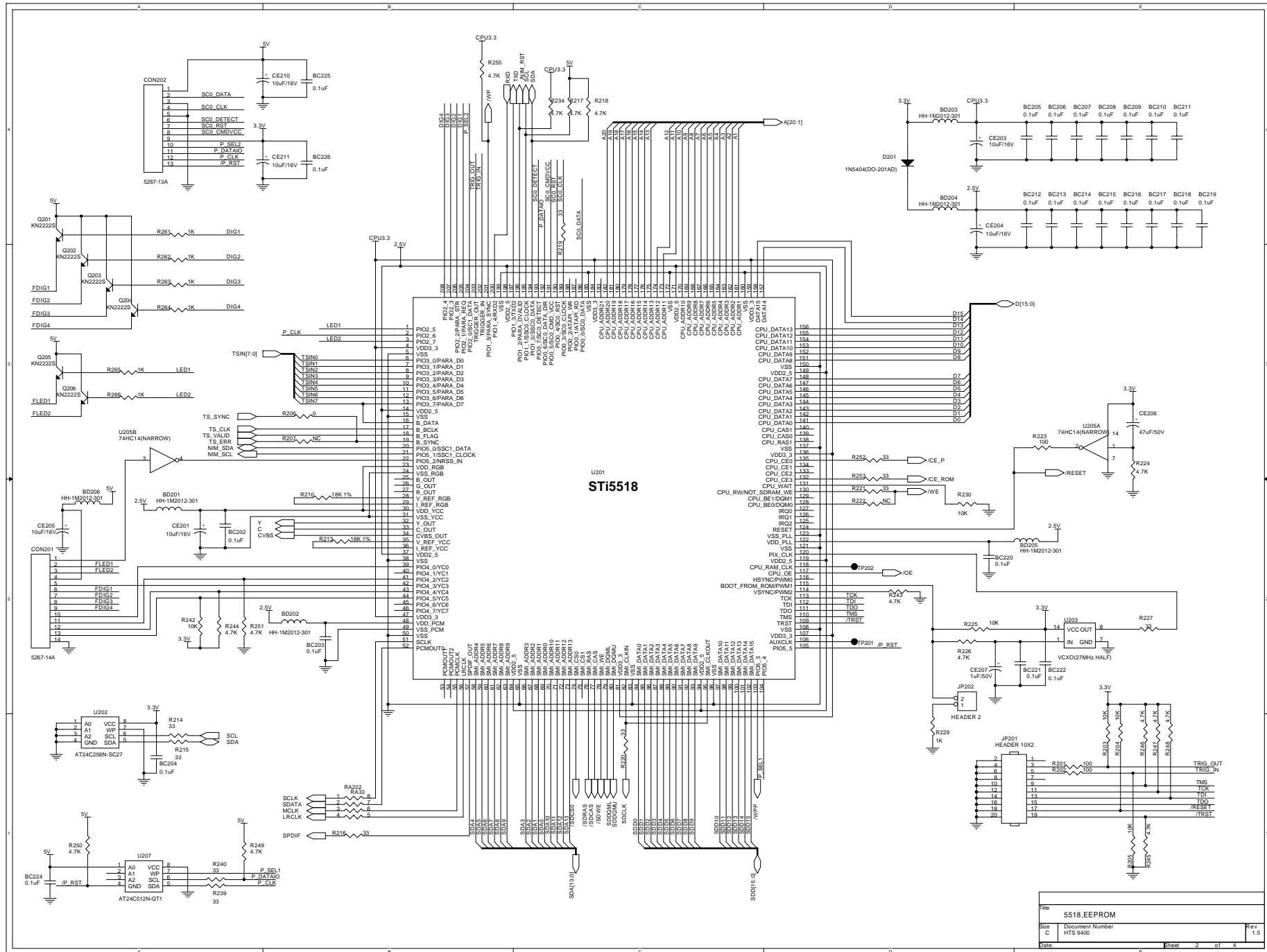
TS syncCheck Point : **Pin 24 of TU101****TS valid**Check Point : **Pin 23 of TU101****TS clock**Check Point : **Pin 22 of TU101****TS data0~7**Check Point : **Pin 14~21 of TU101**3 Mar 2004
22:14:133 Mar 2004
22:15:39

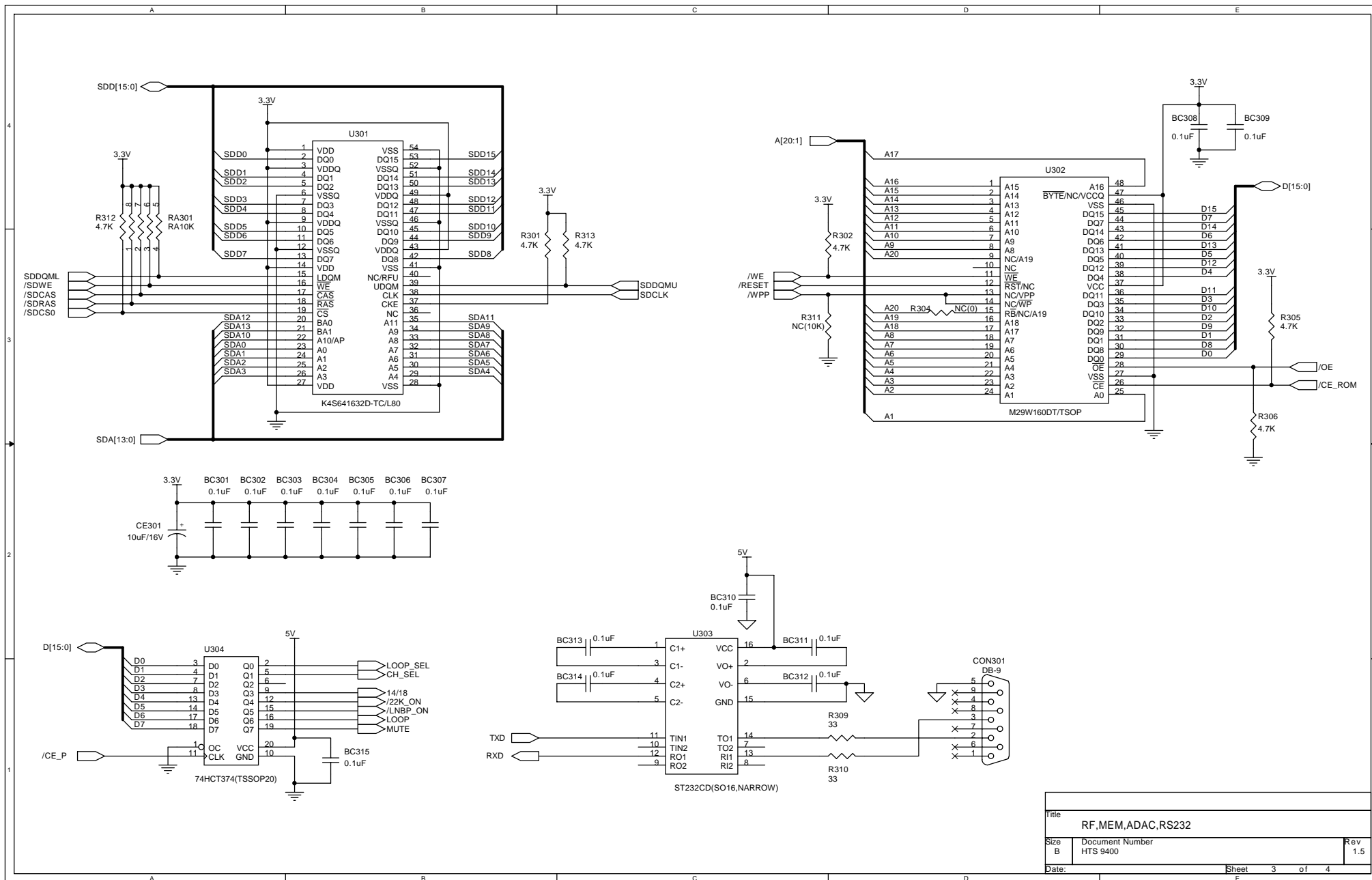
The above check points are sequential. Among check points, the signals pass several signal routes. If the signals show different shapes from the above graphs, find the position by referencing circuit diagram.

If MPEG play is not acting, check whether the soldering condition such as cold-soldering makes signal error at TS data line.

4.1 MAIN BOARD

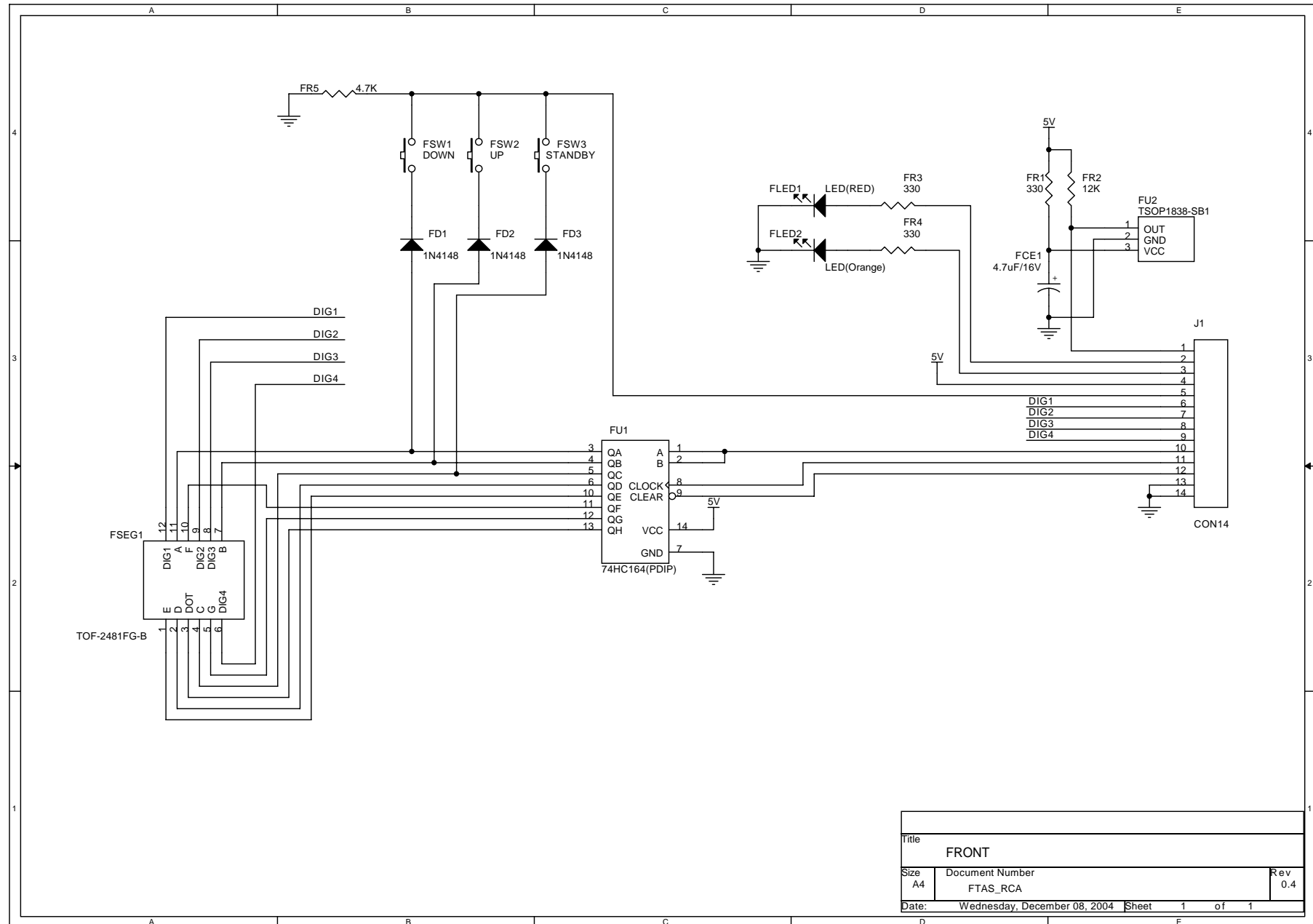






Title		
RF, MEM, ADAC, RS232		
Size	Document Number	Rev
B	HTS 9400	1.5
Date:	Sheet 3 of 4	

4.2 FRONT BOARD



Title		
FRONT		
Size	Document Number	Rev
A4	FTAS_RCA	0.4
Date:	Wednesday, December 08, 2004	Sheet 1 of 1

5. BILL OF MATERIALS

MAIN BOARD			
PART NO.	DESCRIPTION	QTY	LOCATION NO.
PCB, MAIN	PCB-D,HTS 9400 MAIN VER. 0.3	1	
HEAT SINK	LM317,VCD	1	(U103)
SCREW	TT2,BIN+,3*6,SILVER	1	(U103)
RESISTOR,AXIAL	R-C-AX,1/4,10K,J	1	R133
TRANSISTOR,DIP	KSB772-Y (TO-126)	1	Q101
REGULATOR,DIP	REG-RA,KIA7809PI	1	U602
REGULATOR,DIP	REG-RA,LM78L05 (TO-92)	1	U603
REGULATOR,DIP	REG,LM317T (TO-220)	1	U103
DIODE,RECTIFIER	1N5819 (DO-41)	1	D103
DIODE,RECTIFIER	1N5404 (DO-201AD,DIP)	1	D201
DIODE,ZENER	MTZ J 6.2B	1	D601
POLY SWITCH	PRHA065T	1	F101
JACK,RS-232C	9P,Male,SCREW	1	CON301
JACK,RCA	RCA,3*2,JE060061	1	CON601
JACK,RCA	RCA,1P,JE010003PN	1	CON603
JACK,S-VHS	mini-DIN4_2	1	CON602
CON,WAFER	LWB0640-13P,13P	1	CON202
CON,WAFER	LWB0640-14P,14P	1	CON201
CON,WAFER	PWR,11P,2.54m	1	CON901
MDL,TUNER	BS2FVZ0624,SHARP	1	TU101
MDL,RF	RMVP13450AB,NTSC	1	MOD601
VCXO	27MHz,3.3V,4P,HALF	1	U203
CAPACITOR,ELEC	50V,1 UF,SMS	1	CE207
CAPACITOR,ELEC	16V,10 UF,SMS	19	CE201,CE203,CE204,CE205,CE210,CE211,CE301,CE602,CE603,CE604,CE605,CE606,CE607,CE608,CE609,CE610,CE612,CE614,CE618
CAPACITOR,ELEC	50V,47 UF,SMS	2	CE106,CE206
CAPACITOR,ELEC	16V,100 UF,SMS	10	CE601,CE611,CE613,CE615,CE616,CE617,CE619,CE901,CE903,CE904
CAPACITOR,ELEC	16V,220 UF,SMS	3	CE101,CE102,CE103
CAPACITOR,CHIP	1608,J,50V,10 PF	2	C618,C617
CAPACITOR,CHIP	1608,J,50V,22 PF	7	C104,C609,C610,C613,C616,C619,C621
CAPACITOR,CHIP	1608,J,50V,47 PF	2	C604,C602
CAPACITOR,CHIP	1608,J,50V,56 PF	1	C623
CAPACITOR,CHIP	1608,J,50V,200 PF	3	C608,C620,C622
CAPACITOR,CHIP	1608,J,50V,390PF	2	C603,C601
CAPACITOR,CHIP	1608,K,50V,1000 PF	9	C101,C102,C103,C105,C605,C606,C607,C614,C615

CAPACITOR,CHIP	1608,Z,25V,0.1 UF	58	BC101,BC102,BC103,BC104,BC202,BC203,BC204,BC205,BC206,BC207,BC208,BC209,BC210,BC211,BC212,BC213,BC214,BC215,BC216,BC217,BC218,BC219,BC220,BC221,BC222,BC224,BC225,BC226,BC301,BC302,BC303,BC304,BC305,BC306,BC307,BC308,BC309,BC310,BC311,BC312,BC313,BC314,BC315,BC601,BC602,BC603,BC604,BC605,BC607,BC608,BC609,BC610,BC613,BC614,BC903,BC904,BC905,BC906
CAPACITOR,CHIP	2012,Z,50V,0.1 UF	2	BC108,BC902
BEAD,CHIP	HH-1M2012-301JT	15	BD101,BD102,BD103,BD106,BD201,BD202,BD203,BD204,BD205,BD206,BD901,BD902,BD903,BD905,BD907
INDUCTOR,CHIP	LEM2520T100J,10 UH	3	L601,L602,L603
RESISTOR,CHIP,ARRAY	3216,J,1/4,33 OHM	4	RA101,RA102,RA103,RA202
RESISTOR,CHIP,ARRAY	3216,J,1/4,10K OHM	1	RA301
RESISTOR,CHIP	1608,J,1/16,0 OHM	5	R126,R137,R206,R626,R627
RESISTOR,CHIP	1608,F,1/16,10 OHM	4	R619,R629,R636,R648
RESISTOR,CHIP	1608,J,1/16,33 OHM	16	R106,R107,R214,R215,R216,R219,R220,R221,R227,R239,R240,R252,R253,R309,R310,R646
RESISTOR,CHIP	1608,F,1/16,75 OHM	8	R618,R622,R632,R634,R639,R641,R643,R650
RESISTOR,CHIP	1608,J,1/16,100 OHM	5	R201,R202,R223,R647,R649
RESISTOR,CHIP	1608,F,1/16,150 OHM	3	R615,R630,R637
RESISTOR,CHIP	1608,J,1/16,220 OHM	5	R101,R612,R613,R644,R645
RESISTOR,CHIP	1608,F,1/16,390 OHM	6	R617,R620,R621,R628,R635,R642
RESISTOR,CHIP	1608,J,1/16,1K OHM	16	R229,R261,R262,R263,R264,R265,R266,R602,R608,R609,R610,R611,R614,R623,R633,R640
RESISTOR,CHIP	1608,F,1/16,3.3K OHM	3	R616,R631,R638
RESISTOR,CHIP	1608,J,1/16,4.7K OHM	23	R104,R105,R217,R218,R224,R226,R234,R243,R244,R245,R246,R247,R248,R249,R250,R251,R255,R301,R302,R305,R306,R312,R313
RESISTOR,CHIP	1608,J,1/16,10K OHM	12	R109,R113,R118,R127,R129,R130,R203,R204,R205,R225,R230,R242
RESISTOR,CHIP	1608,J,1/16,18K OHM	2	R213,R210
RESISTOR,CHIP	1608,J,1/16,27K OHM	2	R603,R601
RESISTOR,CHIP	1608,J,1/16,47K OHM	2	R605,R607
RESISTOR,CHIP	1608,J,1/16,68K OHM	2	R604,R606
RESISTOR,CHIP	2012,J,1/10,120 OHM	1	R131
RESISTOR,CHIP	2012,F,1/10,240 OHM	1	R120
RESISTOR,CHIP	2012,F,1/10,820 OHM	1	R128
RESISTOR,CHIP	2012,F,1/10,1.1K OHM	1	R122
RESISTOR,CHIP	2012,F,1/10,1.2K OHM	1	R123
RESISTOR,CHIP	2012,J,1/10,4.7K OHM	2	R110,R111
TRANSISTOR,CHIP	KST2222AMTF (SOT-23)	6	Q201,Q202,Q203,Q204,Q205,Q206

TRANSISTOR,CHIP	MMBT3904 (SOT-23)	11	Q103,Q108,Q109,Q110,Q112,Q602,Q603,Q604,Q606,Q608,Q609
TRANSISTOR,CHIP	MMBT3906 (SOT-23)	4	Q601,Q605,Q607,Q610
REGULATOR,LDO	AME1117CCCT,3.3V(DPAK or SOT-223)	1	U101
REGULATOR,LDO	LM1117S,1.8V(DPAK or SOT-223)	1	U104
IC,TTL	74HC14D (SO-14P)	1	U205
IC,TTL	IC,TTL,MM74HCT374 (TSSOP-20P)	1	U304
IC,PROTECT	HC908QT (SO-8P)	1	U207
IC,MPEG DECODER	STI5518BQC (LQFP-208P)	1	U201
IC,MEMORY	24C256N (SOI-8P)	1	U202
IC,MEMORY	EM638165TS-7 (TSOP-54)	1	U301
IC,MEMORY	M29W160DT-90N1,1M*16 (TSOP-48P)	1	U302
IC,RS-232 DRIVER	MAX232DR (SO-16P)	1	U303
IC,AUDIO DAC	WM8726ED (SOIC-14)	1	U601
IC,OP-AMP	LM358	1	U604

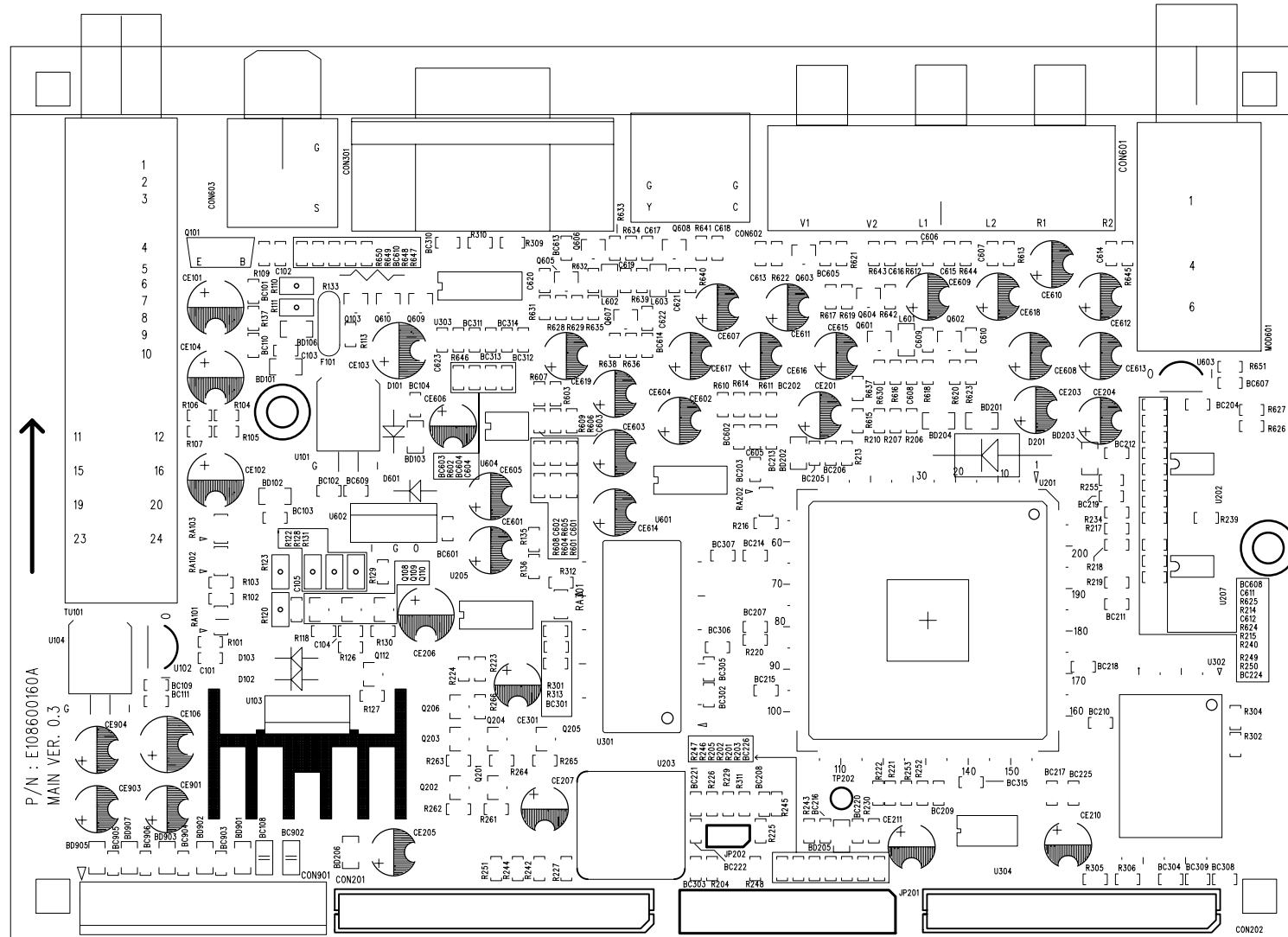
FRONT BOARD

DESCRIPTION	SPECIFICATION	Q'TY	LOCATION NO.
PCB,FRONT	PCB-S,HTS 1300 FRONT VER. 0.3	1	
CABLE ASS'Y	14P,STRAIGHT,170mm	1	J1
7-SEGMENT	88:88,SOCKET,8mm	1	FSEG1
IR RX MODULE	FRP-5051H6,10.2mm	1	FU2
CAPACITOR,ELEC	16V,4.7UF,SRE	1	FCE1
SWITCH,TACT	SW,TACK,2P	3	FSW1, FSW2, FSW3
LED	SR5511-B.SP,RED	1	FLED1
LED	SO5511-B.SP,ORANGE	1	FLED2
DIODE,RECTIFIER	1N4148M	3	FD1, FD2, FD3
WIRE,JUMPER	WIRE-NS-S,52MM	10	JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10
RESISTOR,AXIAL	1/6,J,330	3	FR1, FR3, FR4
RESISTOR,AXIAL	1/6,J,4.7K	1	FR5
RESISTOR,AXIAL	1/6,J,12K	1	FR2
IC,LOGIC	IC,TTL,74HCT164,PDIP	1	FU1

6. GERBER DATA

HTS9400 MAIN VER. 0.3

COMP SILK



HTS 1300 FRONT VER. 0.3 COMP SILK

