SERVICE MANUAL

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Digital Satellite Reciever
DRX100

SERVICE MANUAL

OCT 21. 98
Digital T/F, SYSTEM DEV
SAMSUNG Electro-Mechanics. CO. LTD

Contents

1. Waning and Precautions

1-1. Warning

Alternations of the design or circuitry of this DRX100 should not be made. Any design changes or additions such as, circuit modifications, auxiliary jacks, switches, grounding, active or passive circuitry etc. may alter the safety characteristics of this DRX100 and might potentially create a hazard situation for the user.

Any design alterations or additions will void the manufacture's warranty and will further relieve the manufacture of responsibility for personal injury or property damage resulting therefrom.

1-2. Safety Precautions

Before installing any DRX100 for the customer, a safety check of the entire instrument should be made.
The service technician must be sure that no protective device built in to the instrument by the manufacturer has become defective or inadvertently degraded during service.

2. Instructions

2-1. Scope of Manual

This service manual is intended to direct experienced technician in the service of this product.
It contains necessary information for the equipment described and is current as of the printing date changes that occur after the printing date are incorporated by service manual revisions.

2-2. Customer Service

Product service and information are available from custom service department during normal workdays from the hours at AM 08:00 to PM 17:00.

2-3. Replacement Parts

Replacement parts are available through Amstrad plc when ordering replacement parts.
Please use the complete identification number of the part shown later in this manual.
If the identification number is not known, the order should contain the part schematic symbol number, and a descriptions of the part so that the part may be properly identified.

2-4. Technical Support

Technical trouble shooting assistance is available through service center appointed by Amstrad plc.

3. Overview

The DRX100 DSR(Digital Satellite Receiver) is only for BSKYB receiption which is a CAM (Conditional Access Module) type receiver not a FTA(Free To Air) type. The DRX100 operates with a built-in Open TV OS (OPERATING SYSTEM) software.

The signal that has been received from the satellite(ASTRA) antenna goes to the LNB(Low Noise Blockdown Conversion) and then is transfered to I/Q signals for QPSK demodulation. After the QPSK demodulation the signals are converted to digital bitstreams. As the bitstreams are scrambled it goes to the DEMUX after it has been descrambled by the CAM. The channels are identified by PIDs and transfered to the A/V decoder.

The A/V decoder manages MPEG decoding and seperates video and analogue signals. The video signal is encoded to analogue composite signals from the video encoder IC(STV0119) and the audio is digital to analogue convered by varios sampling ratio to the final TV/VCR scart outputs. The video encoder(STV0119) has a macro vision anti-recording function to prevent recording by a VCR.

The Digibox CAS(Conditional Access System) is from NDS(News Data System) and provides an IEE1394 port for high speed data access, a 33.6kbps modem with a G729 voice encoder built-in, a RS232 port for serial communication and various in/output connectors for external devices.

The CPU conbines the functionality of the STB transport IC and system microcontroller in a single device which controls various interfaces like ; memories, smart card access, front panel & the de/encoder interfaces.

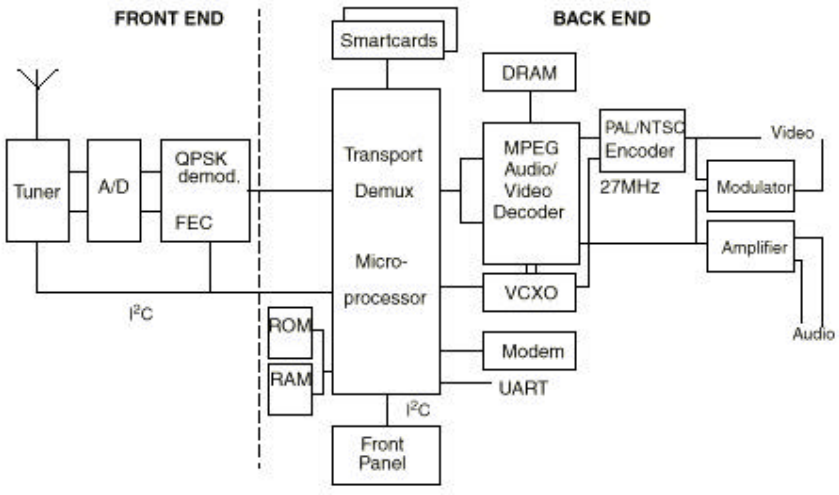
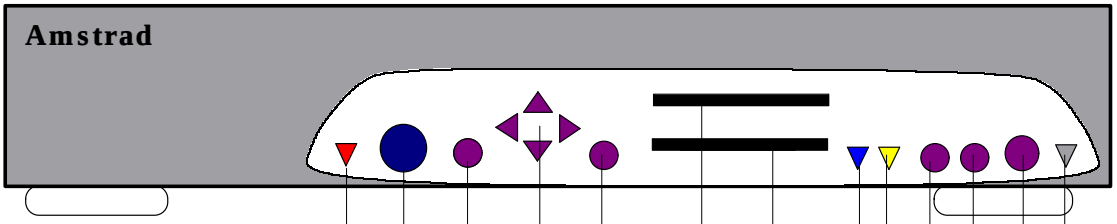


Figure 3.1 Set Top Box architecture

4. General Feature

4-1. Front & Rear Viewing

4-1-1. Front Panel



Red when receiving a command from the remote control

IR Reciever Lens

Shows the previous screen

Moves the highlight around the screens or changes channels

Chooses the highlighted option or confirms your choice

Insert your interactive card here when using interactive services(once available) and only when an instruction to do so appears on-screen

Insert your sky viewing card here

Yellow when Message waiting

Green when digibox is on-line (using the phone line)

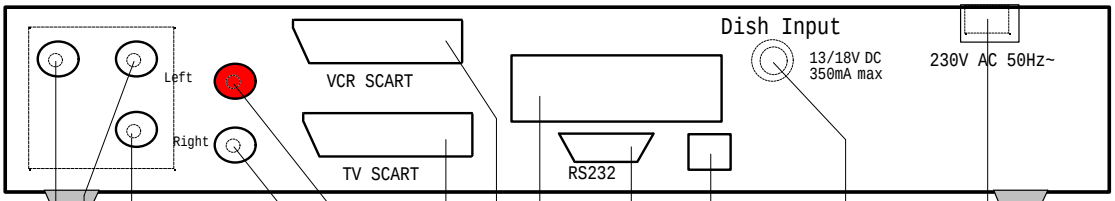
Shows the TV Guide screen

See information about the programme

Turns the digibox on or off

Green when digibox is on
Red when digibox is off

4-1-2. Rear Panel



power cord

dish input : connect to LNB out

telephone jack : connect to telephone line

Sreal jack : connect to PC Serial port

digital interface : connect to PCMCIA interface card

RF Out-2 : TV RF in or for accessory connections

RF Out-1 : TV RF INPUT

Aerial In : For terestrial input

Audio L : RCA jack for audio left(white)

Audio R : RCA jack for audio right(red)

VCR scart : connect to VCR scart jack

TV scart : connect to TV scart jack

4-1-3. Remote Control Unit

4-1-3-1. **TV** : Sets your remote control to control your TV

4-1-3-2. **SKY** : Sets your remote control to control your Digibox

4-1-3-3. **Power** : Turns your Digibox(or TV) on and off

4-1-3-4. **box office** : Shows the Box Office screeen

4-1-3-5. **services** : Shows the Customer Service

4-1-3-6. **TV guide** : Shows the TV Guide

4-1-3-7. **interactive** : Shows the Interactive Service

4-1-3-8. **mute** : Turns the TV sound off/on

4-1-3-9. **information** : Shows information about the programme you have highlighted

4-1-3-10. **vol** : Changes the TV volume

4-1-3-11. **select** : Chooses the option you have highlighted or confirms your choice

4-1-3-12. **Arrow Buttons** : Moves the highlight around the screen to highlight the option you want

4-1-3-13. **ch** : Changes the channel

4-1-3-14. **text** : Switches to text mode

4-1-3-15. **help** : For help on using the SkyGuide

4-1-3-16. **color key** : use to select the corresponding colour option on-screeen

4-1-3-17. **backup** : Shows the previous screeen

4-1-3-18. **Numeric keys** : For selecting channel numbers or on-screeen options

4-2. Tuner

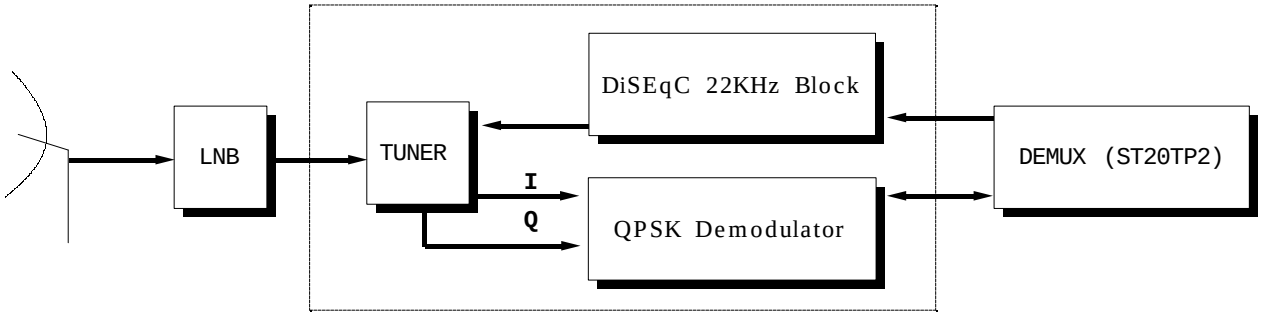


Figure 4.2 QPSK Block Diagram

a LNB (Low Noise Block Down Converter) converts the incoming satellite signal from 12GHz down to an intermediate frequency (IF) of 1 GHz to 2 GHz.

Then a PLL frequency synthesizer further down converts the signal to a second IF (479.5MHz).

The DEMUX (with microprocessor) adjusts the frequency delivered by this circuit in such a way that the IF signal falls within the bandwidth of the IF surface acoustic wave (SAW) filter.

The I/Q down converter translates the IF signal to baseband.

4-2-1.	input frequency range	:	950 ¡- 2150 MHz
4-2-2.	input power level	:	-65 ¡- -25 dBm
4-2-3.	first IF frequency	:	479.5 MHz
4-2-4.	maximum input level	:	0 dBm
4-2-5.	input connector type	:	IEC 169-24 (F-type)
4-2-6.	input impedance	:	75 ¥Ø
4-2-7.	input return loss	:	>8 dB
4-2-8.	LNB current	:	350 mA max
4-2-9.	surge protection level	:	> 5kV
4-2-10.	IF bandwidth	:	26MHz/-1dB and 33MHz/-1dB
4-2-11.	tuning increment	:	125 KHz
4-2-12.	signal acquisition range	:	+/- 10 MHz
4-2-13.	AFC tracking range	:	+/- 2 MHz
4-2-14.	channel selection	:	PLL frequency synthesizer
4-2-15.	PLL controll interface	:	I^2C bus
4-2-16.	out of band rejection	:	¡Ã30 dB (in band being the bandwidth where 99% of the signal energy is)
4-2-17.	AGC level adjustment step	:	0.5 dB
4-2-18.	AGC VOLTAGE	:	0 ¡- 5V
4-2-19.	Amplitude distortion	:	¡Â 0.8 dB
4-2-20.	phase distortion	:	¡Â 5¡Æ
4-2-21.	LO phase noise	:	¡Â -50 dBc/Hz (@ 1 kHz)
		:	¡Â -75 dBc/Hz (@ 10 kHz)
		:	¡Â -95 dBc/Hz (@ 100 kHz)
4-2-22.	OUTPUT SIGNAL	:	I, Q ANALOG OUTPUTS WITH 600mV$_{P-P}$ (load 1K¥Ø,15pF at 2.5V AGC)
4-2-23.	IM2 discrimination	:	-40dB (for two input carriers at -25dBm)

4-3. LNB Control Signal

LNB control signal is used to select frequency band (low/high band), either conventional(22KHz tone) signalling or the new signalling method(DiSEqC) could be used to control the switch.

The DiSEqC system is a communication bus between satellite receivers/IRDs and satellite peripheral equipment,using only the existing coalial cable. This single master microcontroller-based system is bi-directional and enables controlling of satellite peripherals like;

- LNBs
- multi-switches
- SMATV switch nodes
- antenna positioners
- polarizer control units
- other devices

4-3-1. LNB control frequency : 22 kHz ¡¾2 KHz

4-3-2. duty cycle : 50% ¡¾10%

4-3-3. control signal amplitude : 0.6 V ¡¾0.2V p-p

4-3-4. transition time : 10§Á ¡¾5§Á

4-3-5. source impedance : ¡Â50§Ù

4-3-6. LNB supply voltage : 12.5 - 14.0 (vertical)
: 17.0 - 19.0 (horizontal)

4-3-7. DiSEqC Bus functional spec : V4.1, at level 1.1

4-4. Demodulator & Channel Decoder

The outcoming I/Q signal from the tuner is tranfered to the ADC (analouge to digital conversion) for QPSK demodulation. This digital data is then channel decoded to remove various noise and error corrected that can occur during satellite transmittion.

Channel decoding is accomplished by VITEBI decoding(inner FEC) and RS decoding (outer FEC). Most RS decoders have the function for de-interleaving and remove energy dispersal.

4-4-1.	demodulation method	:	QPSK
4-4-2.	inner FEC	:	VITERBI convolution
4-4-3.	symbol rates	:	20 ~ 30 Msym/s, step 0.1Msym/s
4-4-4.	symbol rate lock range	:	110 ppm
4-4-5.	convolutional code rates	:	1/2, 2/3, 3/4, 5/6, 7/8. K=7 (depend on BIT stream)
4-4-6.	outer FEC	:	reed solomon decording (204,188) T=8
4-4-7.	bit error rate	:	1¡¿10^{-11} max
4-4-8.	deinterleaving	:	convolutional, depth I=12
4-4-9.	implementation loss	:	¡Â0.5 dB, 0.8 dB max at AWGN, 4.1 dB < Rs/No < 8.5 dB
4-4-10.	data acquisition time	:	¡Â300 msec

4-5. DEMUX & CPU

A Transport Demultiplexing integrates all audio, video, and data service MPEG-2 transport layer functions, the DEMUX's principle operation is straight forward:

4-5-1. A stream of data packed in transport layer format 188 bytes per packet enters the DEMUX IC through its channel decoder interface.

The DEMUX system or IC detects the sync byte, which is the first byte of every transport packet header. Once in sync, byte, byte-aligned data is posted to the next stage of processing.

4-5-2. The DEMUX parses the incoming data using its Packet ID(PID) processor. Upon user programming the DEMUX extracts the user selected program, audio, and video Packetized Elementary Stream(PES) data, Program Specific Information(PSI), Service Information(SI), and Private Data.

4-5-3. The selected audio and video PES layer encoded data stream is output through the DEMUX.

4-6. A/V DECODING

Video Compression & Decompression Concepts The MPEG standards define a format for compressed digital video.

Encoders designed to work within the confines of the standard compress video information, and decoders decompress it. The MPEG algorithms for video compression and decompression are flexible, but generally fit the following criteria.

4-6-1. Data rates are about 1 to 1.5Mbit/sec for MPEG-1 and up to 15Mbit/sec for MPEG-2. The MPEG-2 A/V Decoder used in DRX100 is capable of supporting data rates up to 15Mbits/sec.

4-6-2. Resolution are about 352 pixels horizontal up to about 288 lines vertical for MPEG-1 and 720 x 576 for MPEG-2(main profile). The A/V Decoder used in DRX100 is capable of resolution up to 720 x 576 for either MPEG-1 or MPEG-2.

4-7. Video Encoding

For a video signal to be compressed, it must be sampled, digitized, and converted to luminance and color difference signals (Y, Cr, Cb).
The MPEG standard stipulates that the luminance component(Y) be sampled with respect to the color difference signal (Cr and Cb) by the ratio of 4:1.

That is, for every four samples of Y, there is to be one sub-sample each of Cr and Cb, because the human eye is much more sensitive to luminance components than to color components.

Video sampling takes place in both the vertical and horizontal directions.
Once video is sampled, it is reformatted, if necessary, into a non-interlaced signal.
An interlaced signal contains only part of the picture content(every other horizontal line, for example) for each complete display scan.

The encoder must also choose which picture type is used. A picture correspond to a single frame of motion video, or to a movie frame. There are three picture types:

- Intracoded pictures (I-pictures) are coded without reference to any other pictures.

- Predictive-coded pictures (P-pictures) are coded using motion compensated prediction from the past I or P reference pictures.

- Bidirectionally predictive-coded pictures (B-pictures) are coded using motion compensation from a previous and future I or P-pictures.

A typical coding scheme contains a mixture of I, P, and B-pictures. Typically, an I-picture may occur every half a second, to give reasonably fast random access, with two B-pictures inserted between each pair of I or B-pictures.

4-8. Video Decoding

Video decoding is the reverse of video encoding and is intended to reconstruct a moving picture sequence from a compressed, encoded bitstream.
Decoding is simple then encoding because there is no motion estimation performed and there are far fewer options.

The data in the stream is decoded according to the syntax defined in the MPEG-2 standard. The decoder must first identify the beginning of a coded picture and identify the type of picture, then decode each individual macroblock(a 16 x 16 region of video, corresponding to 16 horizontal pixels and 16 vertical display lines.) within a particular picture.

Motion vectors and macroblock types (each of the picture types I, P, and B have their own macroblock types) present in the bitstream, are used to construct a prediction of the current macroblock based on past and future reference pictures that the encoder has already stored.

Coefficient data is then inversed quantized and operated on by inverse DCT (Discrete Cosine Transform) process that changes data from the frequency domain to the time space domain. After the decoder processes all of the macroblocks the picture reconstruction is completed.

If the picture just reconstructed is a reference picture (I-picture or B-picture), it replaces the oldest stored reference picture and is used as the new reference for subsequent pictures.

The pictures may need to be reordered before they are displayed, in accordance with the display order instead of the coding order. After the pictures are reordered, they may be displayed on an appropriate output device.

4-9. System Overview

A/V decoding is for use in digital audio and video-decoding systems based on the MPEG-2 algorithm. It may consider as a "black box" that receives coded audio and video data and produces a decoded audio and video data stream.

4-10. A/V OUTPUT

4-10-1. Video

After the output of the video encoder (STV0119) it is buffered to be output for the SCART and UHF modulator.

4-10-2. Audio

After the output of the OPAMP it is buffered to be output for the SCART and RCA jack and UHF modulator.

4-10-3. scart - TV output : composite video, R, G, B, audio(L,R)
VCR output : composite video, audio(L,R)

4-10-4. phono out audio : Left audio (white), Right audio (red),
RF modulator (mono)

Video Output Impedance is 75§Ù and the connector is scart type. In Play mode, VCR signal is routed automatically so TV viewing is possible.

4-11. RF Modulator

RF modulator is PAL I PLL type and it can select CH21 ~ CH69. Output impedance is 75§Ù, connector is EIA type, and pre set channel is CH68. When an external device output is connected to terrestrial in port, TV viewing is possible by the signal coming from RF out1 and 2. RF out2 serves as RCU's input signal port. Instead of using front IR, it can be used RCU remote signal controlled by an accessory box which means that STB's functions like channel changing and volume can be controlled by remote control.

4-11-1. RF input

4-11-1-1. frequency range	:	47 - 862 MHz
4-11-1-2. input impedance	:	75§Ù
4-11-1-3. RF bypass gain	:	5 dB ¡¾2 dB
4-11-1-4. isolation	:	>20 dB

4-11-2. RF output

4-11-2-1. frequency range	:	47 - 862 MHz
4-11-2-2. output impedance	:	75§Ù
4-11-2-3. modulator output range	:	471 - 862 MHz (ch21 - 69)

4-11-2-4. output level : 70 dB§Å ¡¾5 dB§Å
4-11-2-5. video modulation depth : 80 ¡¾ 8 %
4-11-2-6. default output channel : 68

4-11-3. Additional RF output

4-11-3-1. frequency range : 47 - 862 MHz
4-11-3-2. output Voltage : 9 ¡¾1 V
4-11-3-3. maximum current : 100mA
4-11-3-4. carrier frequency : 4.5 - 10 MHz
4-11-3-5. signal level "0" (p-p) : 0.5 V
4-11-3-6. signal level "1" (p-p) : 2 ¡¾0.15 V
4-11-3-7. input impedance : >1K§Ù (at carrier frequency)

4-12. RS232 port

STB provides 9 pin RS232 serial port for communication with PC. The monitoring of the STB and the command delivering from PC is done via hyper terminal. Moreover, G.729 audio data can be delivered in real time to G.729 decoder and to STB memory via the EIA232A (RS232) port.

4-13. ICAM

ICAM contains all descrambling and CA functions supported by NDS (News Digital Systems). ICAM uses MBM87F2011 chip to capture PID for EMM and ECM streams, a descrambler, a smart card interface, an interface to main microcontroller, and NDS security functions.

4-14. Smart Card Interface

The STB uses the Philips Semiconductors TDA 8004 to implement the electrical interface to the NDS conditional access smart card slot The smart card reader interface shall be subject to approval by NDS.

4-15. Second Smart Card (MONDEX)

The Second Smart card interface uses the Philips Semiconductors TDA 8006. Mondex card reader is capable of reading cards entered chipside facing upwards, and chipside facing downward The second smart card slot supports T=0 and T=1 protocols.

4-16. PSTN MODEM

TCP /IP streams is delivered via the PSTN with either real-time transfer of data identified as G.729A audio to the G.729A decoder, or to STB memory. MODEM used in the STB supports data transmission rate of 33.6kbps.

4-17. G.729A

On line audio data is sampled at 8kHz and delivered via the MODEM, or the EIA232 port. G.729 decoder stores the transmitted data into the RAM and send it again to L,R channel output after decoding this data.

4-18. IEEE1394

The objective of IEEE 1394 data port is to transmit and receive TS stream among the devices and transmit DVB TS Stream received from the module to ICAM at data rate of 25Mbps. Asynchronous input/output data rate between CPU and IEEE 1394 is 2Mbps and it is realized through the host parallel interface(1284). Electrical and mechanical specifications of IEEE 1394 are as follows:

4-18-1. It uses a 68 pin PCMCIA/JEIDA type edge connector.

4-18-2. It provides independent Transport Stream input/output paths.

4-18-3. It supports parallel 8-bit communication and an I2C path for control of the module.

4-18-4. All I/O signals of its connector is 3.3V logic level.

4-19. Power Supply

4-19-1. switching mode power supply
4-19-2. AC 95V ~ 240V ¡¾15%

4-20. Size & Weight

- 365(W) X 265(D) X 62(H) , 1.7KG

5. Technical Specification

5-1. System Specifications

5-1-1.	TV system	:	PAL I
5-1-2.	symbol rates	:	20Msym/s ~ 30 Msym/s, STEP 0.1Msym/s
5-1-3.	demodulation method	:	QPSK (DVB specification)
5-1-4.	inner FEC	:	viterbi convolutional coding rate 1/2, 2/3, 4/3, 5/6, 7/8. K=7 (DVB)
5-1-5.	outer FEC	:	reed solomon decording (204,188) T=8(DVB)
5-1-6.	system decoding	:	ISO/IEC 13818-1(MPEG2) TS specification TS descrambling
5-1-7.	video decoder	:	13818-2(MPEG2) MP@ML 11172-2(MPEG1) compatible wide screen TV (16:9) / normal TV (4:3)
5-1-8.	picture resolution	:	720(H) ¡¿ 480(V) ¡¿ 50 fields/sec 560(H) ¡¿ 480(V) ¡¿ 50 fields/sec 480(H) ¡¿ 480(V) ¡¿ 50 fields/sec 360(H) ¡¿ 480(V) ¡¿ 50 fields/sec
5-1-9.	audio decoder	:	ISO/IEC 11172-3(MPEG1) layer 1, 2 multi-lingual sampling frequency - 32, 44.1, 48 KHz operation mode - stereo, dual, mono, joint stereo

5-2. System Features

5-2-1.	dimensions	:	365(w) x 265(d) x 62(h)
5-2-2.	operating temperature	:	0¡É ~ 40¡É
5-2-3.	storage temperature	:	-20¡É ~ 60¡É
5-2-4.	humidity	:	operating --- up to 95% storage --- less than 90%
5-2-5.	remote control	:	full function infra-red remocon (35 keys)
5-2-6.	front panel control	:	power, ¡ã/¡å, ¢¸/¢º, back up, select, TV guide, i (information)

5-3. Power Supply

5-3-1.	power supply type	:	SMPS
5-3-2.	input voltage	:	95V - 240 Vac / 50 Hz
5-3-3.	protection	:	internally fused
5-3-4.	output voltage	:	18V GND 28V 8V 12V GND 3.3V ¡¾ 0.25V 5V ¡¾ 0.25V GND
5-3-5.	LNB power supply	:	13V/18V ,350mA max (switchable)

5-4. Composite Video Output

5-4-1.	composite video	:	PAL I
5-4-2.	output level	:	1V p-p (load 75¥Ø)
5-4-3.	impedance	:	75 ¥Ø
5-4-4.	connector	:	scart (TV/VCR)
5-4-5.	S/N ratio	:	60 dB (luminance weighted)

5-5. Audio Output

5-5-1.	operating mode	:	stereo, dual, mono, joint stereo
5-5-2.	output level	:	2.0 ¡¾0.2V p-p
5-5-3.	output connector	:	RCA phone jack (female)
5-5-4.	Left / Right balance	:	¡¾2 dB max
5-5-5.	S/N ratio	:	80 dB min

5-6. RF Modulator Output

5-6-1.	TV standard	:	PAL I
5-6-2.	output level	:	70 dB§Å ¡¾5 dB§Å
5-6-3.	modulator output range	:	471 - 862 MHz (ch21 - 69)
5-6-4.	default output channel	:	CH68
5-6-5.	connector	:	EIA type (female)
5-6-6.	output audio	:	mono

5-7. R.G.B Output

5-7-1.	output level	:	0.7Vp-p ¡¾0.1V (load 75¥Ø)
5-7-2.	impedance	:	75 ¥Ø

5-8. Asynchronous Data Output

5-8-1.	standard	:	RS232
5-8-2.	bit rate	:	115200 bps
5-8-3.	connector type	:	9 pin D-type

6. Diagnostics

6-1. Preparations

6-1-1. Personal Computer (With 486 CPU or higher)
6-1-2. RS232 Cable for communication
6-1-3. OS (Windows 3.1 or higher)

6-2. Setup

6-2-1. Connect the 9 pin connector(RS232 Null Modem cable) of IRD (on the back panel) to the serial port of the PC or terminal (115200,N,8,1)

6-2-2. Turn on the PC

6-2-3. Select Winfile manager to execute BskybTerm.

6-2-4. Configurate the Port and Baudrate as below;
Port : Select to COM port currently used.
Baudrate : 115200

6-2-5. Turn on the STB.

For normal operation the following messages will display on the PC screen,

```
.
.
.
set LNB freq (lo 9750000, hi 10600000, sw 11700000)
tv status 2!
Set TV to CBVS
Send Ok
#CONTROL[running] unknown control error=0x10
new scan parameters
fixed parameters invalid - IGNORED
new scan request
scan: freq 11778000, sr 27500000, pol 1 (0=H, 1=V), direction 0
tune 1178000KHz, 27500Ksps Auto
scan lock  <-------------------------  Press 'ESC' here
Welcome to Test tool V1.00
Tool>
```

6-3. Function keys

T1 or F1 : Is to turn 22KHz on, 18V on and set the LNB to Horizontal and Set to TV mode RGB & 16:9, RF ON, MOD +9V ON, MOD Led 0 to 3 BLINK, infinite BEEP on, GVOL 00 and FF, Audio H/W muted.

T2 or F2 : Is to turn 22KHz off, 14V off and set the LNB to Vertical and Set to TV mode CBVS & 4:3, infinite BEEP off, MOD +9V OFF.

T3 or F3 : is to check IEEE1394 data port (addr : 0, wr data : 0, rd data : 0 to addr : 17, wr data : 17, rd data : 17, CD2:1, MOD_I2C:1, INT:1)

T4 or F4 : Is to turn on Front LED 0 to 3 BLINK

T5 or F5 : is to check G.729 stream (ex : g729 playing, G729A mode, G729 Decoder is enabled, G729 audio stop)

T6 or F6 : is to check CA system (ex : Card is not inserted, removed...)

T7 or F7 : is to check video Contrast (ex : Set TV to CBVS, CVBS :-10, CVBS : +10, Set TV to RGB, RGB :-10, RGB :+10)

T8 or F8 : is to check and write FLASH rom

T9 or F9 : is to check Modem port (ex : DTMF, PULSE)

F10 to F12 is for additional future features to analyze the set top box.

7. Trouble Shooting

7-1. Instrument

7-1-1. Transmmiter

7-1-1-1. TEKTRONIX MODULATOR (DVT200)
7-1-1-2. TSG or MTG200 (MPEG test generator)
7-1-1-3. QPSK modulator
7-1-1-4. DATA CD for EPG (distributed from BSKYB)
or
7-1-1-5. dish input signal

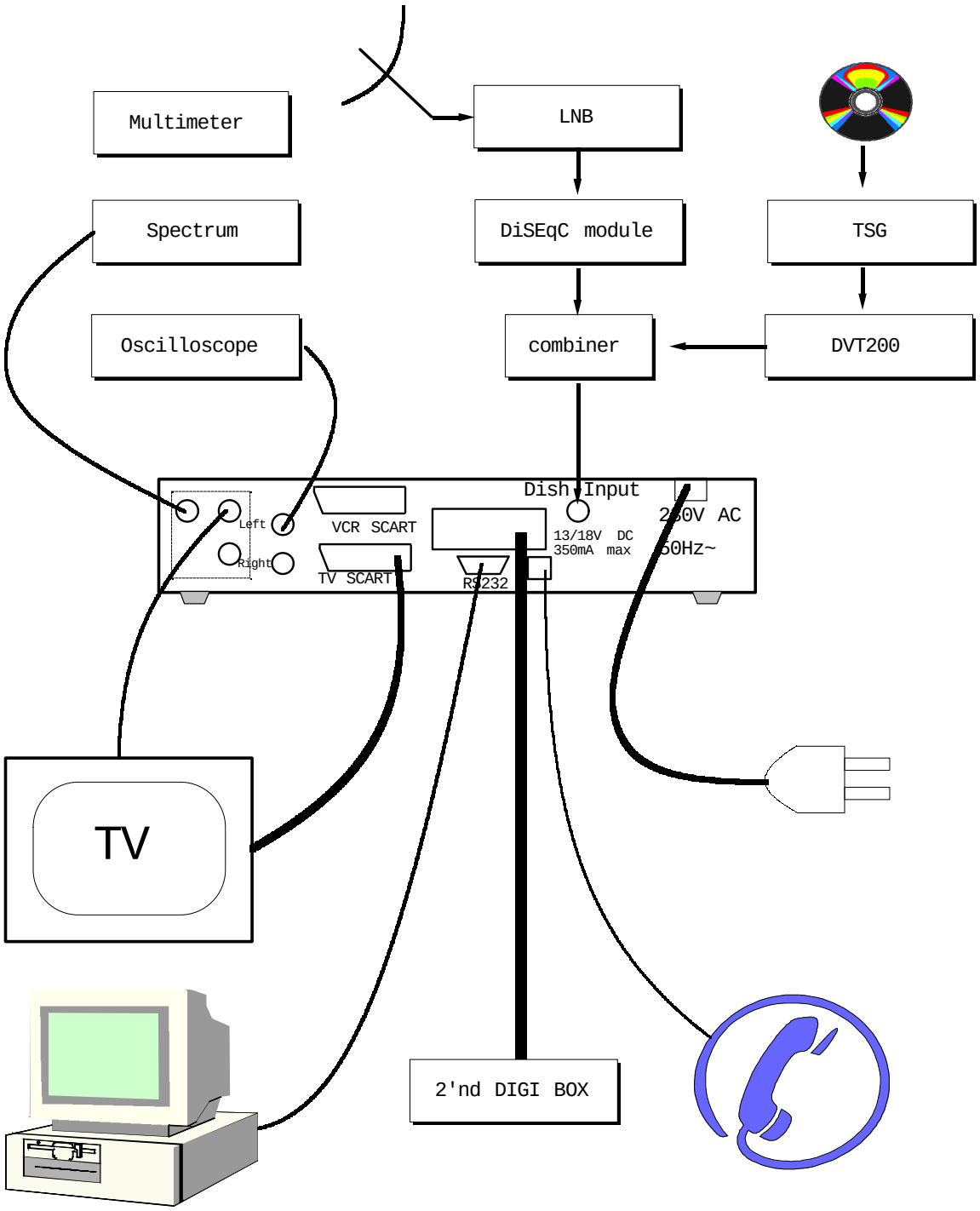
7-1-2. Checker

7-1-2-1. VM700A (audio/video signal analyzer)
7-1-2-2. analog or digital oscilloscope
7-1-2-3. spectrum analyzer
7-1-2-4. PC (i486 & windows 3.1 system or higher)
7-1-2-5. multimeter

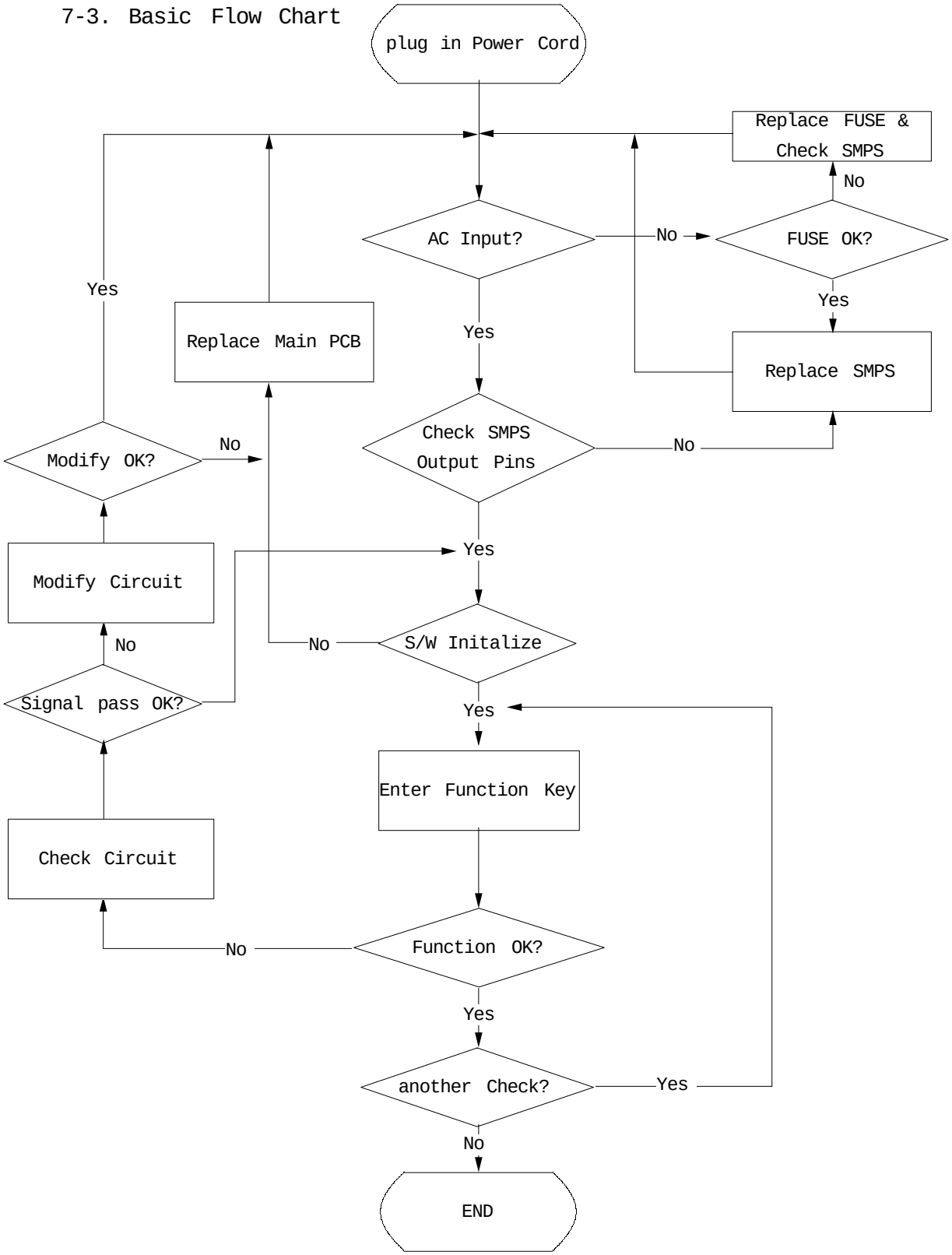
7-1-3. Accessory

7-1-3-1. TV (PAL type)
7-1-3-2. RS232C 9pin cable
7-1-3-3. scart cable
7-1-3-4. RCA jack
7-1-3-5. iron & solder...

7-2. Installation



7-3. Basic Flow Chart



7-4. SMPS

7-4-1. **The SMPS's Fundamental Operation**

The present circuit uses the commercial power supply of AC230V. The power is supplied at the F1 Live part and Neutral part when the AC power is On. During this operation, the TH1 THERMISTOR protects the semiconductor devices from a sudden current and the TNR1 Varistor protects the semiconductor devices setted behind the Fuse of the AC Suge Voltage (> AC 380V).

Capacitors C1,C2, and inductor L1 are Filter circuit which eliminate the noise introduced from a AC Line and the noise, originated from an internal circuit, flowing to AC Line.

The voltage, passed through the Filter circuit, is rectified by DC Diode (D1 - D4) and after this wave is smoothed by a capacitor C3 and finally it is supplied to Q1's DRAIN through the Primary Trans.

The rectified voltage is changed to around DC 310V calculated by the equation V=¡î2 V and it is called Vin. Also, when the Vcc power is supplied to Q1 SMART IC through R2, Q1 SMART IC internal circuit works and supplies GATE Signal of 50KHz to the GATE of Q1 SMART IC.

The Dnn voltage of Q1 is by passed to Ground when Q1 SMART IC is turned on.
In this process, the FEEDBACK PIN of SMART IC serves as a function to regulate voltage level and to protect from an excessive load simultaneously.

The method used for the voltage regulation is Current Mode Control method which modulate the width of PWM DUTY comparing the error voltage detected by PHOTO COUPLER and the value of MOSFET DRAIN Current detected by current detection resistor. In the process, it also occurs an inverse power at Secondary trans.

This kind of circuit is PWM type and this cycle is realized continuously.
The working frequency is fixed at 50kHz. The working switching pulse is taken to the Secondary trans where it absorves the energy by resonating the frequency oscillation with L and C of Secondary Trans (F=1/2¥ð ¡îL C).

This energy is rectified by Diode and it is smoothed by a capacitor and finally

it obtains the output voltage (+5V, +3.3V, 8V, 12V, 18V, 28V) passing through voltage control circuit.

7-4-2. Fuse Open

7-4-2-1. check D1, 2, 3, 4 and repaier if there are N.G
7-4-2-2. check Q1 and repaier if there are N.G

7-4-3. No Output

Observe the DRAIN Voltage Signal wave connecting Q1 DRAIN and GND of the SMPS by using an Oscilloscope.

- normal wave form - - unnormal wave form -

figure 7-4-3. Q1 switching voltage wave form

If the previous Channel Output is not appeared, it means the state of Current Limit of SMART IC ocurred by a damage of the components.
In this case, the components have to be checked as follows:

7-4-3-1. check OPT1, and repaier if it is N.G
7-4-3-2. check D7, 8, 9, 10, 11, 12 and repaier if there are N.G
7-4-3-3. check IC1, and repaier if it is N.G

Verify the Channel Pattern or an existence of bad connection among components

in thd case of certain Channel voltage level is not reachec

7-4-3-4. +3.3V : check D8, L3, J26 and wire pin 4
7-4-3-5. +12V : check D11, L4, J33 and wire pin 7
7-4-3-6. +8V : check D10, L5, J30, J23 and wire pin 8
7-4-3-7. +18V : check D9, L6, J17, J26 and wire pin 11
7-4-3-8. +28V : check D12, BD2, J24 and wire pin 9

7-5. No Power

7-5-1. Check the input AC voltage
7-5-2. Check fuse. (Rating 250V T2A)
7-5-3. Check the SMPS output voltages.(Refer to page for pin discription)
7-5-4. if there are no power then go to 7-4

7-6. Video

7-6-1. Press 'venc 0 39' command using PC terminal
7-6-2. Check U750 pin 11, for composite video signal
if there is no composite video output goto 7-6-6

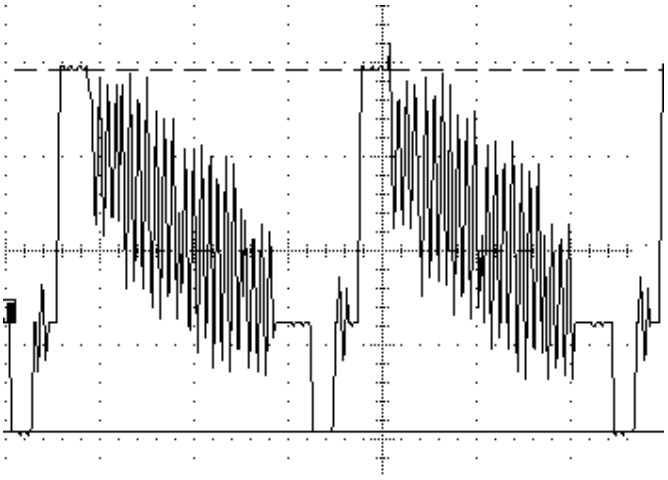
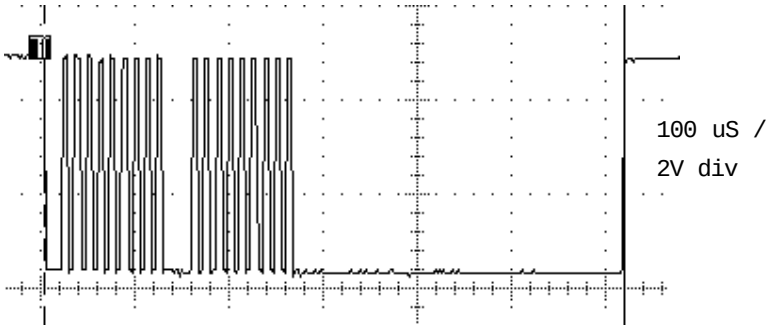
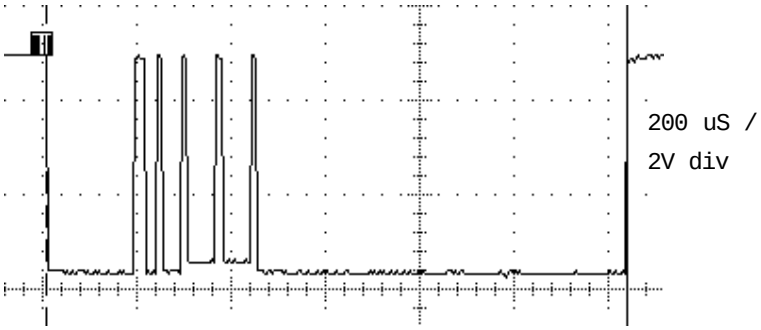


Figure 7-6-2. composite video(1V p-p) signal wave form

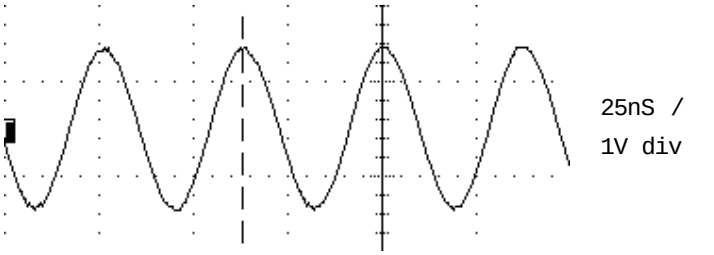
7-6-3. Check U752 pin 14, if there is no composite video output then check pin 16 VCC Voltage. if there is always +5V then Replace the U752 IC's
7-6-4. Check the test point TP917, if there is no composite video signal (2V p-p) then check pin 54 of U901 VCC Voltage. it should always be +12V, if no problem Replace U901 IC's
7-6-5. Check the test point TP918, if there is no composite video signal then Replace Q911 else goto 7-6-8
7-6-6. Continually Check U750 pin 13, 16, 24, 26, 27 for video encoder control signal and check pin 15, 21 VCC voltage. pin 13, 16 will be about 1.1V. If there is no more problem, Replace U750 IC's



- clock signal -



- data signal -



- FIXCLK signal (27MHz)-

figure 7-6-6. encoder control signal wave form

7-6-7. If no composite video signal even when U750 IC's is replaced then Replace main PCB board

7-6-8. Keep checking(tracing) the signal path referring to the schematic diagram and find PCB pattern's open or short and defective component to replace.

7-7. Audio

7-7-1. Check pin 5 and 8 of U700 for audio signal with an oscilloscope as below when STB's channel is locked. if there are no audio signal, goto 7-7-5

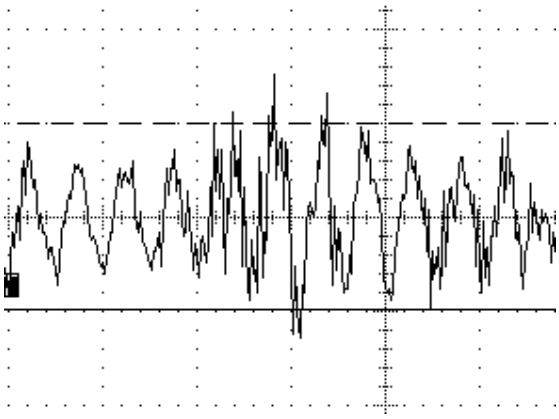


figure 7-7-1. Audio signal wave form

7-7-2. Check pin 1, 7 of U701 for amplitude audio signal and if there are no signal, check VCC voltage pin 8 and replace IC's if VCC has no problem.

7-7-3. Check the test point TP944, TP946. if there is no audio signal then check VCC Voltage pin 55. if there is always +12V then Replace the U901 IC's

7-7-4. Check the test point TP901, TP902, TP908, TP909. if there is no audio signal then continually Check and find PCB pattern's open or short and defective component to replace R943,R946 and L900 to L905

7-7-5. check control signal pin 1 to 4 of U700 and Replace U700 IC's if control signal is normal, else replace mainboard.

7-7-6. if there are no audio signal when after Replacing U750 IC's then Keep tracing the signal path referring to the schematic diagram and find PCB pattern's open or short and defective component to replace.

7-8. RF Modulator

7-8-1. Check the DC level of I^2C (MODSCL,MODSDA) line of the RF modulator input with an Oscilloscope, this point always be high (4.4 ~ 5V).

7-8-2. Check the tuning voltage of the modulator pin 1 of Modulator. this voltage should be 28+/-1V.

7-8-3. Check pin 6 of MOD1(RF Modulator) this pin should be always +5V.

7-8-4. Check pin 4 of MOD1(RF Modulator) this pin is able to control voltage 0 to +5V by S/W. RF carrier should be outputed when this pin at +5V condition.

7-8-5. Make sure the audio and video signals are going to the RF modulator input

7-8-6. The pins should be 2 for video and 3 for audio(the pin of MOD1 RF modulator).

7-8-7. if all of the Moduluator pin are normal then replace the Modulator.

7-8-8. if there are no audio and video signal when after Replace Modulator then Keep checking the signal path referring to the schematic diagram and find PCB pattern's open or short and defective component to replace.

7-9. QPSK

QPSK Module delivers MPEG TS to the output decoding the STB's Front-End input signal such as Tuning, Acquisition, Tracking, Demodulation and FEC.
QPSK Module's defects can be divided in two types.

- Tuning Defect : PLL Control of the Tuner does not work properly.

- Tracking Defect : The Operations of the Tuner and QPSK Demodulator IC are not done properly.

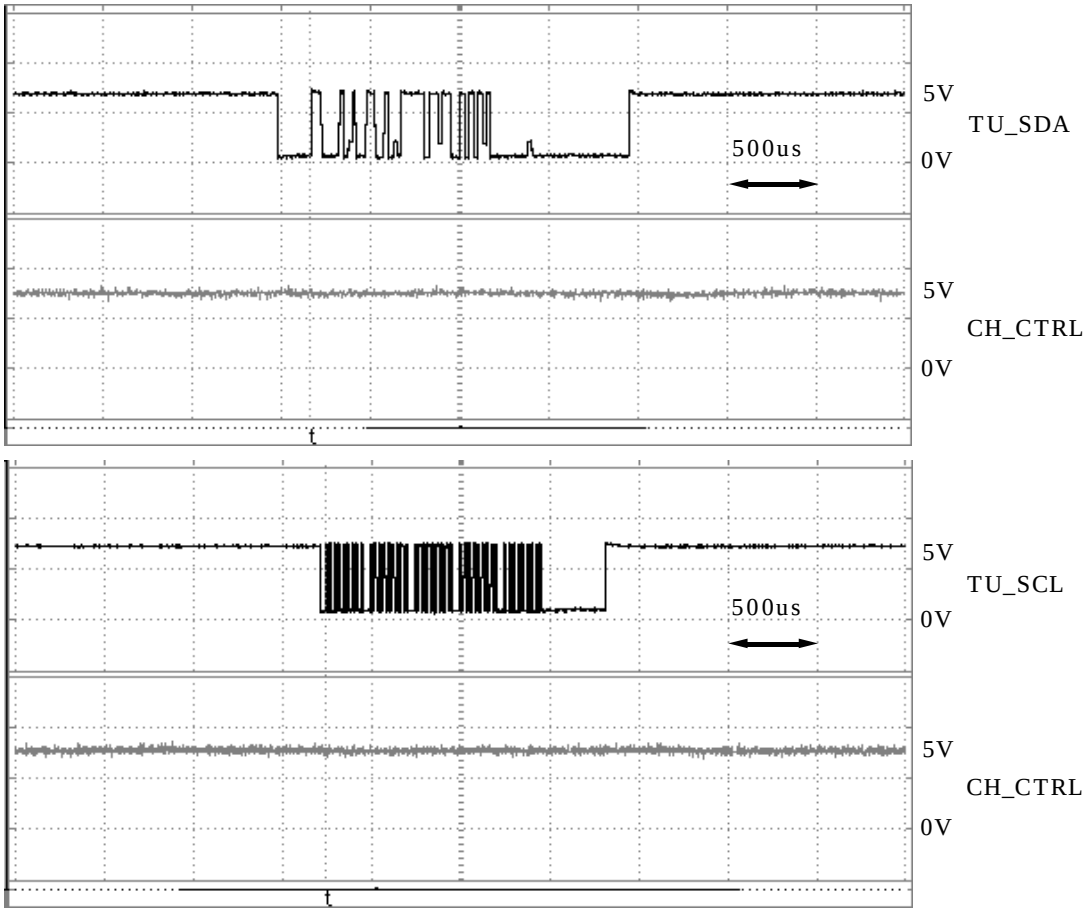
7-9-1. Tuning Defect

7-9-1-1. Check the Tuner's Operating Voltage as follows.

+5V : Junction of C104 & C105
VT : Junction of C103 & L106
LNB : TP100

7-9-1-2. Check control signal whether PLL Control of the Tuner works properly as follows.

TU_SDA : Pin 2 of U103
TU_SCL : Pin 10 of U103
CH_CTRL : Pin 12 or 13 of U103



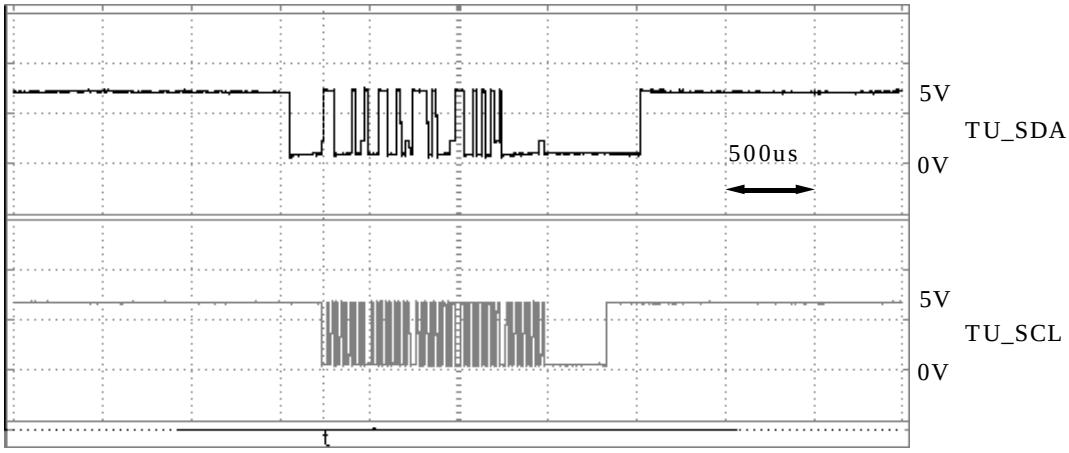


figure 7-9-1. QPSK Control signal wave form

7-9-2. Tracking defect

7-9-2-1. Check the Main Crystal's Oscillation(15MHz) as follows

XTALI : Junction of X100 & C116
XTALO : Junction of X100 & C117

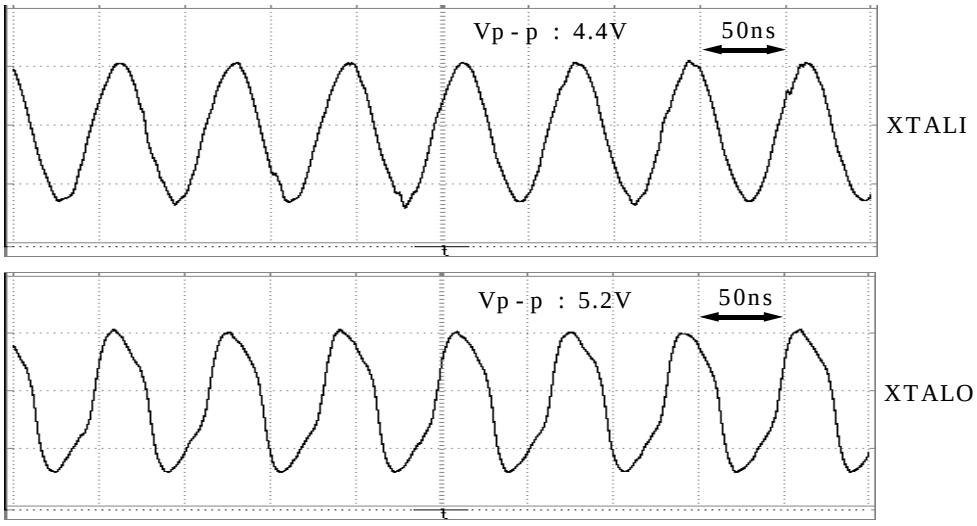


figure 7-9-2-1. X-TAL signal wave form

7-9-2-2. Check the Operating Voltage of the QPSK Demodulator IC as follows.

3.3VD : Pin 2 of U104
3.3VA : Pin 2 of U105

7-9-2-3. Check whether I2C Control of the QPSK Demodulator works properly as follows

SDA : TP108
SCL : TP106

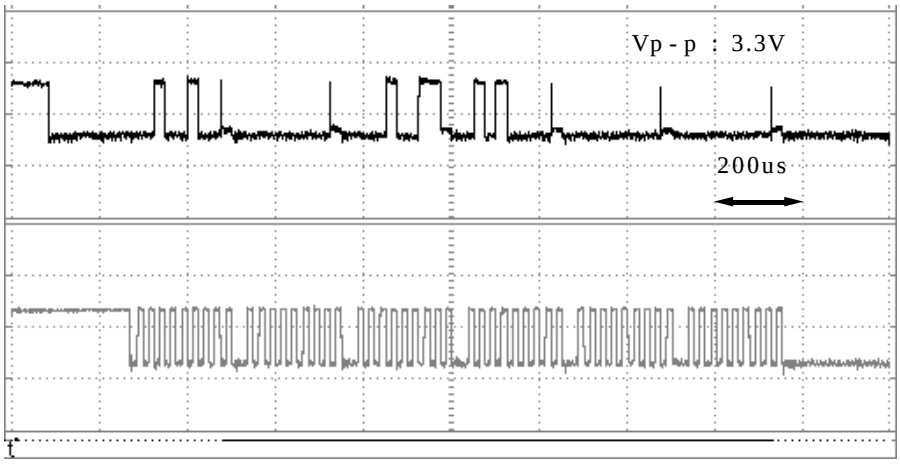


figure 7-9-2-2. SDA, SCL signal wave form

7-9-2-3. Check the TP107, ADC Sampling Clock as follows.

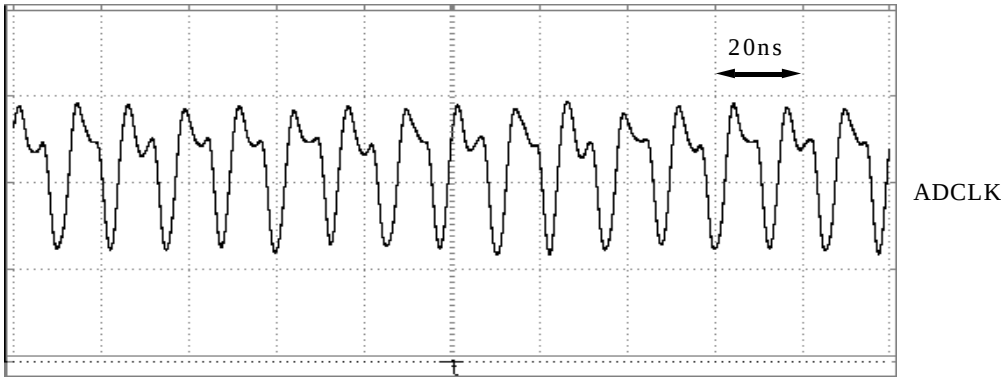


figure 7-9-2-3. ADCLK signal wave form

7-9-2-4. Check the AGC Loop as follows.

I	:	Junction of R125 & C118
Q	:	Junction of R131 & C121
AGC_CTL	:	Junction of R122 & Pin 41 of U100
AGC Voltage	:	TP101

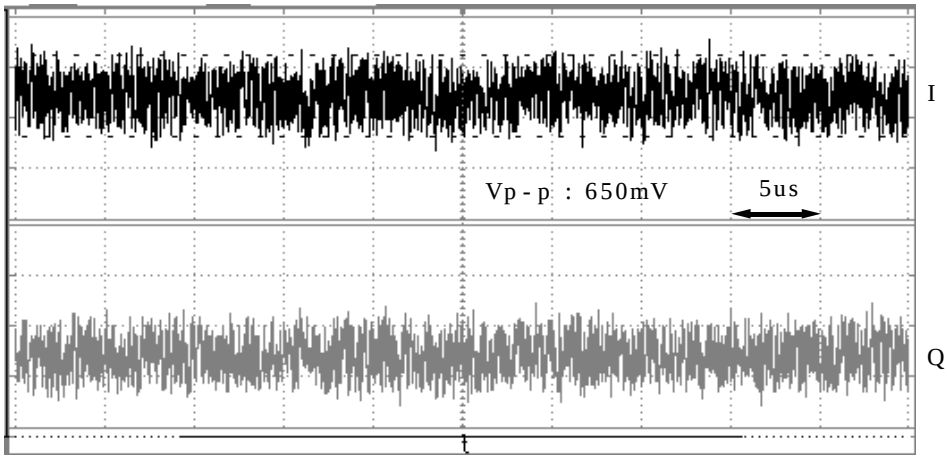
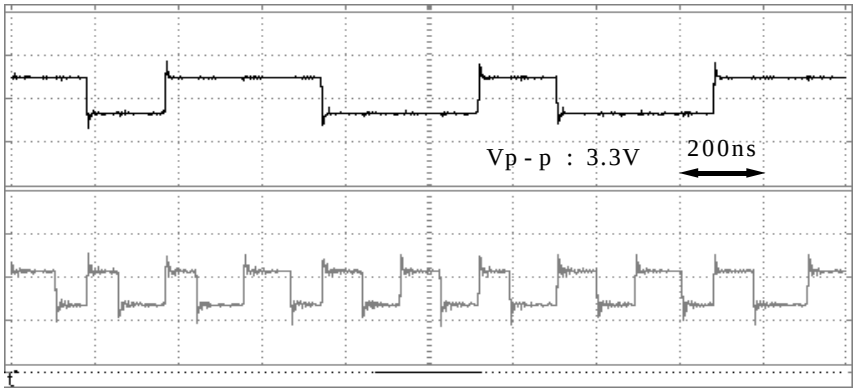


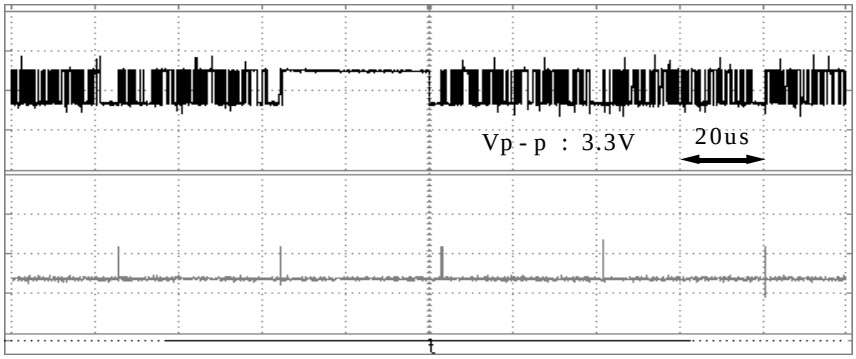
figure 7-9-2-4. I, Q signal wave form

7-9-2-5. Check the final Decoded Data output 'FECD' 0 to 7

7-9-2-6. Check the Output Control Signal as follows.
when The status of CH_SYNC is HIGH(+3.3V) the STB is channel locking and the ERROR is HIGH(+3.3V) means there is no error during channel locking.

Decoded Data	:	Pin 11,12,13,14,17,18,19 or 20 of U100
BYTE_CLK	:	TP117
F_START	:	TP114
DATA_VALID	:	TP116
CH_SYNC	:	TP119
ERROR	:	TP115





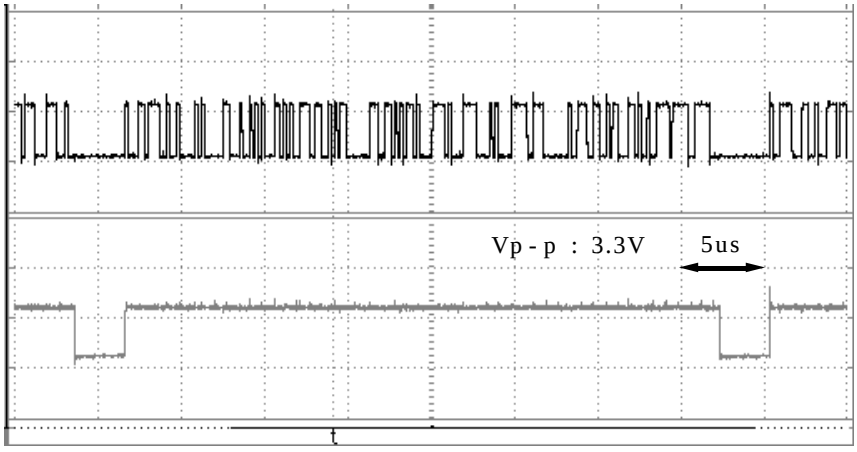


figure 7-9-2-6. QPSK DATA I/O signal wave form

7-10. ICAM

7-10-1. Look for a message on the terminal on power on stage as below;

"Task <opentv Task1>:
ICAM version is 00XX" if 00XX is "0000" that means there is a H/W defect in the ICAM part.

7-10-2. For normal descrambling operation you will have to check the below points with an oscilloscope;

7-10-2-1. TSI_BYTECLK (U800.89 or R821)
7-10-2-2. TSI_packetCLK(U800.75 or R819)
7-10-2-3. TSI_BYTECLKVALID(U800.77 or R817)

7-10-3. Connect the DRX100 to an antenna and insert an valid NDS card and check the outcoming descrambled data.

TSI_DATA[0..7] (R260 ~ 267)

7-10-4. If 7-10-2 and 7-10-3 are normal then you can suspect the QPSK(U100) TP2(U1) or the NDS card interface partition,
if 7-10-2 and 7-10-3 are not normal, check MB87F2011(U800) and MACH215(U802) for open/short circuits, bad soldering.

7-10-5. If it is still defected inspite of checking items 7-10-1 to 7-10-3 then it should mean that the IC MB87F2011(U800) and MACH215(U802) have a unrecoverable damage. Replace the IC's or replace the main PCB.

7-11. G729A

7-11-1. Type "T5" command on the terminal and check U305.36 and 38 with an oscilloscope.

If there is no signal then go to 7-11-2.
If there is a signal then go to 7-11-3.

7-11-2. Check G729_INT (U305.21 or R361) with an oscilloscope after typing ¡°T5¡±command. If there is an outcoming signal check U305.36 and 38 pins for open/short circuits and if it is O.K replace R6715(U305). But if there is no outcoming signals, check the incoming signals of U305 and the control signals as below;

(First type ¡°T5¡±command then check)
7-11-2-1. /G729-cs (U305.11)
7-11-2-2. /MEMRD (U305.12 or R355)
7-11-2-3. /MEMBE0 (305.8 or R357)
7-11-2-4. Address lines (R346,R348,R350 ~ R352)
7-11-2-5. Data lines (R337 ~ R344)
7-11-2-6. /RESET (U305.23 or R301)

If the above signal lines are O.K. replace U305 IC and if the signals are not normal then check U1(TP2).

7-11-3. As the next sections are mostly analogue, correct the errors by tracing the signals as below;

7-11-3-1. Check U752.15 and U752.4 with an oscilloscope.
7-11-3-2. Then U701.1 and U701.7
7-11-3-3. Then U901.26(TP944) and U901.28(TP946)

Correct the defects if there is no signals at the above items and if it is O.K. but no signal then check the scart connectors or the cables.

7-12. BEEP

7-12-1. Type "T1" command then check U900 pin 3 and 7.

If there is no signal then go to 7-12-2.
If there is a signal then go to 7-12-3.

7-12-2. Check the incoming signals of U900 pin 2 and 6, if it is O.K. then replace U900(1406HA). If there is no incoming signals check R956, R955,R954 with an oscilloscope.
If there is no signals on above resisters then check TP2(U1).

7-12-3. Check U703.15 and U703.4 with an oscilloscope.
Also check G729 part 7-11-3-2 to 7-11-3-3 items.

7-13. Interactive(Mondex) Card Interface

7-13-1. Insert the card while the DRX100 is power on.
Check if "Slot #1 card inserted" message is displayed on the PC's monitor.

If there is a message displayed then go to 7-13-2.
If there isn't any message displayed then go to 7-13-3.

7-13-2. Check if the card in slot #1 is defected.

7-13-3. Check the RESET signal with an oscilloscope on U450.34(TDA8006AH) or R454 at main power on.
If there is no RESET signal check U1(TP2).

7-13-4. Check the TX signal of U450.39(R456) when inserting the card.
If there is no signal you can suspect a mechanical defect or U450 IC damage.

7-13-5. If there is a mechanical defect replace the whole main PCB,if the IC is damaged replace U450.

7-14. NDS Card Interface

7-14-1. Insert the card while the DRX100 is power on.
Check if "s/c inserted" message is displayed on the monitor.

If there is a message displayed then go to 7-14-2.
If there isn't any message displayed then go to 7-14-3.

7-14-2. Check if the NDS card is defected.

7-14-3. Check the RESET signal oscilloscope on U400.20(TDA8004) at main power on. If there is no RESET signal you can suspect a defect on ICAM section or U1(TP2).

7-14-4. Check test points TP407,TP408,TP409,TP411 with an oscilloscope. The test points should be HIGH state when the card is inserted and LOW when the card is absent.

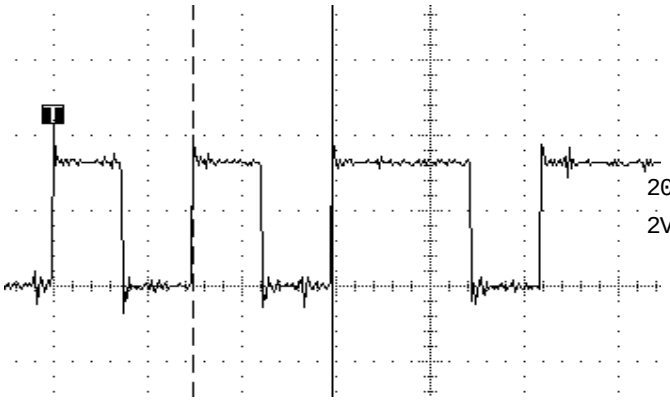
7-14-5. If there is no signal you can suspect a mechanical defect or U450 IC damage and If there is a mechanical defect replace the whole main PCB,if the IC is damaged, replace U400.

7-15. IEEE1394

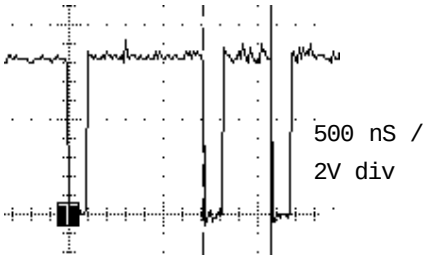
7-15-1. Type "T3" command on the terminal and check signal line with an oscilloscope as follows.

7-15-1-1. BUF_ADDR lines 2 to 11 (J6.1 to 10)
7-15-1-2. BUF_DATA lines 0 to 7 (U17.2 to 9)
7-15-1-3. DATA lines D 0 to 7 (U17.11 to 18)
7-15-1-4. BSKYB_DATA lines 0 to 7 (J6.53 to 60)
7-15-1-5. /BSKYB_CS (U17.19) and MEMR/W (U17.1)
7-15-1-6. /BSKYB_OE (J6.22) and /BSKYB_R/W (J6.23)
7-15-1-7. SDA & SCL lines (J6. 31 to 32)
7-15-1-8. BSKYB_BYTECLK (J6.51) and BSKYB_BYTECLKVAL (J6.50) and BSKYB_PACKETCLK (J6.49).

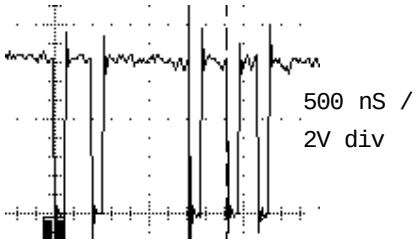
7-15-2. If the above signal lines are O.K. then check the IEEE1394 cable else if no problem then Keep checking the signal path referring to the schematic diagram and find PCB pattern's open or short and defective component to replace else replace main board.



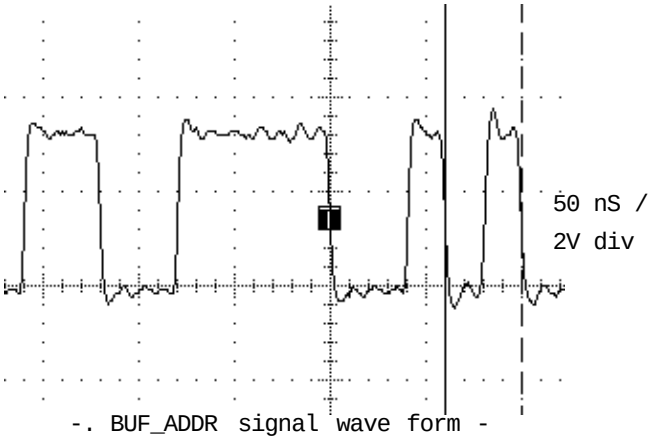
- 1284 data signal wave form -



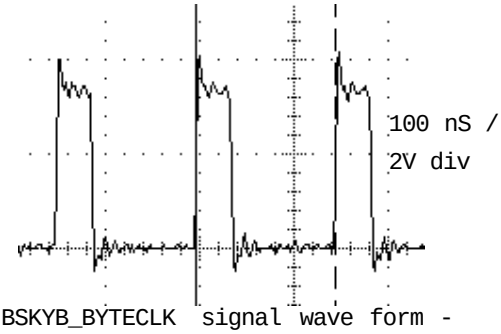
- BSKYB_OE signal wave form -



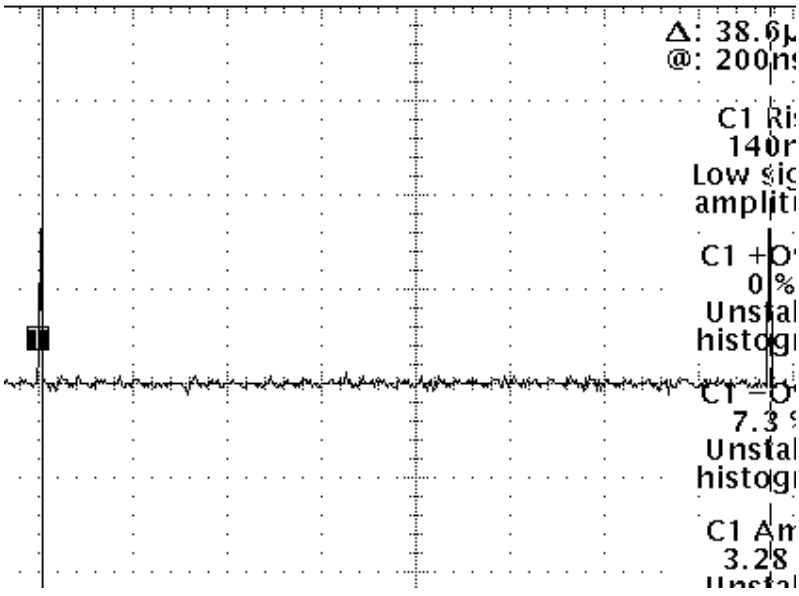
- BSKYB_RW signal wave form -



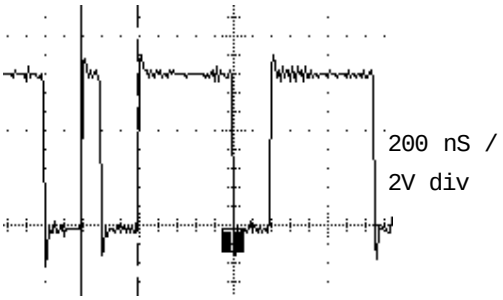
-. BUF_ADDR signal wave form -



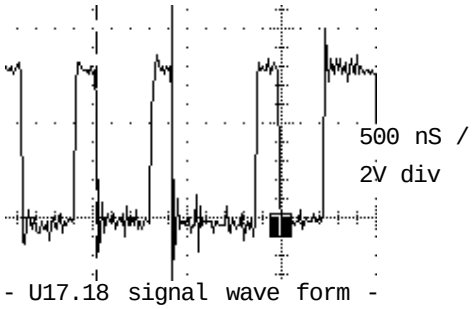
- BSKYB_BYTECLK signal wave form -



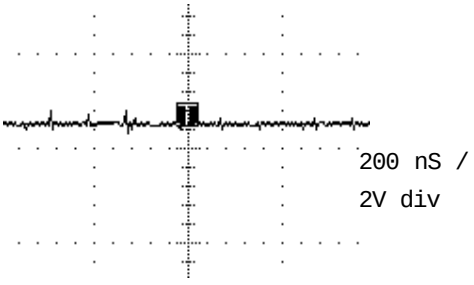
- BSKYB_PACKETCLK signal wave form -



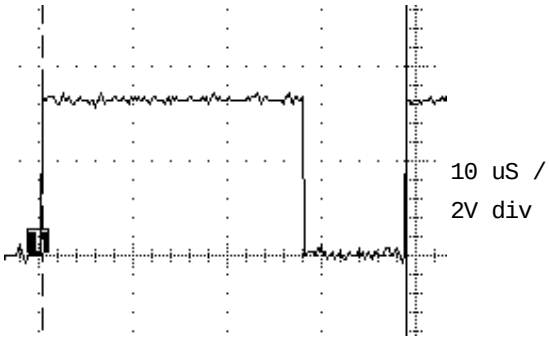
- U17.1 signal wave form -



- U17.18 signal wave form -



- U17.19 signal wave form -



- BSKYB_BYTECLKVAL signal wave form -

figure 7-15-2. control signal wave form

7-16. MODEM

7-16-1. The set will be considered normal if the Frequency Scan is realized after the system initialization. The set will be considered bad if it is stopped during the initialization process. Initialization process take place even there is a problem at the Modem part.

7-16-2. In the normal setting

Check the tone/pulse and dial when you hit command 'T9'.
If you do not detect the tone/pulse, check the U300.53p ring point for the possible occurrence of pulse.
The pulse appears at U306.11 and 13p during Ringing detection.

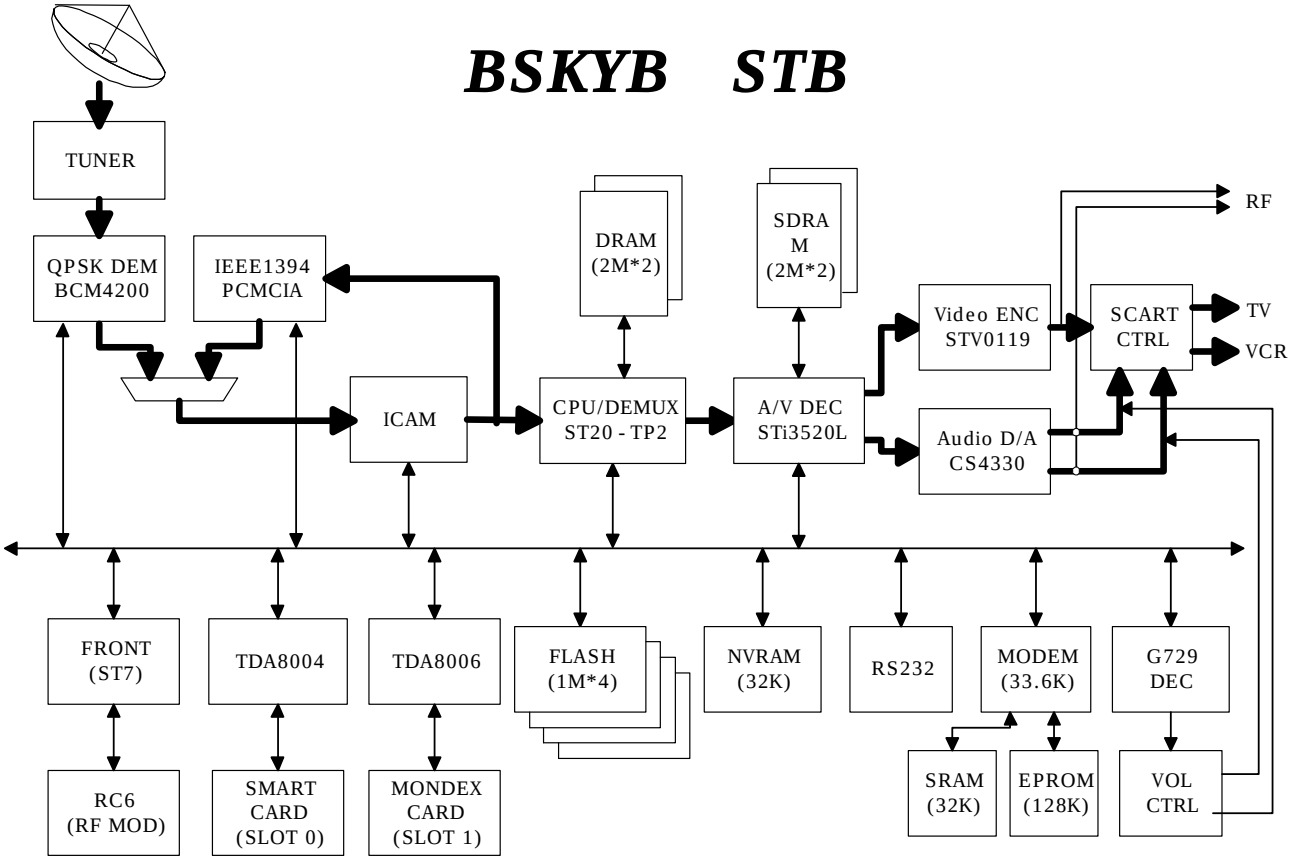
7-16-3. In the case of no pulse

occurrence, check the parts U306.3 and 4p.
Verify the Loop condition detection part whether the U306.15 is the normal output.

7-16-4. If the Modem does not work completely, please check whether normal output level is coming out from U302.
Try to change this component because there is a great possibility of damage caused externally.

7-16-5. Please check the parts U306.11 and 13.6p whether the normal pulses are getting out from them. In the case of problem occurrence, try to change the component because there is a possibility of damage.

8. Block Diagram



9. PART LIST

9-1. Main PCB Part List

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
1	3301-000287	BD1,L100,L101,L102,L103,L105, BD300,BD700,BD750	BC3560	SEM	9
2	2203-000206	C1,C5,C7,C8,C9,C10,C11,C14,C16,C17, C18,C19,C20,C21,C22,C23,C24,C25,C26, C27,C28,C29,C30,C31,C32,C37,C38,C39, C40,C41,C42,C43,C44,C45,C46,C100,C103 C104,C106,C111,C114,C123,C125,C126, C127,C128,C129,C130,C200,C201,C202, C203,C204,C205,C206,C207,C300,C302, C303,C308,C310,C311,C314,C315,C316, C317,C321,C322,C323,C324,C326,C328, C339,C341,C344,C350,C351,C353,C354, C400,C402,C403,C404,C405,C406,C407, C601,C602,C603,C604,C605,C606,C607, C608,C701,C706,C720,C750,C752,C758, C759,C764,C767,C772,C800,C801,C802, C803,C804,C805,C806,C807,C808,C809, C810,C903,C930,C945,C975,C976,C977	C-CHIP;100NF,10%,50V	"	121
3	2203-001246	C2	C-CHIP;82PF,5%,50V	"	1
4	2203-000811	C3	C-CHIP;33PF,5%,50V	"	1
5	2203-000618	C4	C-CHIP;22N,10%,50V	"	1
6	2203-000444	C6,C908,C909,C919,C920,C978, C979,C980	C-CHIP;1N,10%,50V	"	8
7	2401-000273	C15,C600,C700,C902	C-AL;100U/16	"	4
8	2401-001096	C915,C923,C934,C944,C966	C-AL;330u/16, 20%, 2.5	"	5
9	2401-000595	TP100 to GND (C140)	C-AL;1uF/50V, 20%, 2.5	"	1
10	2203-000267	C101,C109,C940	C-CHIP;10N,20%,50V	"	3
11	2401-000478	C102	C-AL;10U/50,	"	1
12	2401-001287	C704,C708,C711,C713,C718,C721,C722, C754,C756,C760,C763,C765,C766,C768, C771,C773,C774,C811,C812,C901,C910, C914,C916,C922,C928,C933,C938,C942, C959,C960,C961,C963,C965,C968,C971	C-AL;47/16V	"	35
13	2401-003070	C105,C110,C112,C113,C115,C122, C124,C352	C-AL;47u/25,-55to105C	"	8
14	2203-002278	C107,C108	C-CHIP;100P,5%,50V	"	2
15	2203-000429	C116,C117,C139	C-CHIP;18P,5%,50V	"	3

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
16	2203-000480	C118,C119,C120,C121	C-CHIP;1UF,+80-20%,3216	SEM	4
17	2401-000852	C131	C-AL;220/35V	"	1
18	2401-001576	C132,C937	C-AL;47/50v	"	2
19	2401-001100	C133,C134,C751,C753	C-AL;330u/16	"	4
20	2401-001358	C135,C136,C137	C-AL;470u/10V	"	3
21	2401-000408	C301,C304,C309,C312,C313,C318,C320, C325,C327,C338,C340,C342,C401,C703, C705,C710,C907,C911,C912,C921,C927, C929,C931,C932,C939,C950,C951,C952, C953,C954,C955,C956,C957,C958,C967	C-AL;10u/16V	"	35
22	2203-000379	C335,C305	C-CHIP;15P,10%,50V	"	2
23	2203-000295	C306,C307,C333,C334	C-CHIP;10P,5%,50V	"	4
24	2203-000922	C319	C-CHIP;470N,+80-20%,Y5V	"	1
25	2203-000061	C329,C330,C332	C-CHIP;1U,+80-20%,2012	"	3
26	2201-000286	C331,C337	C-DISC;1NF,1KV	"	2
27	2203-000543	C408	C-CHIP;200P,5%,50V	"	1
28	2203-000784	C702,C709,C981,C982,C983, C984,C985	C-CHIP;330P,	"	7
29	2301-000543	C712,C707	C-DISC;1.5NF	"	2
30	2401-000909	C762,C943	C-AL;22uF/16V,20%,2.5mm	"	2
31	2203-000716	C941	C-CHIP;3.3N,	"	1
32	2203-000403	C1000	C-CHIP;180P	"	1
33	3701-000320	DB300	RS232 9pin-dsub		1
34	0401-000133	D1,D300,D301,D700,D701,D702, D901,D902	RLS4148		8
35	0402-000514	D100	BYW32		1
36	0402-000129	D101,D102	1N4003		2
37	1404-000197	F100	X050		1
38	1404-001108	F700	X010		1
39	3711-001562	J1	H5		1
40	3711-001415	J2	H2		1
41	3711-003619	J3	W5		1
42	3711-004016	J6	H30A*2	BOONGKUK	2
43	3710-000574		SHUNT		1
44	3711-002687	J7	W10		1
45	MF37-00012A	J100	W11		1
46	3711-002679	J200	H3		1

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
47	0601-000523	LD800	LED;RED		1
48	2703-000125	L106,L300,L302,L700,L750,L907, L908,L909	IND-SMD;10uH,10%		8
49	2703-000271	L303,L301	IND-SMD;4.7uH,10%		2
50	2703-000229	L900,L901,L904,L905	IND-SMD;6.8uH,20%		4
51	MF59-00185U	MOD1	RMUP73855FX	SEM	1
52	0504-000180	Q100,Q103,Q104,Q106,Q107	TR;DTC114ES,NPN		5
53	0504-000184	Q701,Q926	TR-CHIP : DTC114		2
54	0501-000317	Q101,Q102,Q700	TR;A928		3
55	0501-000463	Q927	TR;KST2907A	SEC	1
56	0501-000458	Q200,Q300,Q752,Q753,Q754,Q755,Q756, Q901,Q902,Q904,Q905,Q906,Q907,Q909, Q911,Q914,Q915,Q916,Q917,Q918,Q920, Q925	TR;KST2222AL	SEC	22
57	2007-000290	R39,R61,R62,R63,R69,R70,R71,R72,R73, R74,R75,R76,R77,R78,R83,R84,R85,R86, R87,R88,R89,R90,R91,R92,R93,R97, RD100,R123,R301,R302,R303,R304,R305, R306,R307,R308,R309,R310,R311,R313, R326,R329,R331,R337,R338,R339,R340, R341,R342,R343,R344,R346,R348,R350, R351,R352,R355,R356,R357,R367,R402, R403,R404,R405,R406,R407,R408,R424, R774,R776,R778,R780,R817,R819,R824, R825,R826,R828,R842,R843,R844,R845, R847,R848,R849,R852,R853,R854,R857, R859,R860,R861,R862,R863,R864,R867, R868,R869,R880,R881,R882,R883,R886, R887,R888	R-CHIP;100,5%,1/10W	SEM	105
58	2007-001043	R1,R10,R11,R14,R23,R40,R612, R616,R753,R754,R782, R821, R865, R878,R889, R980	R-CHIP;56,5%1/10W	"	16
59	2007-000282	R12,R16,R909,R912,R924,R925	R-CHIP;100K,5%,1/10W	"	6
60	2007-000300	R2,R3,R4,R17,R19,R20,R21,R22,R24, R28,R29,R30,R31,R34,R36,R37,R38,R42 ,R43,R79,R80,R81,R82,R94,R105,R111, R118,R204,R312,R314,R325,R328,R332, R349,R361,R401,R416,R606,R607,R608, R609,R610,R611,R720,R750,R751,R786, R788,R879,R902,R954,R955,R956,R976, R979,R984,R985,R988	R-CHIP;10K,5%,1/10W	"	58

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
61	2007-000029	R5,R6,R33,R57,R58,R95,R130,R133, R260,R261,R262,R263,R264,R265,R266, R267,R275,R276,R277,R330,R336,R354, R366,R373,R419,R613,R614,R615,R814, R815,R816,R820,R822,R830,R835,R838, R840,R846,R850,R851,R877,R890,R891, R977,R1020,R1030,R1031,R1034,R1042	R-CHIP;0,5%,1/10W	SEM	49
62	2007-000001	R13,R347,R353	R-CHIP;68K,5%,1/10W	"	3
63	2007-000498	R15	R-CHIP;2.2M,5%,1/10W	"	1
64	2007-000468	R18,R122,R126,R127,R203,R327,R365, R371,R730,R731,R945,R973,R981, R1032,R1033,R948	R-CHIP;1K,5%,1/10W	"	16
65	2007-001710	R100,R360	R-CHIP;15K,5%,1/10W	"	2
66	2007-000774	R101	R-CHIP;33K,5%,1/10W	"	1
67	2007-000964	R102,R323	R-CHIP;5.1K,5%,1/10W	"	2
68	2007-000546	R103,R319,R320,R322,R324,R363,R400, R923	R-CHIP;20K,5%,1/10W	"	8
69	2007-000728	R104,R813	R-CHIP;300,5%,1/10W	"	2
70	2007-001428	R110,R106,R783	R-CHIP;1.2K,5%,1/8W, 3216	"	3
71	2007-000026	R107	R-CHIP;200,5%,1/10W	"	1
72	2007-000518	R112,R113,R116,R117,R706,R715,R982, R983	R-CHIP;2.7K,5%,1/10W	"	8
73	2007-000931	R114,R972,R978,R1017	R-CHIP;470,5%,1/10W	"	4
74	2007-000395	R115	R-CHIP;150K,5%,1/10W	"	1
75	2007-000766	R120,R903,R907,R943,R946,R968,R970	R-CHIP;330,5%,1/10W	"	7
76	2007-000572	R124,R129	R-CHIP;220,5%,1/10W	"	2
77	2007-001001	R125,R131, R205,R206	R-CHIP;510,5%,1/10W	"	4
78	2007-000872	R202,R364,R603,R604,R760,R761,R827, R832,R874,R875,R876,R914,R927	R-CHIP;4.7K,5%,1/10W	"	13
79	2007-000603	R333	R-CHIP;240K,5%,1/10W	"	1
80	2007-001088	R345	R-CHIP;620K,5%,1/10W	"	1
81	2007-000671	R358,R359	R-CHIP;2K,5%,1/10W	"	2
82	2007-000338	R362	R-CHIP;120K,5%,1/10W	"	1
83	2007-000598	R370,R369	R-CHIP;22,5%,3216	"	2
84	2007-000941	R701,R711	R-CHIP;47K,5%,1/10W	"	2
85	2007-000221	R705,R714,R789,R790,R1021	R-CHIP;1.2K,5%,1/10W	"	5
86	2007-000615	R707,R716	R-CHIP;24K,5%,1/10W	"	2

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
87	2007-001071	R769,R772,R777,R781,R913,R929,R930, R938,R944,R951,R953,R963,R989,R998	R-CHIP;6.8K,5%,1/10W	"	14
88	2007-000241	R721,R722,R762,R763	R-CHIP;1.5K,5%,1/10W	"	4
89	2007-000642	R757,R759,R764,R771,R773,R931,R939, R952,R964,R999	R-CHIP;270,5%,1/10W	"	10
90	2007-001239	R765	R-CHIP;910,5%,1/10W	"	1
91	2007-000355	R775,R779	R-CHIP;12K,5%,1/10W	"	2
92	2007-001133	R905,R922,R937,R950,R960, R990,R996,R1000	R-CHIP;68,5%,1/10W	"	8
93	2007-001166	R926,R965,R995,R997	R-CHIP;75,5%,1/10W	"	4
94	2007-000565	R932,R933,R974,R975	R-CHIP;220K.1/10W	"	4
95	2007-001055	R969,R971	R-CHIP;6.2K,5%,1/10W	"	2
96	2007-000981	R993,R994,R703,R712	R-CHIP;5.6K,5%,1/10W	"	4
97	2007-001141	R1010	R-CHIP;7.5K,1/10W	"	1
98	2007-000738	R1011	R-CHIP;30K,1/10W	"	1
99	2007-001155	R1012,R1013	R-CHIP;750,1/10W	"	2
100	2007-000205	R1040,R1041	R-CHIP;0,1/8W,3216	"	2
101	3709-001097	SC400A	SMART_CON	DDK	1
102	3404-001016	S1	TSW		1
103	3722-000511	TJ300	RJ11-4/4		1
104	MF40-00115T	T100	TBDE381119A	SEM	1
105	3722-001210	T900	PHONE-2		1
106	3722-001230	T901(A,B)	SCART-CONNECTOR		1
107	1205-001330	U1	ST20TP2	SGS	1
108	0801-002378	U2	74VHC04		1
109	1203-000416	U3	DS1233		1
110	0801-000397	U4	74HC04		1
111	0803-000111	U5,U7	74F138		2
112	0801-002377	U6,U13,U14,U15	74LCX257		4
113	0801-002370	U8,U9,U10	74AC377SCX		3
114	0802-001039	U801,U16	74LVT16244		2
115	0802-001037	U17,U18,U803	74LVT245		3
116	1205-001265	U100	BCM4200_KEF	BRODECOM	1
117	1203-000157	U101	KA317		1
118	1206-000152	U102	NE555		1
119	0801-002384	U103	74HC4066		1

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
120	1203-001026	U104,U105,U751	MC33269		3
121	1203-000273	U106	KA7805	SEC	1
122	1107-001033	U200,U201,U202,U203	MBM29LV800T-10PFTN	FUT	4
123	1105-001194	U204,U205	KM416V1200CT-6	SEC	2
124	1103-001090	U206	AT24C128	ATMEL	1
125	1205-001473	U300	R6741-28	ROCKWELL	1
126	1106-001129	U301	IS61C256-20J		1
127	1107-001103	U302	IS28F010	ISSI	1
128	1201-000167	U303,U701	KA358	SEC	2
129	1202-000165	U304	KA393	SEC	1
130	1205-001215	U305	R6715-13	ROCKWELL	1
131	1205-001446	U306	MH88435AS-P	MITEL	1
132	1006-001103	U350	AD237L	A.D	1
133	1205-001448	U400	TDA8004T	PHILIPS	1
134	0801-000378	U401	74HC00		1
135	1204-001383	U600	STI3520L	SGS	1
136	1105-001165	U601,U602	KM416S1020CT-G10	SEC	2
137	1203-000298	U702	KA7809	SEC	1
138	1002-001059	U700	CS4330	CRYSTAL	1
139	1204-001379	U750	STV0119A	SGS	1
140	MF13-00029J	U800	MB87F2011	Fusitzu	1
141	0801-001045	U703,U752	74HC4053		2
142	1301-001256	U802	MACH215-12JC	Ventis	1
143	1204-000395	U900	UPC1406HA		1
144	1204-001381	U901	CXA2078Q	SONY	1
145	0405-000117	VD1,VD2	1SV215		2
146	1405-000193	V300	10D471K		1
147	2801-003365	X1	27MHz	KONY	1
148	2801-000165	X100	15MHz	KONY	1
149	2801-003655	X300	56.448MHz/s	KONY	1
150	2801-003622	X301	56.448MHz	KONY	1
151	3704-000261	U302	SOCKET-IC;32P		1
152	3704-000282	U802	SOCKET-IC;44P		1

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
153	MF41-00061E		MAIN PCB	CHOENGJOO	1
154	MF62-00014B		HEAT SINK		1
155	2401-000140	C974	1000U/16V, 10*20, 5mm		1
156		X2,R7,R8,R9,C12,C13,R25,R26,R32,R35, R41,R44,R45,R46,R47,R59,R66,R96,R98, R99,Q105,R108,R109,R119,R121,R128, R132,R134,R135,R136,U207,R250,R251, R252,R253,R254,R255,R256,R257,R270, R271,R272,R300,R318,R321,R334,R335, R372,R409,R410,R411,R412,R413,R414, R415,R417,R418,R420,R421,R422,R423, R600,R601,R602,R732,R733,Q753,Q754, R774,R775,R776,R777,R784,R785,R800, R801,R802,R803,R804,R805,R806,R807, R808,R809,R810,C814,C815,R818,R866, R870,R871,R872,R894,R895,R896,R897, R898,Q900,R901,R904,R906,R908,R910, R911,C913,R916,C972,C1001,C900,C962, R1004,R1005,R1035,C964,R992,R987, Q919	NC		

9-2. Front PCB Part List

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
1	2203-000206	C500,C502,C505,C506	C-CHIP;100NF,10%	SEMCO	4
2	2402-000176	C501	C-AL;10U,16V,20%	SAMHWA	1
3	2402-000179	C507	C-AL;47U,16V,20%	SAMHWA	1
4	2203-000429	C504,C503	C-CHIP;18PF,5%,50V	SEMCO	2
5	0401-000133	D500	RLS4148,100V,200MA	ROHM	1
6	0603-001032	IR500	IR,RPM6536,36KHZ	TEMIC	1
7	MF39-00230P	J501	RIBBON WIRE, 10P	KYUNGSUNG	1
8	0601-001051	LD501	LED;ROUND,AMB/GRN,3.1MM	ROHM	1
9	0601-000401	LD502	LED;ROUND,YEL	ROHM	1
10	0601-000523	LD503	LED;ROUND,RED	ROHM	1
11	0601-000552	LD504	LED;ROUNG,GRN	ROHM	1
12	0501-000463	Q500	KST2907A,PNP,350MW	SEC	1
13	0501-000458	Q501	KST2222ATF,NPN,350MW	SEC	1
14	2007-000300	R500	R-CHIP;10K,5%,1/10W	SEM	1
15	2007-000947	R501	R-CHIP;47,5%,1/10W	SEM	1
16	2007-000304	R502	R-CHIP;10M,5%,1/10W	SEM	1
17	2007-000401	R504,R505,R506,R508, R509	R-CHIP;150,5%,1/10W	SEM	5
18	2007-000029	R507	R-CHIP;1.5K,5%,1/10W	SEM	1
19	2007-000844	R510,R516	R-CHIP;3K,5%,1/10W	SEM	2
20	2007-000468	R511~515,R518~522,R52 6,R504	R-CHIP;1K,5%,1/10W	SEM	12
21	2007-000290	R523	R-CHIP;100,5%,1/10W	SEM	1
22	3404-001064	S501~505,S507~S510	SWITCH-TACT	KYUNG-IN	9
23	0903-001123	U500	IC;ST72251	SGS-THO	1
24	2801-000005	X500	XTAL;8MHZ,20PPM,28-AAM	KONY	1
25	MF59-00186F		PCB;FRONT,5 array	CHOENGJOO	1
26	2007-000518	R524,R525,R526	R-CHIP;2.7K,5%,1/10W	SEM	3
27	2703-000125	L1	CHIP-INDUCTOR,10UH,10%	SEM	1
28	2007-000355	R528	R-CHIP,12K,2012,5%	SEM	1
29		R503,R528	NC		

9-3. Mondex PCB Part List

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
1	2203-000897	C450	C-CHIP;4.7NF,10%,50V	SEM	1
2	2203-000206	C451~4,C456~8,C461	100N	SEM	8
3	2402-000176	C455	C-AL,SMD;10U/16,4x5.2	SAMHWA	1
4	2203-000992	C459	C-CHIP;47P,10%,50V	SEM	1
5	2402-000179	C460	C-AL,SMD;47U/16,6.3x5.2	SAMHWA	1
6	2203-000811	C462,C463	C-CHIP;33PF,5%,50V	SEM	2
7	MF39-00230Q	J451	5P RIBBON WIRE	KYUNGSUNG	1
8	2007-000282	R450	R-CHIP;100K,5%,1/10W	SEM	1
9	2007-000029	R451	R-CHIP;0,5%,1/10W	SEM	1
10	2007-000290	R452,R454,R455,R456	R-CHIP;100,5%,1/10W	SEM	4
11	2007-000477	R453	R-CHIP;1M,5%,1/10W	SEM	1
13	1205-001449	U450	TDA8006AH/A13	PHILIPS	1
14	2801-003623	X450	XTAL;14.745MHZ,30PPM,28-AAM	KONY	1
15	MF41-00061H	PCB	MONDEX PCB	CHOENGJOO	1

9-4. PCMCIA PCB Part List

NO.	BOM CODE	LOCATION NO.	DESCRIPTION	VENDOR	Q'ty
1	2203-000206	C407~10	100NF	SEM	4
2	2402-000179	C427,C428	C-AL,SMD;47U/16,6.3x5.2	SAMHWA	2
3	3710-001380	J400	CON30A*2	SAMTEC	2
4	3709-001099	J401	PCMCIA-1394-CON	DDK	1
5	MF41-00061F		PCB	CHOENGJOO	1

9-5. Packing BOX Part List

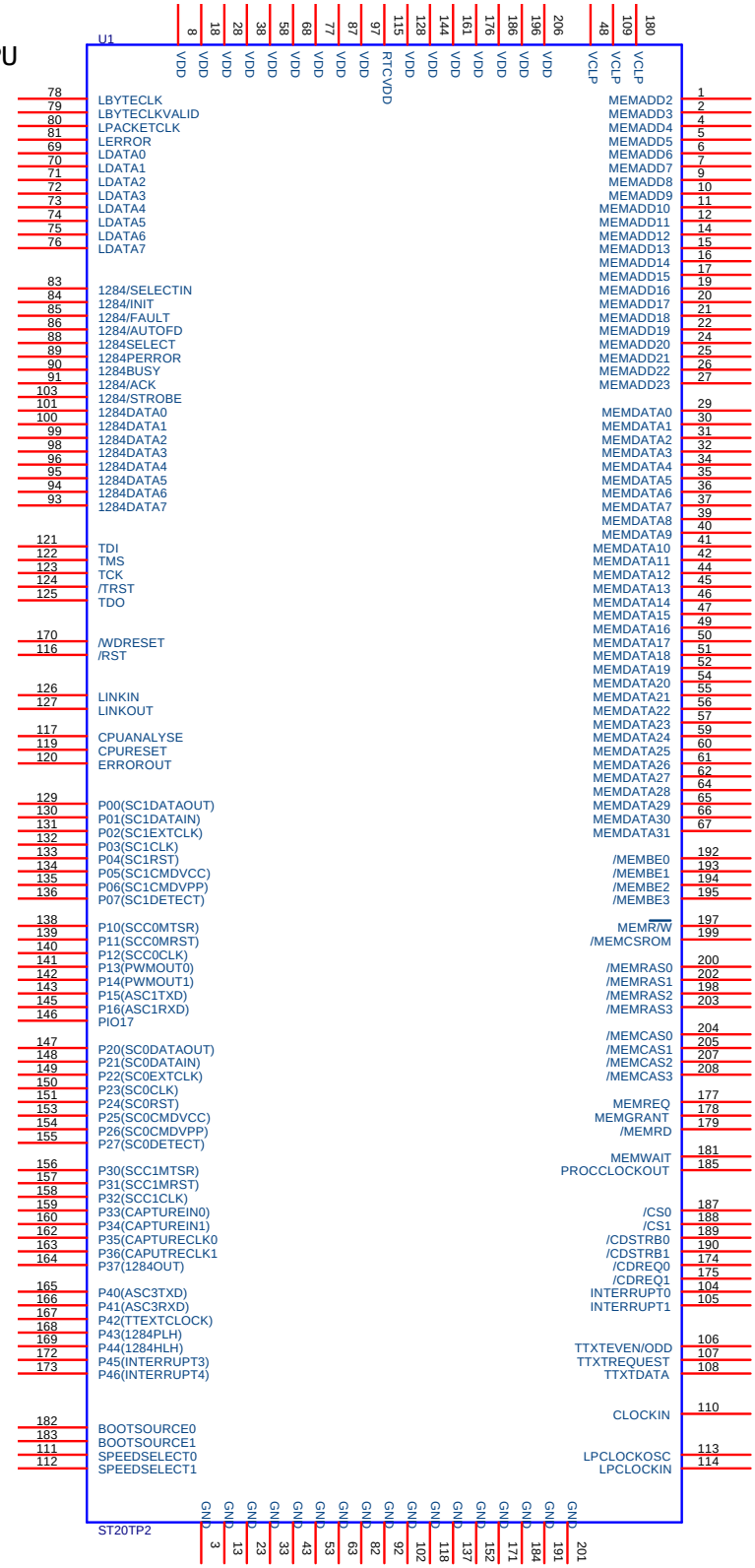
NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
1	MF68-00166K		LABEL(MACROVISION)	SAMKWANG	1
2	MD68-00103A		LABEL(NDS)	"	2
3	MF68-00164S		LABEL(MANUFACTOR)	"	2
4	MF68-00166W		LABEL(BEAB,BABT,CE)	"	1
5	MF59-00185P		RCU	PHILIPS	1
6	MF39-00230E		SCART CABLE	KYUNGSUNG	1
7	MF39-00232A		RF CABLE	KYUNGSUNG	3
8	MF39-00230T		TELEPHONE CABLE	KYUNGSUNG	1
9	MF68-00167B		MANUAL	SAMSUNG MUNHWA	1
10	MF69-00239K		GIFT BOX		1
11	MF69-00240U		MANUAL BOX		1
12	4301-000117		BATTERY;1.5V,AA		2

9-6. Chassis Part List

NO	BOM CODE	LOCATION NO	DESCRIPTION	VENDOR	Q'ty
1	6002-000441		SCREW-TAPPING;M3,L6		9
2	6002-000131		SCREW-TAPPING;M4,L8		5
3	MF60-000113G		SCREW		1
4	6002-000440		SCREW(for REAR FOOT)		4
5	6021-001002		NUT-HEX		1
6	6031-000524		WASHER		1
7	MF62-00014C		HEAT SINK		1
8	MF39-00230M		POWER CORD		1
9	6104-000118		FOOT;BLACK		2
10	MF61-00003L		FOOT;SILVER		2
11	6103-000127		SUPPORTER		2
12	MF70-00137G		COVER		1
13	MF70-00137A		REAR-PANEL		1
14	MF70-00136Y		CHASSIS		1
15	MF72-00156U		FRONT PANEL		1
16	MF69-00240Y		BUFFER-RIGHT		1
17	MF69-00240Z		BUFFER-LEFT		1
18	6501-000127		CABLE TIE		1
19	MF44-00001H		SMPS	INSUNG ELECTRONICS	1
20	MF69-00239H		PACKING--BOX;CB		1
21	MF70-00137F		REAR PLATE		1
22	MF72-00158A		INSULATOR		1
23	0202-000002		SOLDER WIRE		0.0001KG
24	MF02-00001G		SILICON BOND		.000001G

10. Pin Description

10-1. CPU



Pin	Pin name	I/O
1	MemAddr2	O
2	MemAddr3	O
3	GND	
4	MemAddr4	O
5	MemAddr5	O
6	MemAddr6	O
7	MemAddr7	O
8	VDD	
9	MemAddr8	O
10	MemAddr9	O
11	MemAddr10	O
12	MemAddr11	O
13	GND	
14	MemAddr12	O
15	MemAddr13	O
16	MemAddr14	O
17	MemAddr15	O
18	VDD	
19	MemAddr16	O
20	MemAddr17	O
21	MemAddr18	O
22	MemAddr19	O
23	GND	
24	MemAddr20	O
25	MemAddr21	O
26	MemAddr22	O
27	MemAddr23	O
28	VDD	
29	MemData0	I/O

Table 29.1 ST20-TP2 pin allocation

Pin	Pin name	I/O
30	MemData1	I/O
31	MemData2	I/O
32	MemData3	I/O
33	GND	
34	MemData4	I/O
35	MemData5	I/O
36	MemData6	I/O
37	MemData7	I/O
38	VDD	
39	MemData8	I/O
40	MemData9	I/O
41	MemData10	I/O
42	MemData11	I/O
43	GND	
44	MemData12	I/O
45	MemData13	I/O
46	MemData14	I/O
47	MemData15	I/O
48	VDD	
49	MemData16	I/O
50	MemData17	I/O
51	MemData18	I/O
52	MemData19	I/O
53	GND	
54	MemData20	I/O
55	MemData21	I/O
56	MemData22	I/O
57	MemData23	I/O
58	VDD	
59	MemData24	I/O
60	MemData25	I/O
61	MemData26	I/O
62	MemData27	I/O
63	GND	
64	MemData28	I/O

Table 29.1 ST20-TP2 pin allocation

Pin	Pin name	I/O
65	MemData29	I/O
66	MemData30	I/O
67	MemData31	I/O
68	VDD	
69	LData0	I
70	LData1	I
71	LData2	I
72	LData3	I
73	LData4	I
74	LData5	I
75	LData6	I
76	LData7	I
77	VDD	
78	LByteClk	I
79	LByteClkValid	I
80	LPacketClk	I
81	LError	I
82	GND	
83	1284notSelectIn	I
84	1284notInit	I
85	1284notFault	O
86	1284notAutoFd	I
87	VDD	
88	1284Select	O
89	1284PError/TSByteClkValid	O
90	1284Busy/TSPacketClk	O
91	1284notAck/TSByteClk	O
92	GND	
93	1284Data7	I/O
94	1284Data6	I/O
95	1284Data5	I/O
96	1284Data4	I/O
97	VDD	
98	1284Data3	I/O
99	1284Data2	I/O

Table 29.1 ST20-TP2 pin allocation

Pin	Pin name	I/O
100	1284Data1	I/O
101	1284Data0	I/O
102	GND	
103	1284notStrobe	I
104	Interrupt0	I
105	Interrupt1	I
106	TtxtEvennotOdd	I
107	TtxtRequest	I
108	TtxtData	I/O
109	VDD	
110	ClockIn	I
111	SpeedSelect0	I
112	SpeedSelect1	I
113	LPClockOsc	
114	LPClockIn	
115	RTCVDD	
116	notRST	I
117	CPUAnalyse	I
118	GND	
119	CPUReset	I
120	ErrorOut	O
121	TDI	I
122	TMS	I
123	TCK	I
124	notTRST	I
125	TDO	O
126	LinkIn	I
127	LinkOut	O
128	VDD	
129	PIO0<0>	I/O
130	PIO0<1>	I/O
131	PIO0<2>	I/O
132	PIO0<3>	I/O
133	PIO0<4>	I/O
134	PIO0<5>	I/O

Table 29.1 ST20-TP2 pin allocation

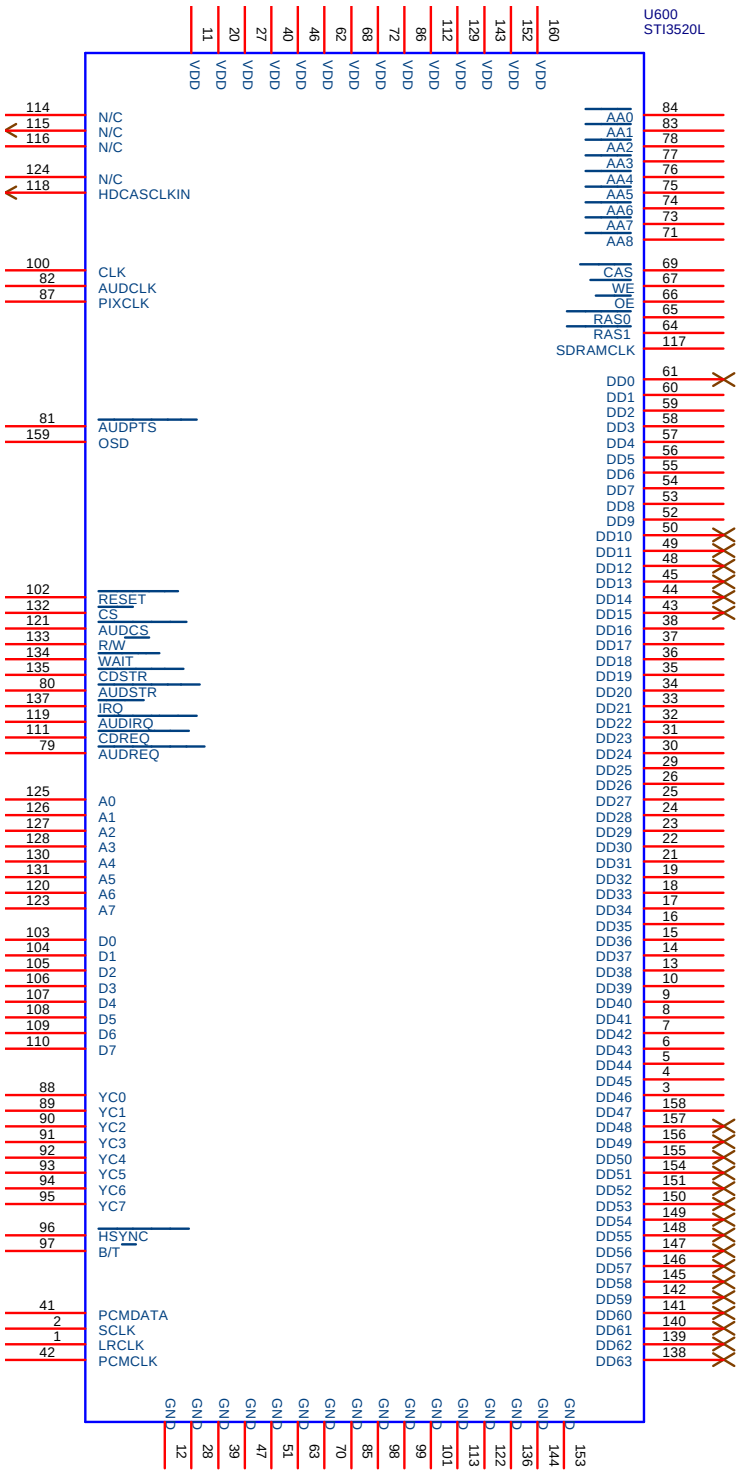
Pin	Pin name	I/O
135	PIO0<6>	I/O
136	PIO0<7>	I/O
137	GND	
138	PIO1<0>	I/O
139	PIO1<1>	I/O
140	PIO1<2>	I/O
141	PIO1<3>	I/O
142	PIO1<4>	I/O
143	PIO1<5>	I/O
144	VDD	
145	PIO1<6>	I/O
146	PIO1<7>	I/O
147	PIO2<0>	I/O
148	PIO2<1>	I/O
149	PIO2<2>	I/O
150	PIO2<3>	I/O
151	PIO2<4>	I/O
152	GND	
153	PIO2<5>	I/O
154	PIO2<6>	I/O
155	PIO2<7>	I/O
156	PIO3<0>	I/O
157	PIO3<1>	I/O
158	PIO3<2>	I/O
159	PIO3<3>	I/O
160	PIO3<4>	I/O
161	VDD	
162	PIO3<5>	I/O
163	PIO3<6>	I/O
164	PIO3<7>	I/O
165	PIO4<0>	I/O
166	PIO4<1>	I/O
167	PIO4<2>	I/O
168	PIO4<3>	I/O
169	PIO4<4>	I/O

Table 29.1 ST20-TP2 pin allocation

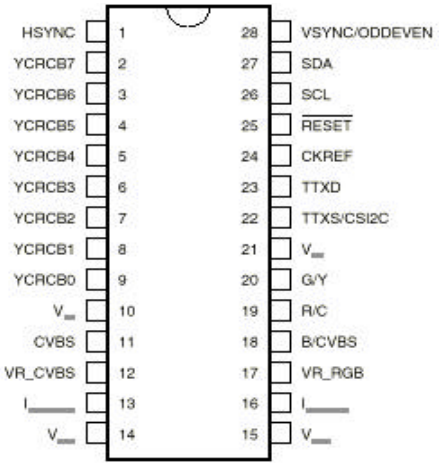
Pin	Pin name	I/O
170	notWdReset	O
171	GND	
172	PIO4<5>	I/O
173	PIO4<6>	I/O
174	notCDREQ0	I
175	notCDREQ1	I
176	VDD	
177	MemReq	I
178	MemGrant	O
179	notMemRd	O
180	notMemRf	O
181	MemWait	I
182	BootSource0	I
183	BootSource1	I
184	GND	
185	ProcClockOut	O
186	VDD	
187	notCS0	O
188	notCS1	O
189	notCDSTRB0	O
190	notCDSTRB1	O
191	GND	
192	notMemBE0	O
193	notMemBE1	O
194	notMemBE2	O
195	notMemBE3	O
196	VDD	
197	notMemPS0	O
198	notMemPS1	O
199	notMemPS3	O
200	notMemRAS0	O
201	GND	
202	notMemRAS1	O
203	notMemRAS3	O

Table 29.1 ST20-TP2 pin allocation

10-2. A/V Decoder

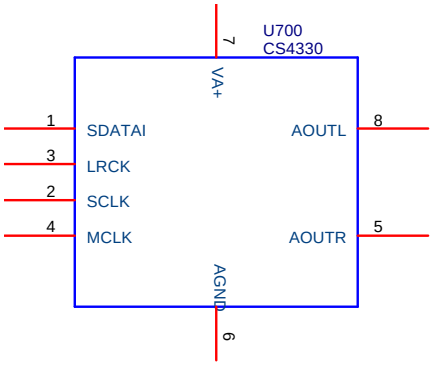


10-3. Video Encoder

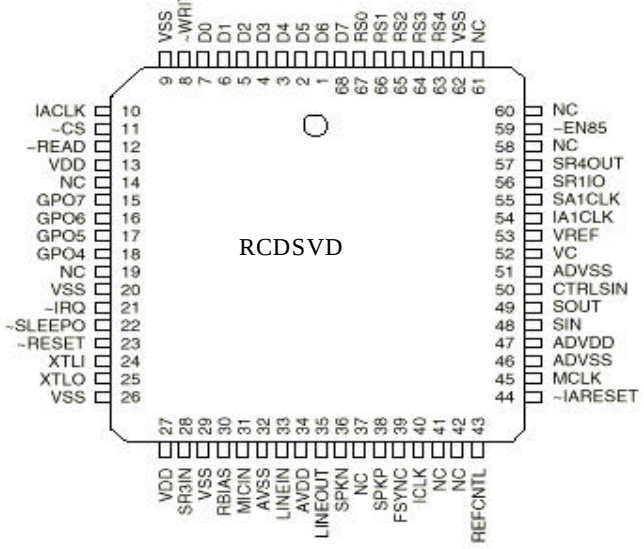


STV0119A

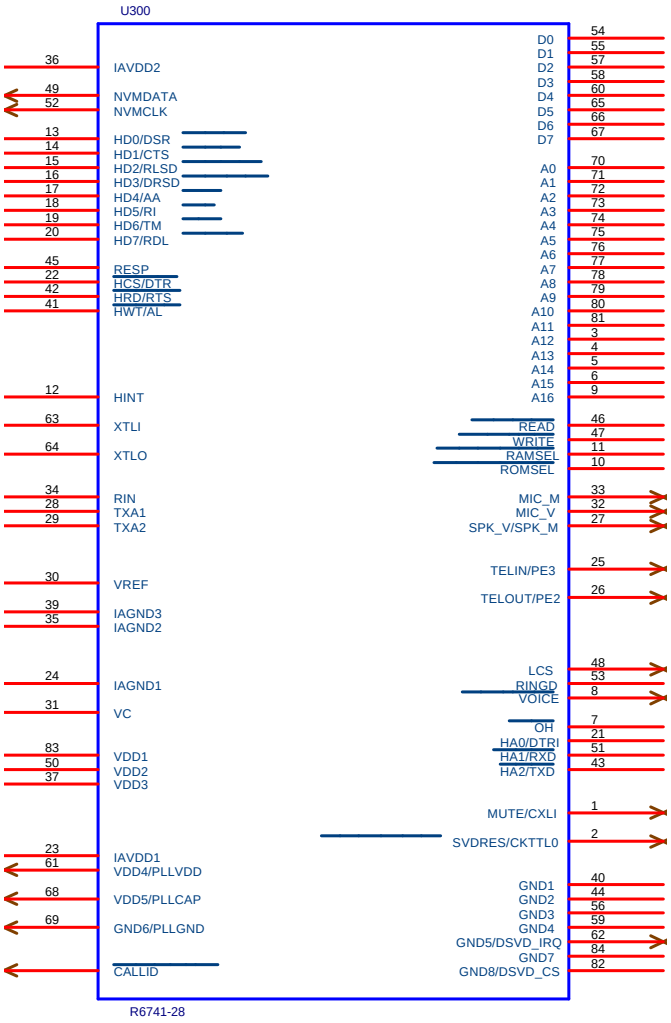
10-4. Audio Decoder



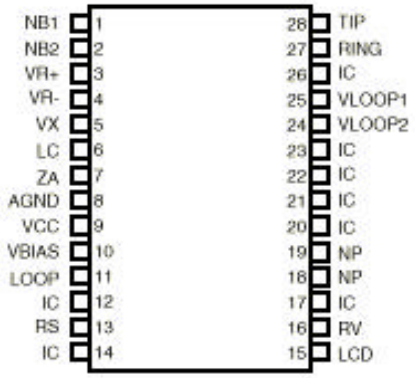
10-5. G,729 Voice Processor



10-6. MODEM chipset

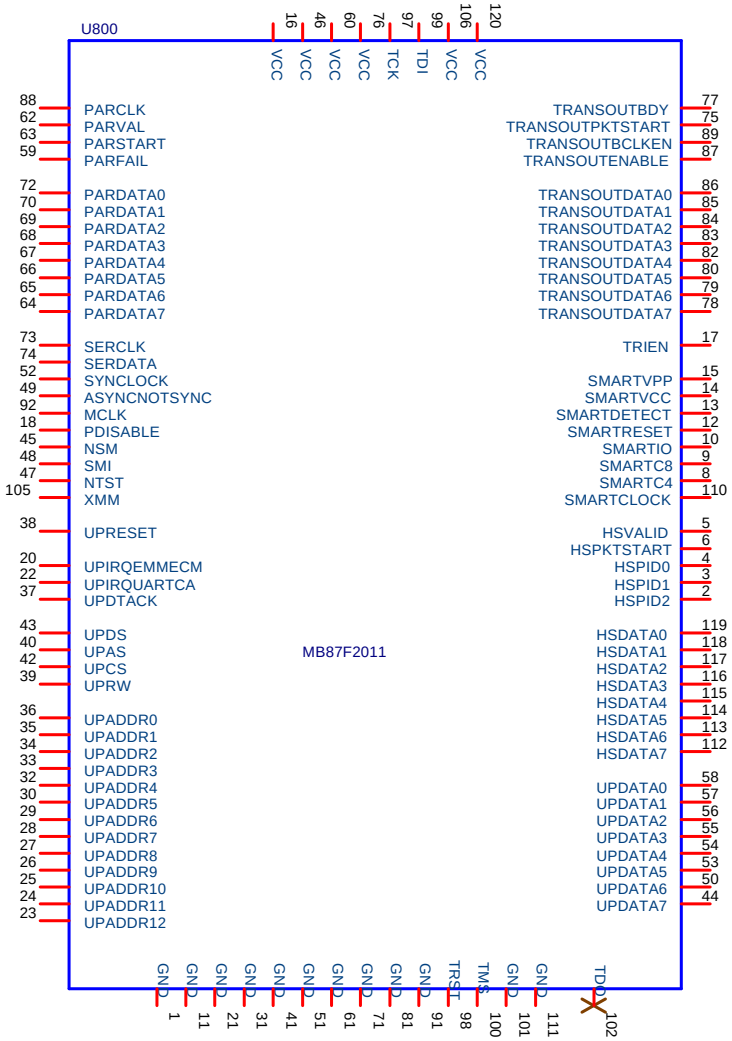


10-7. Telephone line driver

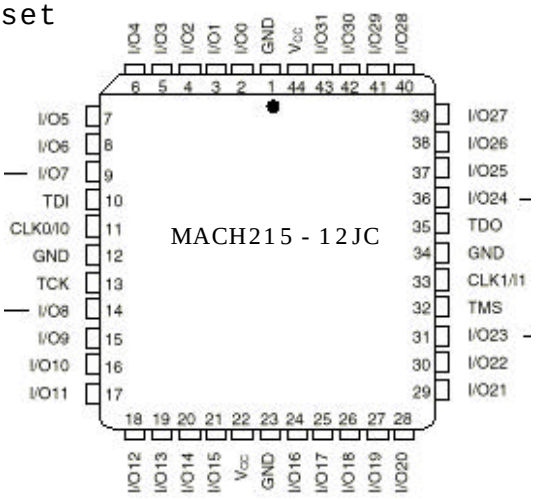


MH88435 - P

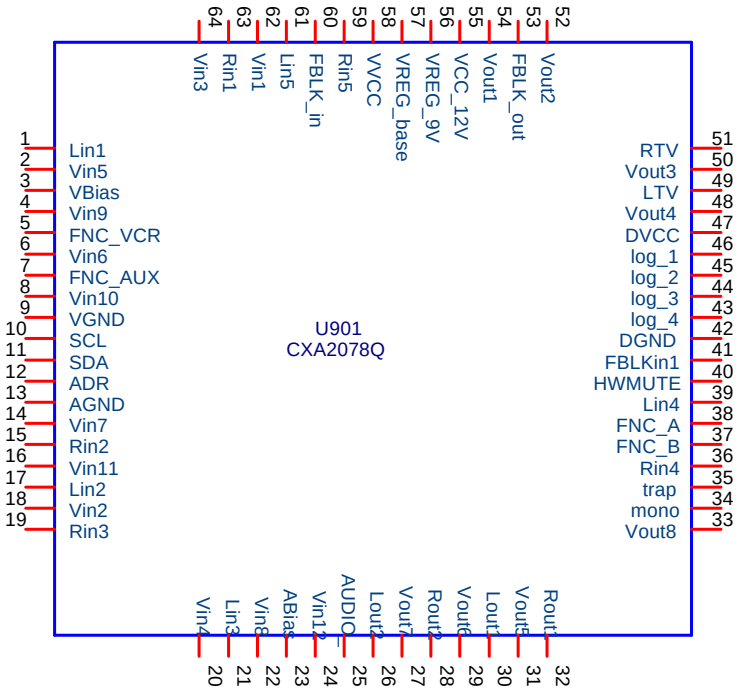
10-8. CAM chipset



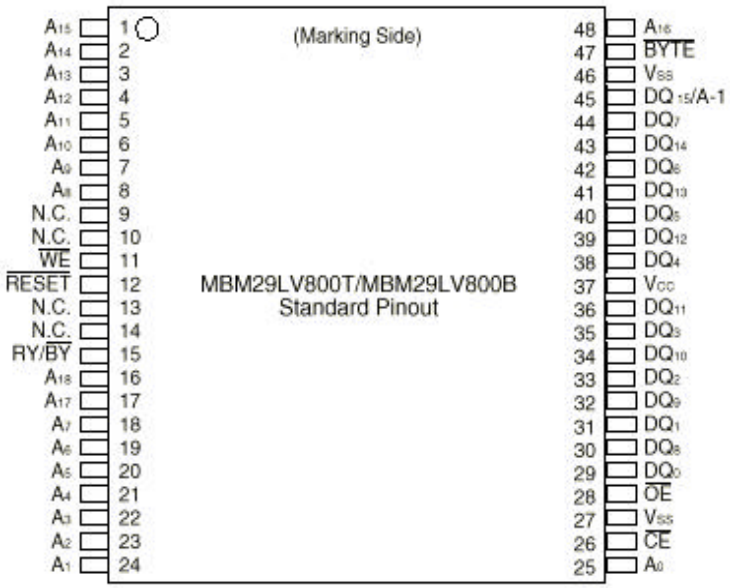
10-9. EPLD chipset



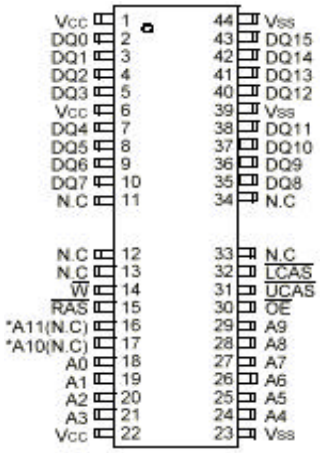
10-10. A/V Switch



10-11. FLASH ROM

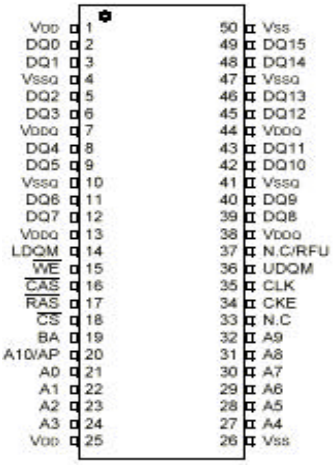


10-12. DRAM



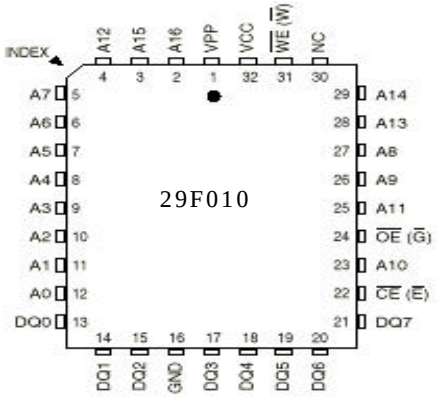
KM416V1200CT

10-13. SDRAM

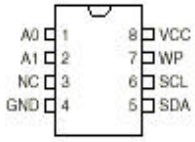


KM416S1020CT

10-14. FLASH ROM for MODEM

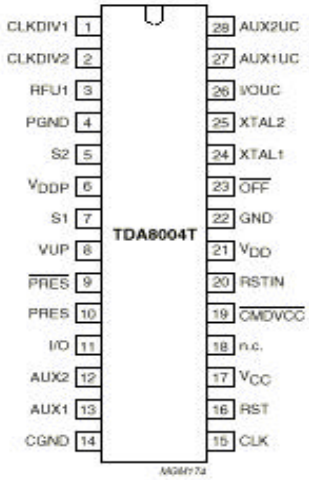


10-15. EEPROM

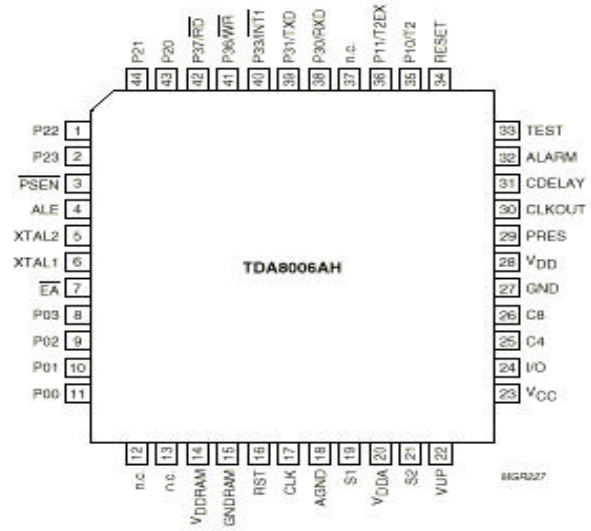


EEPROM

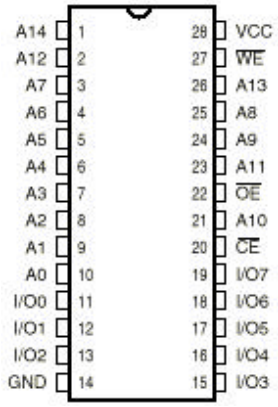
10-16. Smart Card Interface Chipset



10-17. NDS Interface Chipset

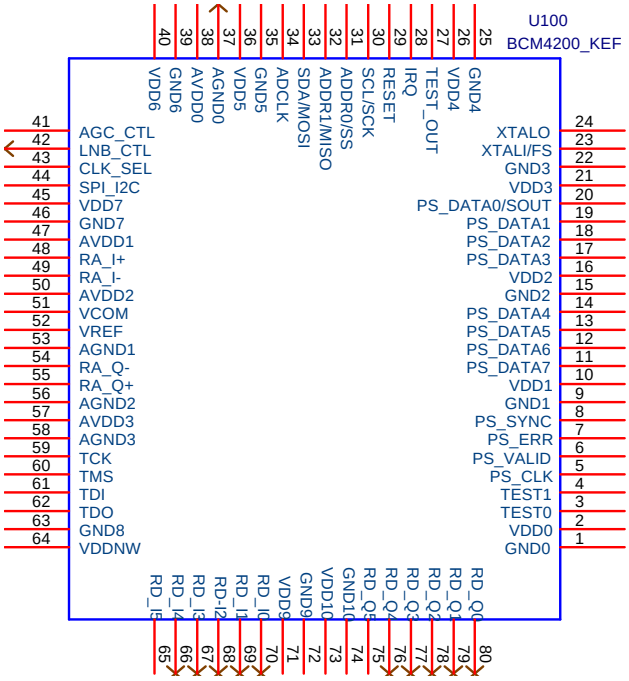


10-18. MODEM SRAM

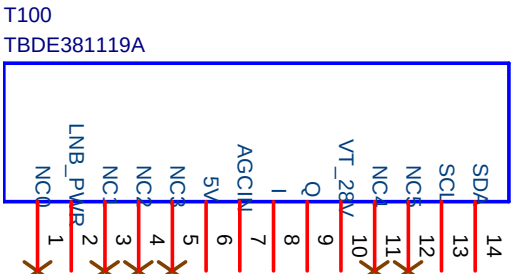


IS61C256

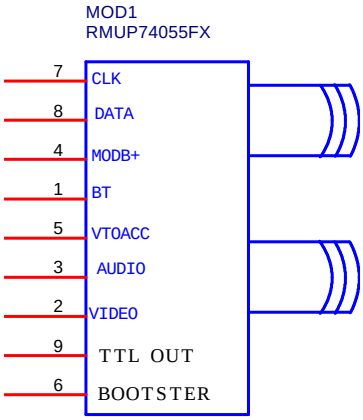
10-19. QPSK Chipset



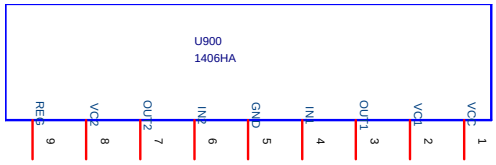
10-20. Tuner



10-21. RF Modulator



10-22. Volume Control Chipset

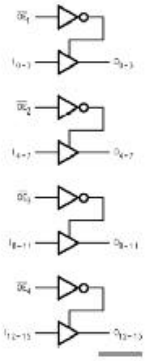


10-23. Buffer

Connection Diagram

Pin Assignment for SSOP and TSSOP

Logic Diagram



74LVT16244MTCX

Functional Description

The LVT16244 contains sixteen non-inverting buffers with 3-STATE outputs. The device is nibble (4 bits) controlled with each nibble functioning identically, but independent of the other. The control pins can be shorted together to obtain full 16-bit operation

Truth Tables

Inputs		Outputs
$\overline{OE}_1$	I_0–I_3	O_0–O_3
L	L	L
L	H	H
H	X	Z

Inputs		Outputs
$\overline{OE}_2$	I_4–I_7	O_4–O_7
L	L	L
L	H	H
H	X	Z

H = High Voltage Level
L = Low Voltage Level

Inputs		Outputs
$\overline{OE}_3$	I_8–I_{11}	O_8–O_{11}
L	L	L
L	H	H
H	X	Z

Inputs		Outputs
$\overline{OE}_4$	I_{12}–I_{15}	O_{12}–O_{15}
L	L	L
L	H	H
H	X	Z

X = Immaterial
Z = High Impedance

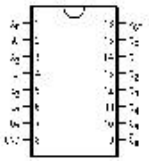
10-24. DATA Selector

74LCX257

Pin Descriptions

Pin Names	Description
S	Common Data Select Input
$\overline{OE}$	3-STATE Output Enable Input
I_{0a}–I_{0d}	Data Inputs from Source 0
I_{1a}–I_{1d}	Data Inputs from Source 1
Z_a–Z_d	3-STATE Multiplexer Outputs

10-25. Line Decoder



74F138

10-26. D-Type Flip Flop

Pin Descriptions

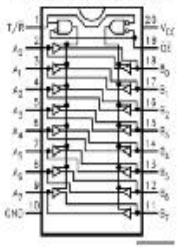
Pin Names	Description
D_0–D_7	Data Inputs
$\overline{CE}$	Clock Enable (Active LOW)
Q_0–Q_7	Data Outputs
CP	Clock Pulse Input

74AC377

10-27. 3 State Bus Tranceiver chips

Connection Diagram

Pin Assignment for SOIC, TSSOP and SSOPII



Pin Descriptions

Pin Names	Description
$\overline{OE}$	Output Enable Input
T/$\overline{R}$	Transmit/Receive Input
A_0–A_7	Side A Inputs or 3-STATE Outputs
B_0–B_7	Side B Inputs or 3-STATE Outputs

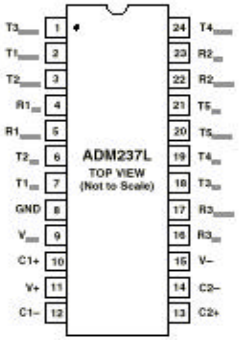
Truth Table

Inputs		Outputs
$\overline{OE}$	T/$\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	HIGH-Z State

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

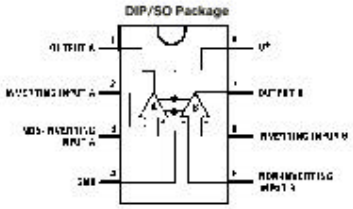
74LVT245

10-28. Serial Interface

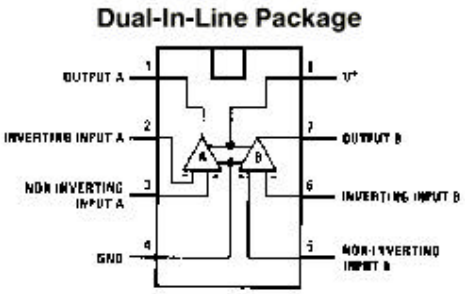


10-29. OP AMP

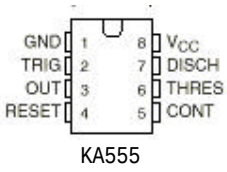
7-29-1. LM358



7-29-2. LM393

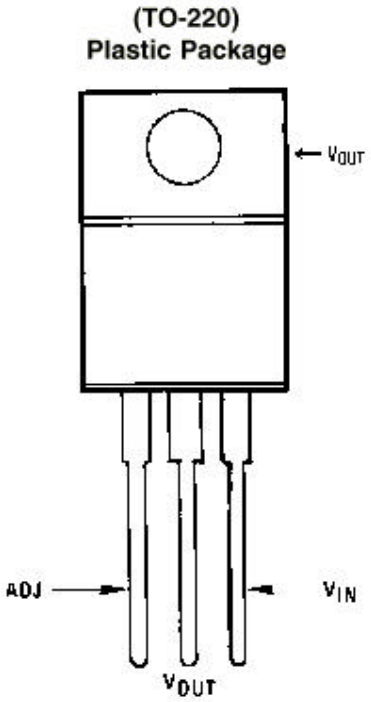


10-30. Timer Chipset, KA555

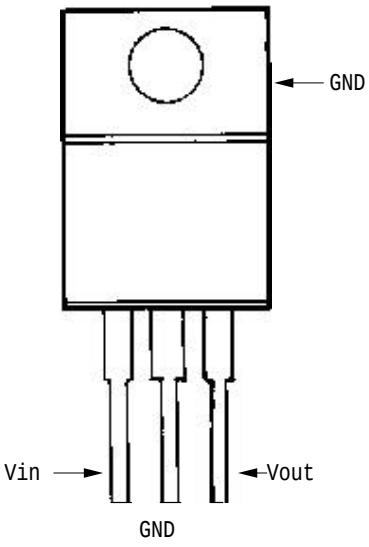


KA555

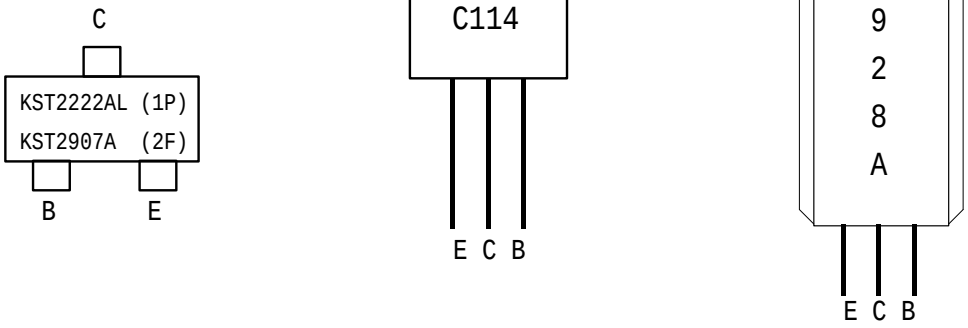
10-31. Regulator, LM317



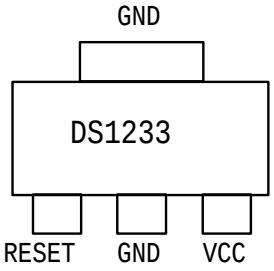
10-32. Regulator, KA78XX



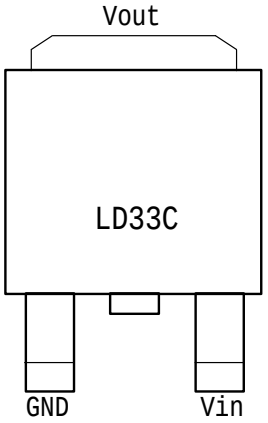
10-33. Smal Signal Transistors



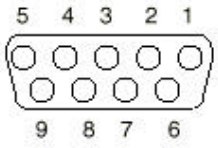
10-34. Reset Cipset, DS1233



10-35. Regulator, LD33C

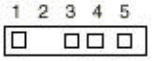


10-36. RS232 Serial Port



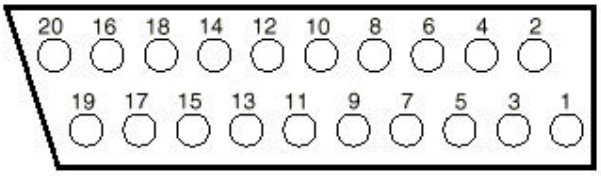
Pin	Description
1	TxD1
2	TxD2
3	RxD1
4	RxD2
5	GND
6	TxD3
7	RxD3
8	TxD4
9	TxD5

10-37. OS-Link Connector (J1)



Pin	Description
1	GND
2	N/C
3	LinkOut
4	LinkIn
5	GND

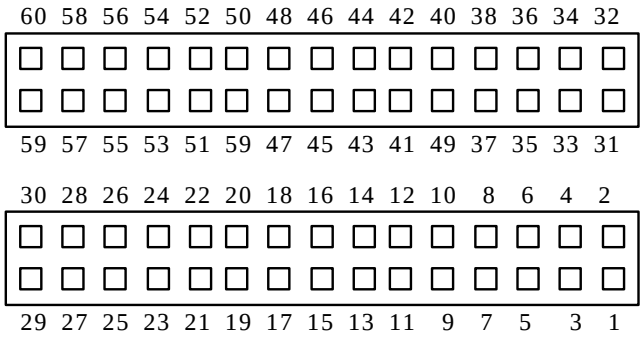
10-38. Scart Connector



Viewed from rear panel

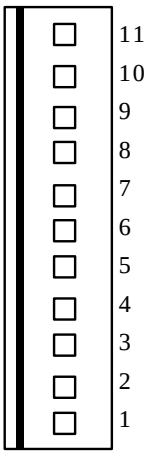
Pin Number	Description	Pin Number	Description
1	Audio_out_R	2	Audio_in_R
3	Audio_out_L	4	Audio_gnd
5	Blue_gnd	6	Audio_in_L
7	Blue	8	Slow_switch
9	Green_gnd	10	Reserved 1
11	Green	12	Reserved 2
13	Red_gnd	14	Blanking_gnd
15	Red	16	Blanking
17	Video_out_gnd	18	Video_in_gnd
19	Video_out	20	Video_in
21	Screen		

10-39. IEEE1394 Module Connector (J6)



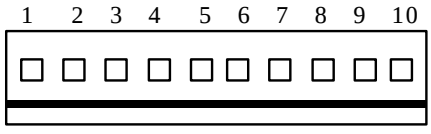
Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	ADDR2	16	DATA4	31	SCL	46	1284DATA0
2	ADDR3	17	DATA5	32	SDA	47	GND
3	ADDR4	18	DATA6	33	+3.3V	48	ERROR
4	ADDR5	19	DATA7	34	1284CON3	49	PACKETCLK
5	ADDR6	20	GND	35	1284CON2	50	VALID
6	ADDR7	21	/BSKYB_CS	36	1284CON1	51	BYTECLK
7	ADDR8	22	/BSKYB_OE	37	1284CON0	52	+12V
8	ADDR9	23	/BSKYB_R/W	38	GND	53	BSKYB_DATA7
9	ADDR10	24	/BSKYB_WAIT	39	1284DATA7	54	BSKYB_DATA6
10	ADDR11	25	/BSKYB_RST	40	1284DATA6	55	BSKYB_DATA5
11	GND	26	/BSKYB_INT	41	1284DATA5	56	BSKYB_DATA4
12	DATA0	27	+5VD	42	1284DATA4	57	BSKYB_DATA3
13	DATA1	28	module useg iic	43	1284DATA3	58	BSKYB_DATA2
14	DATA2	29	GND	44	1284DATA2	59	BSKYB_DATA1
15	DATA3	30	/CD2	45	1284DATA1	60	BSKYB_DATA0

10-40. SMPS Connector (J100)



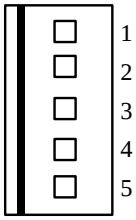
Pin	Description
1	GND
2	5V (2A max) : ¡¾ 0.25V
3	GND
4	3.3V (2A max): ¡¾ 0.25V
5	5V : same as pin2
6	GND
7	12V (500mA) : ¡¾ 0.5V
8	7.5V : ¡¾ 0.5V
9	28V (6mA) : ¡¾ 0.5V
10	GND
11	21V (500mA):18V - 23.5V

10-41. Front Connector (J7)



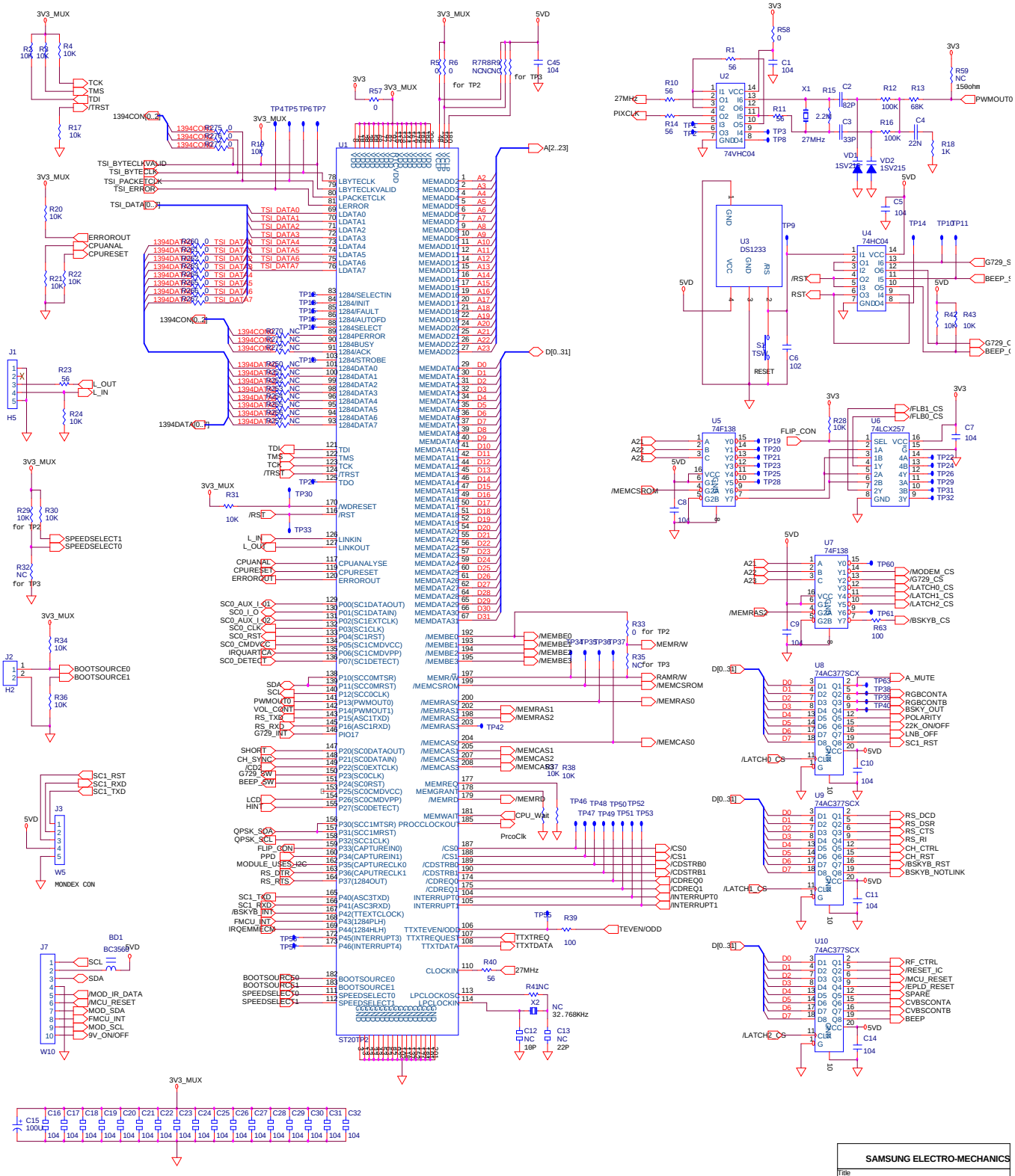
PIN	Description
1	SCL
2	+5VD
3	SDA
4	GND
5	MOD_IR_DATA
6	/MCU_RESET
7	MOD_SDA
8	FMCU_INT
9	MOD_SCL
10	9V_ON/OFF

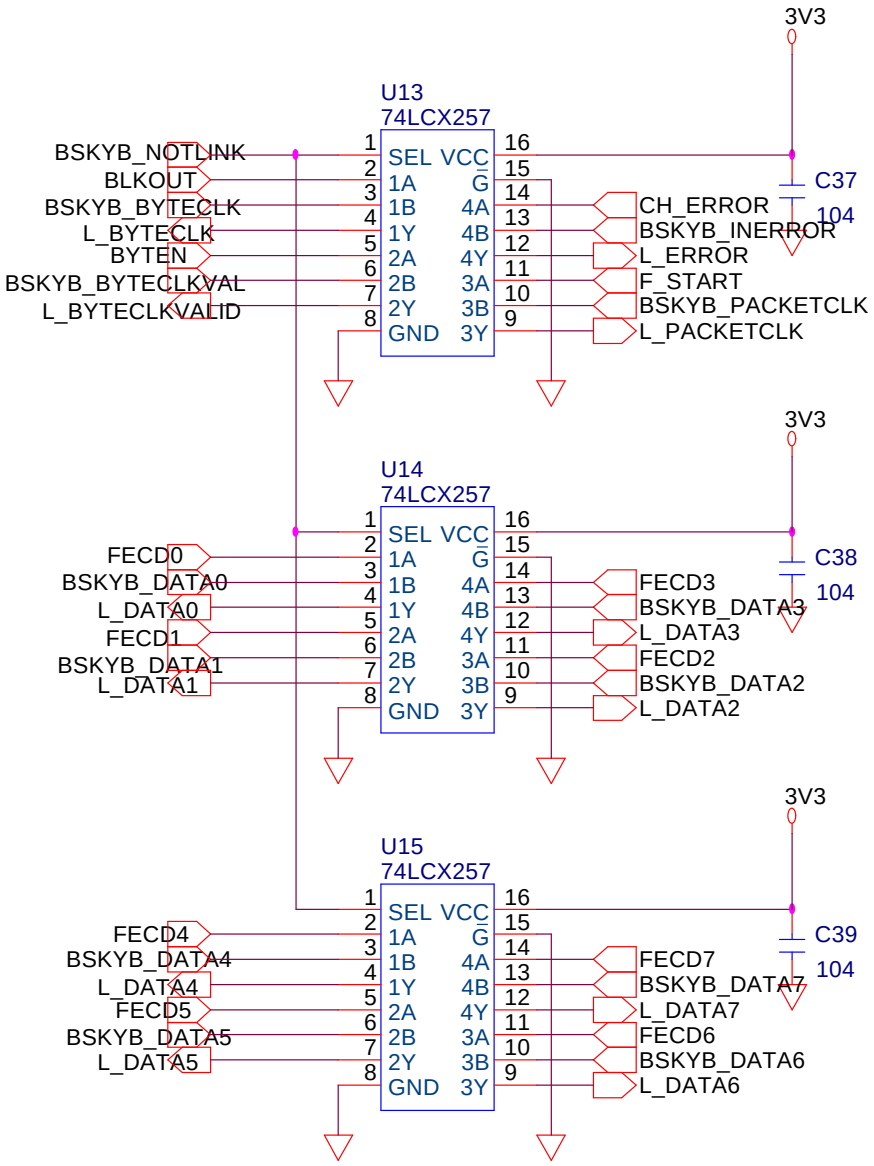
10-42. MONDEX Interface Connector (J3)

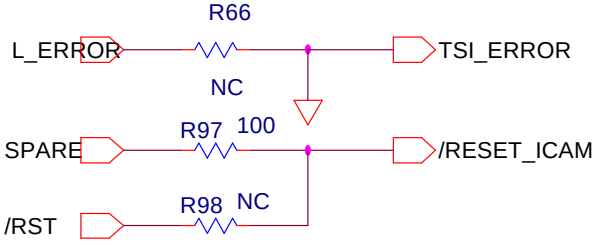


PIN	Description
1	TxD
2	RxD
3	RESET
4	+5VD
5	GND

8. Circuit







SAMSUNG ELECTRO-MECHANICS C		
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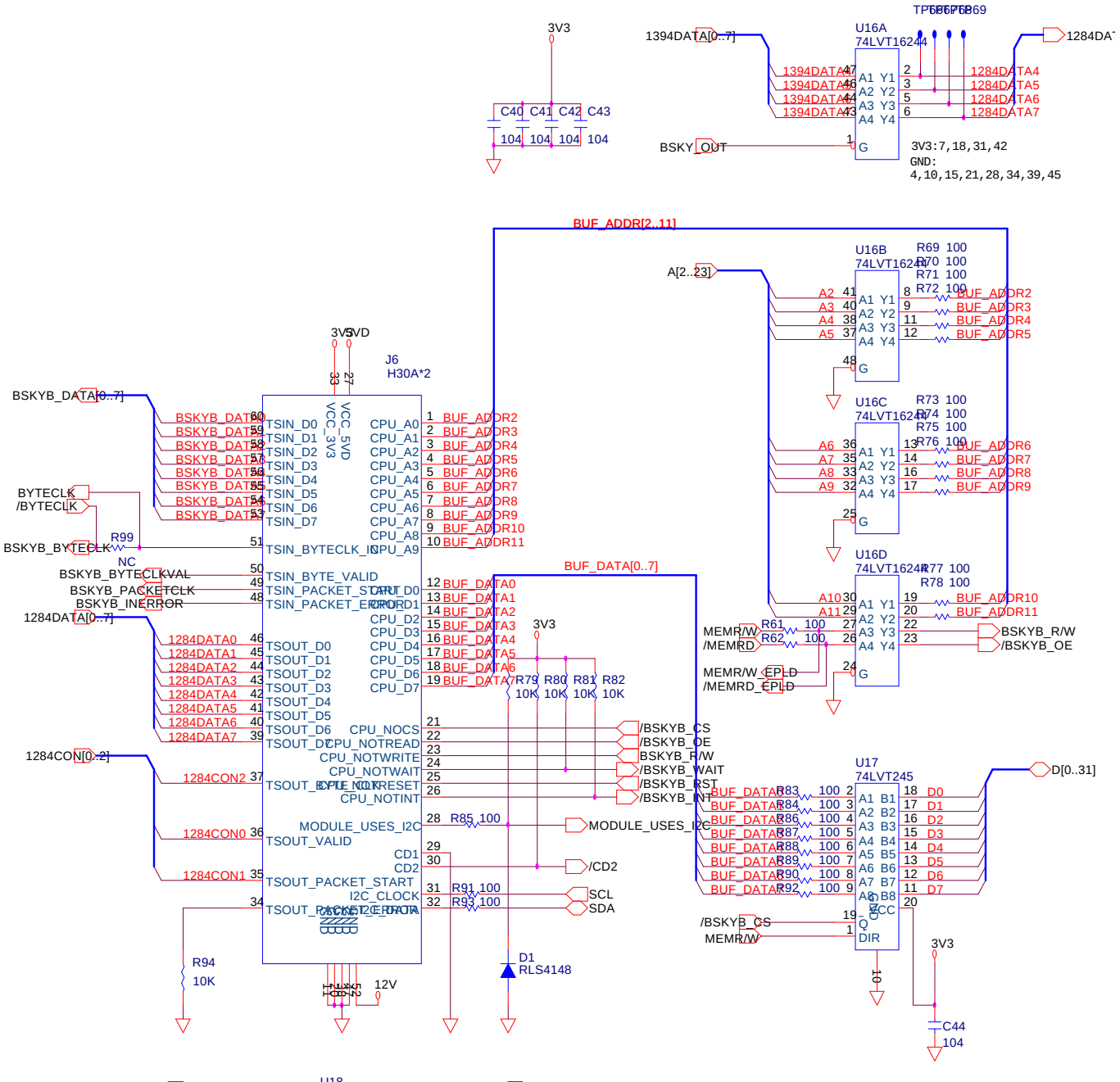
Size: Custom	Document Number: SEMCO-BSKYB	Rev: 4.8
Date: Friday, October 16, 1998	Sheet 2 of 16	



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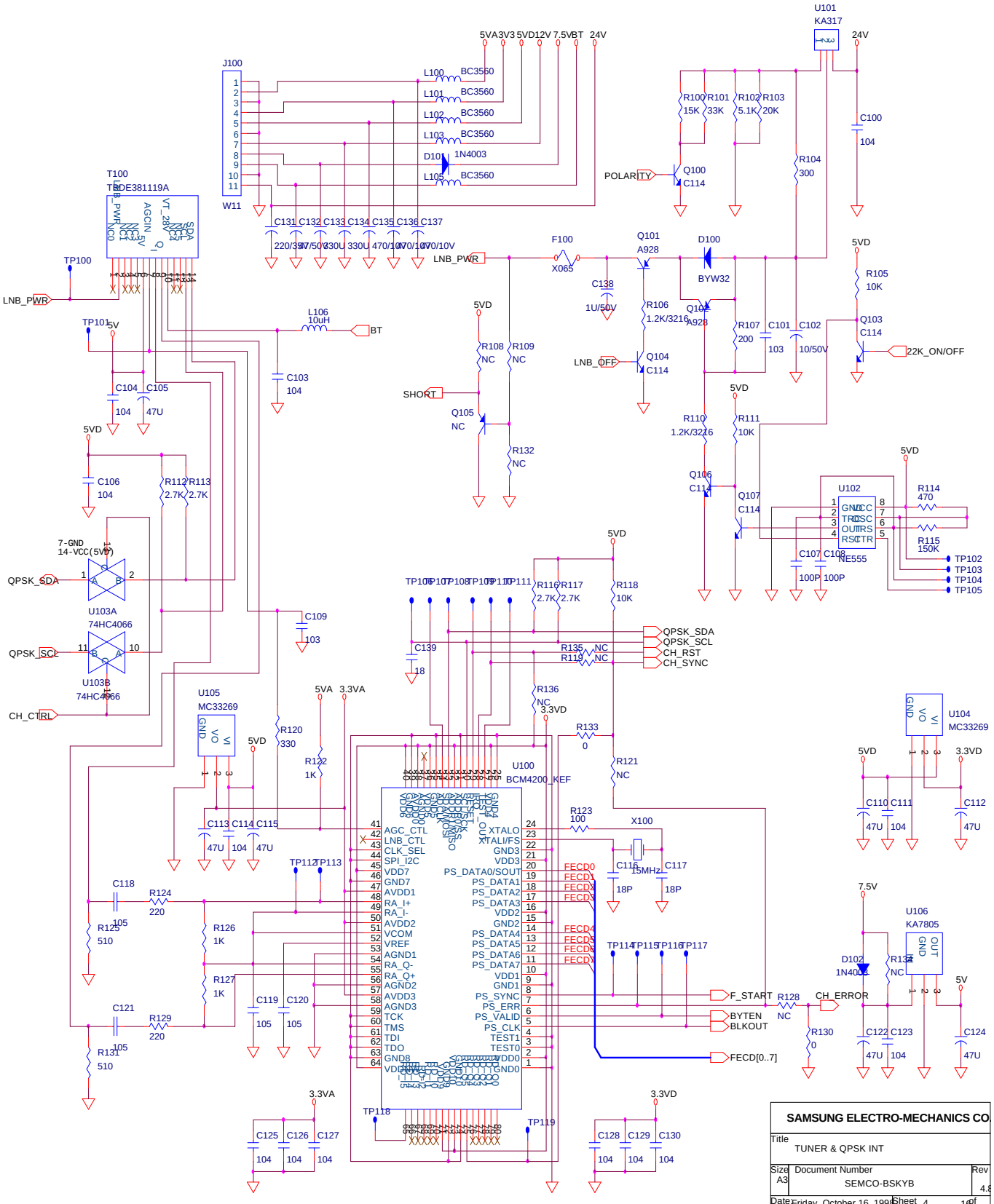
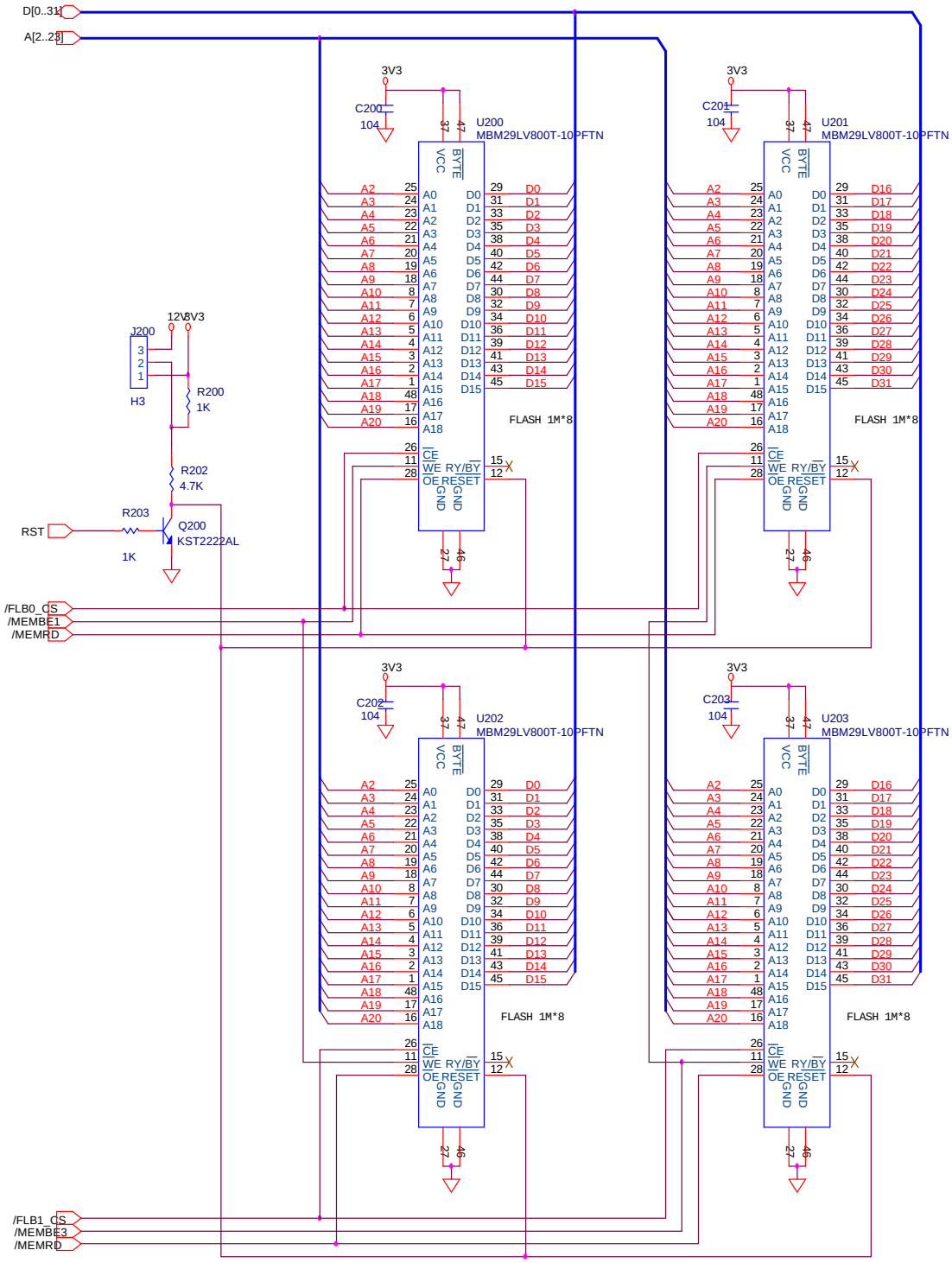
Date: Friday, October 16, 1998	Sheet 3 of 16	





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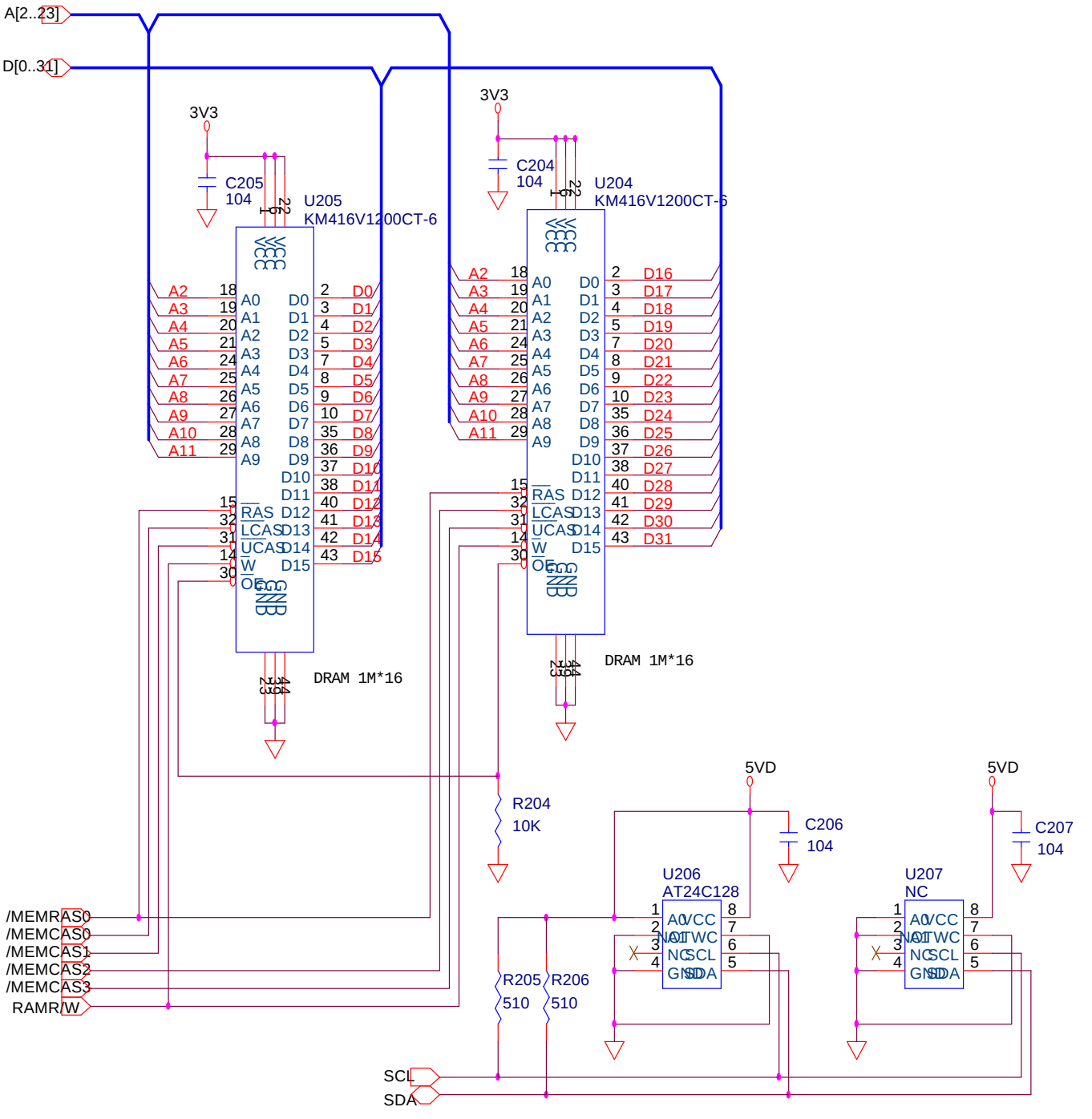

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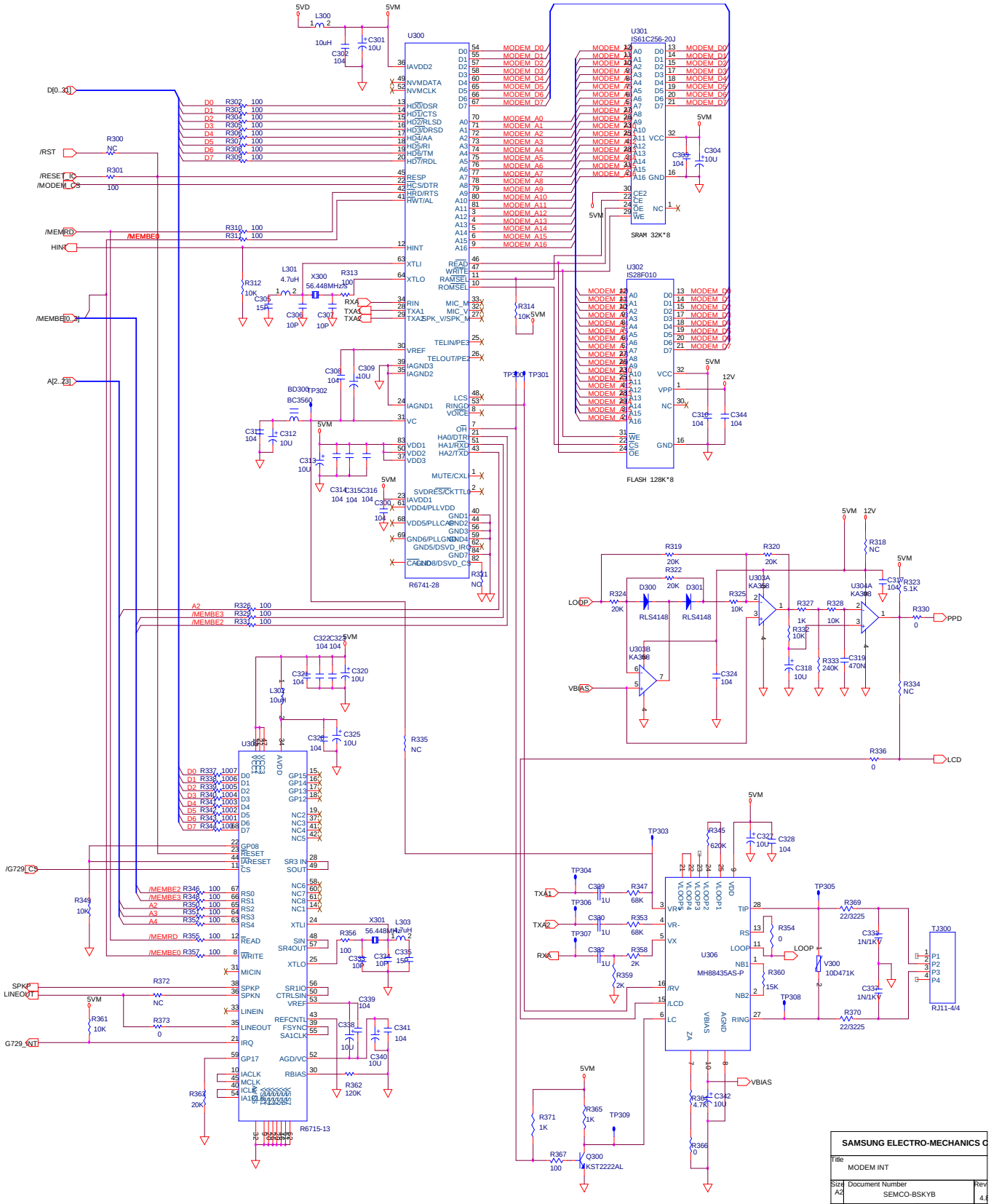
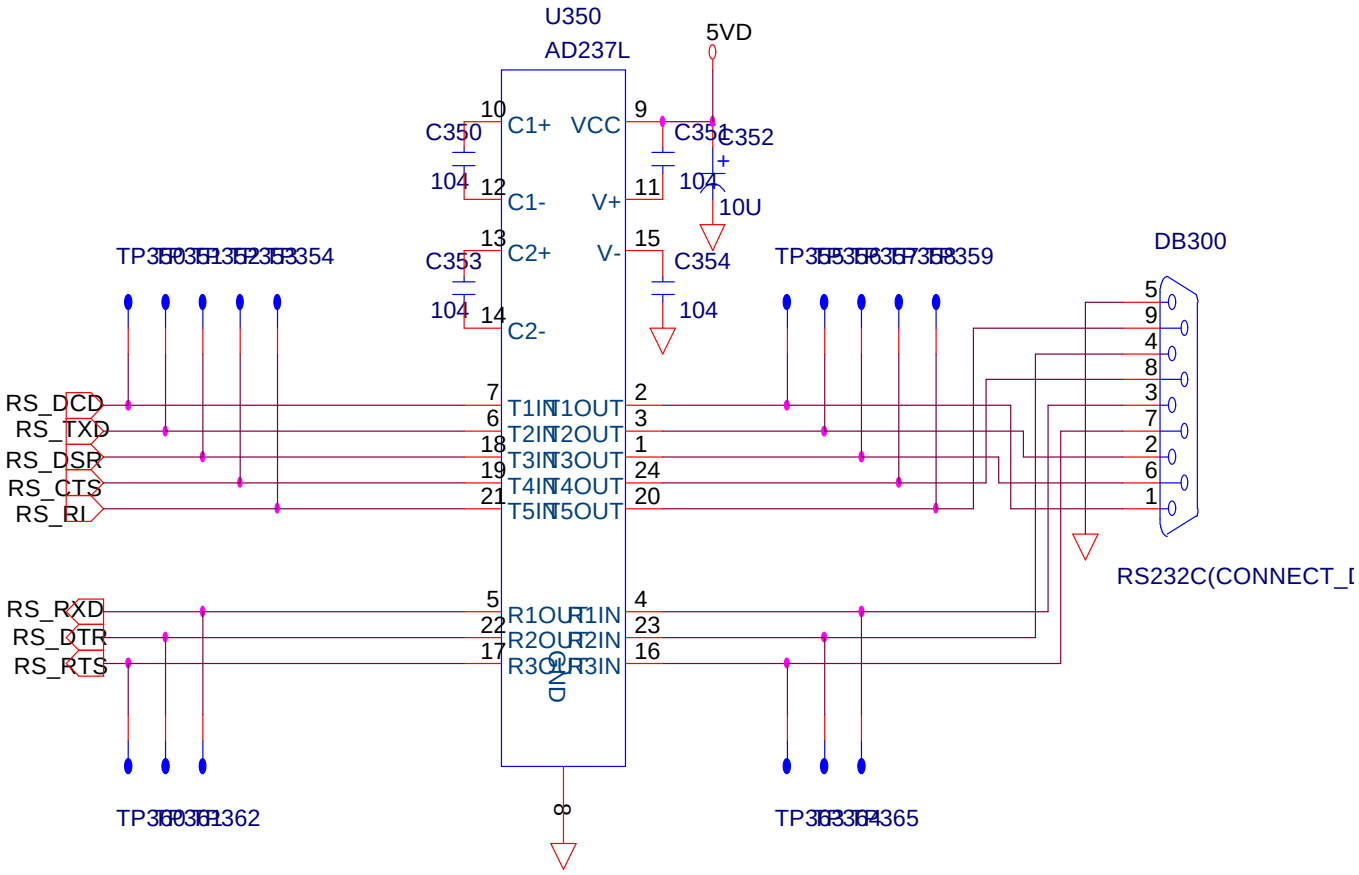
Date: Friday, October 16, 1998	Sheet 6 of 16	





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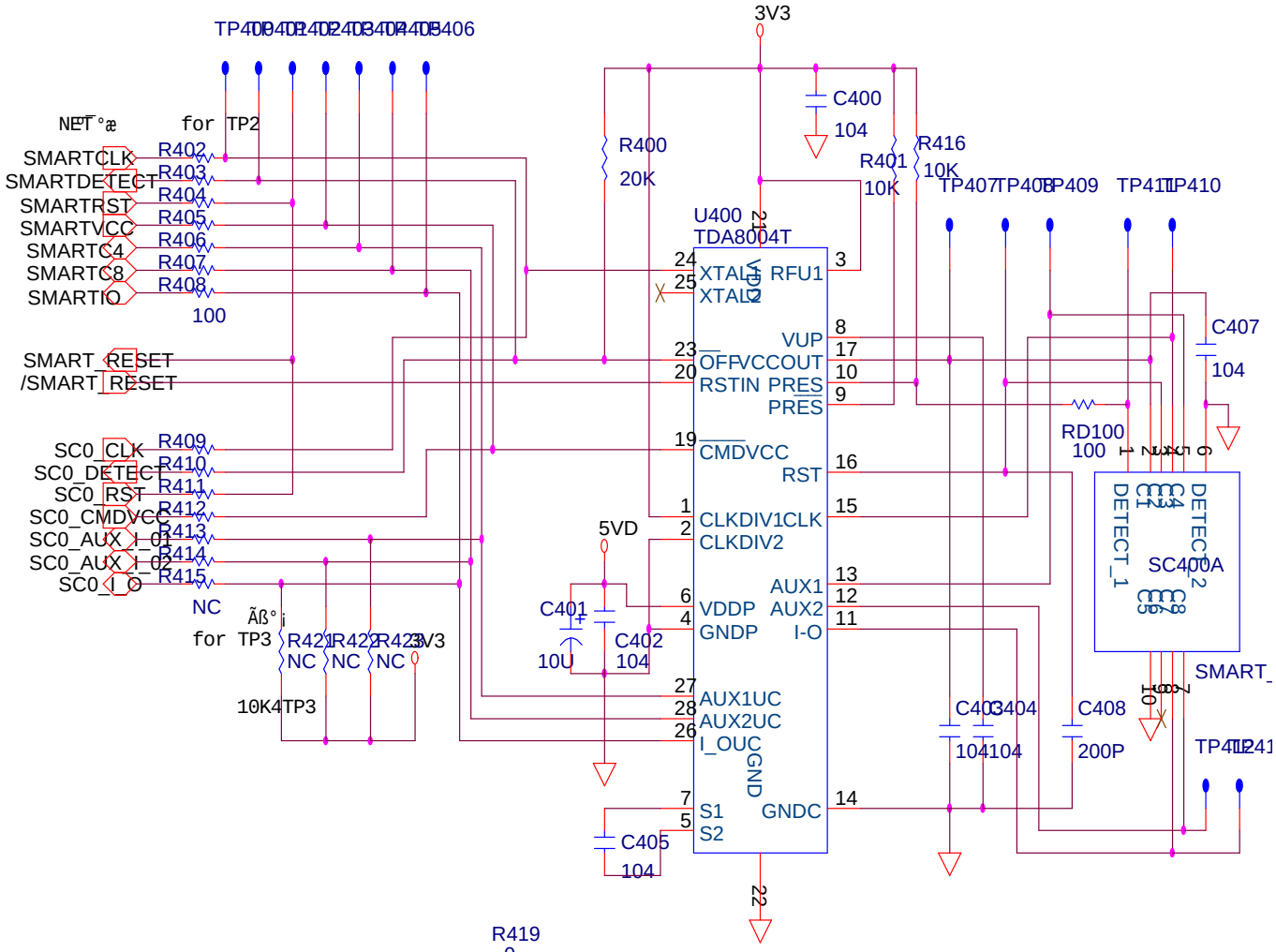
Date: Friday, October 16, 1998	Sheet 8 of 16	



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Size: A4	Document Number: SEMCO-BSKYB		Rev: 4.!
Date: Friday, October 16, 1998	Sheet 9 of 16		

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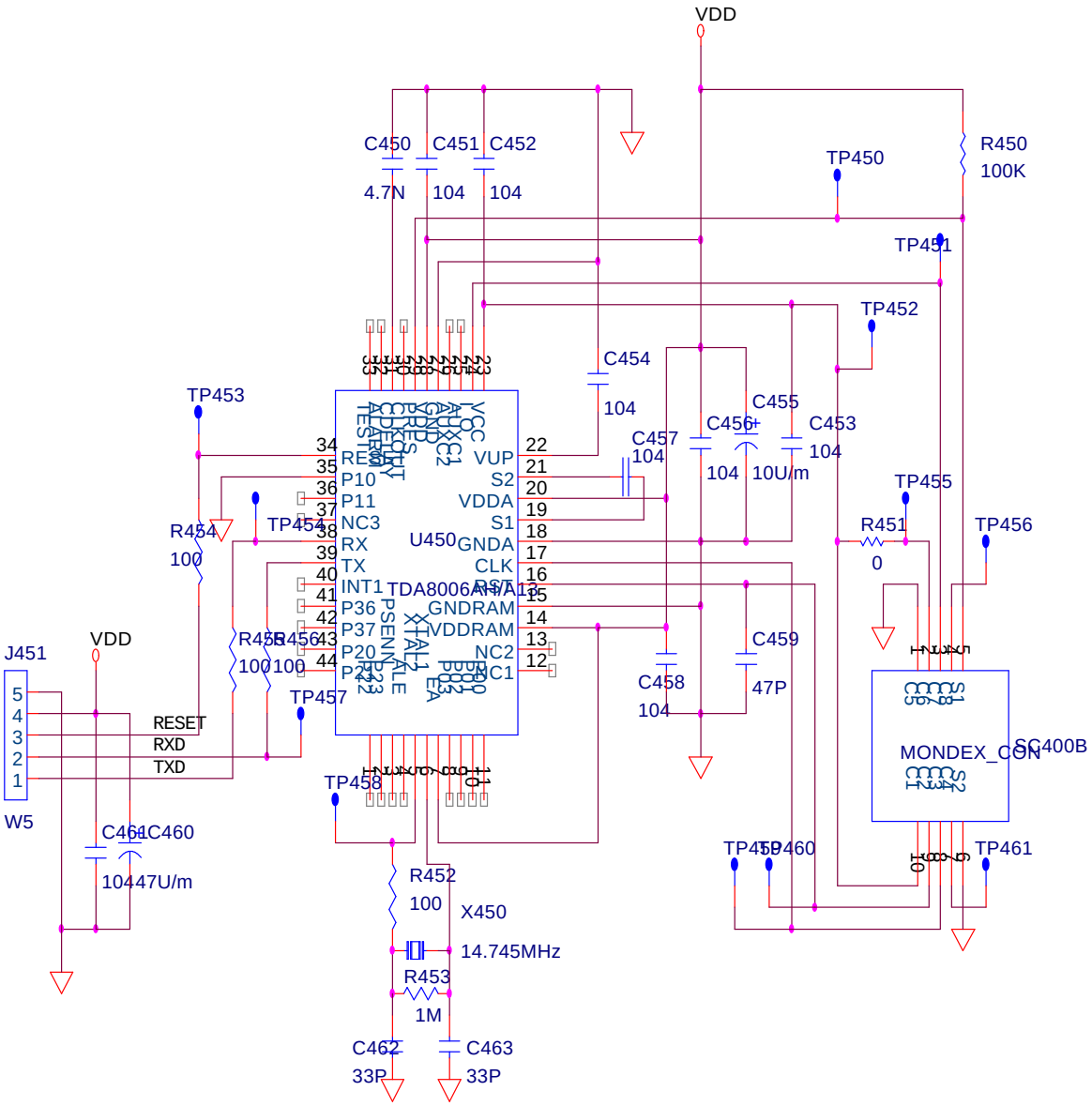
PAGE REV.	0	PAGE	87/102



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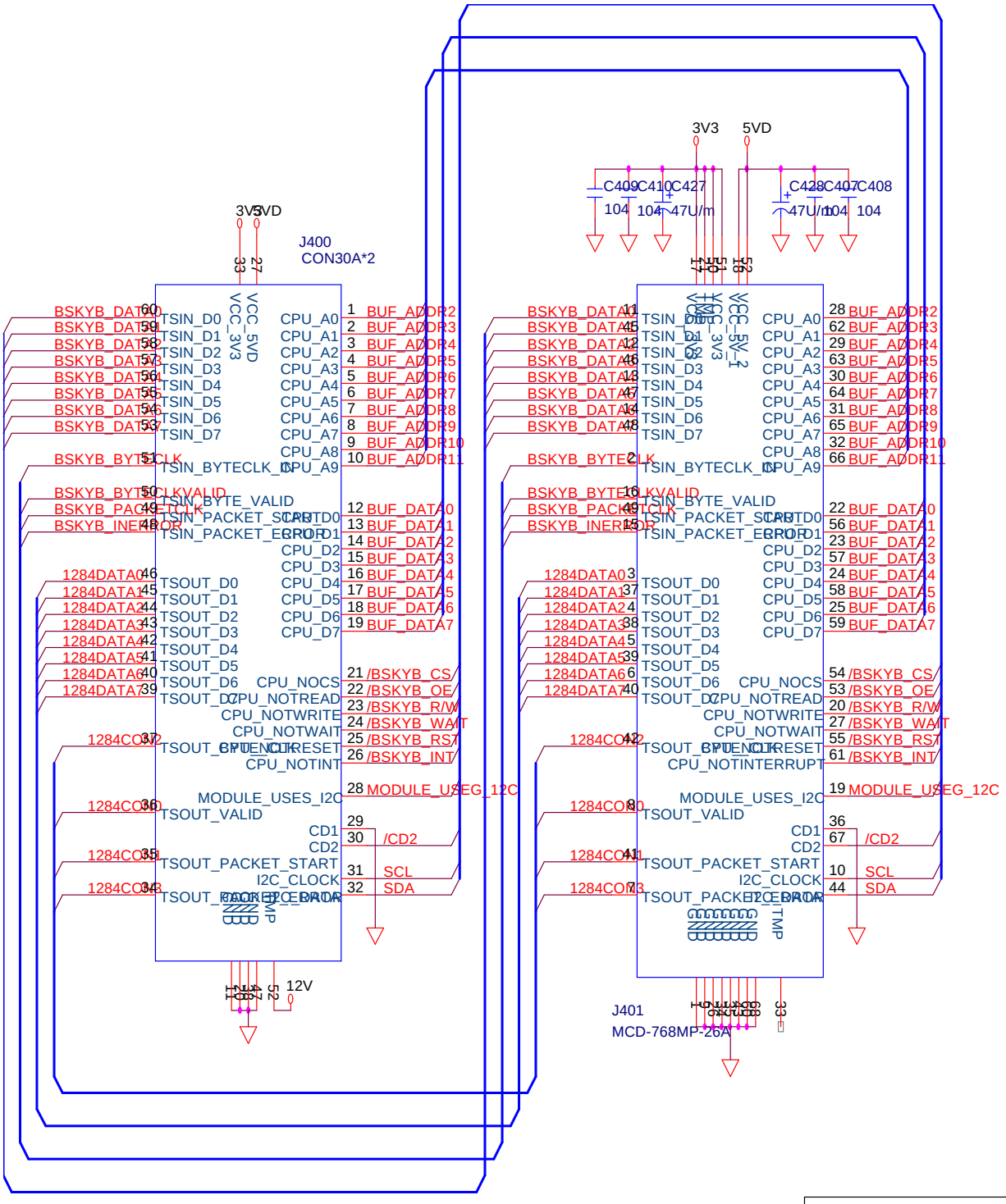

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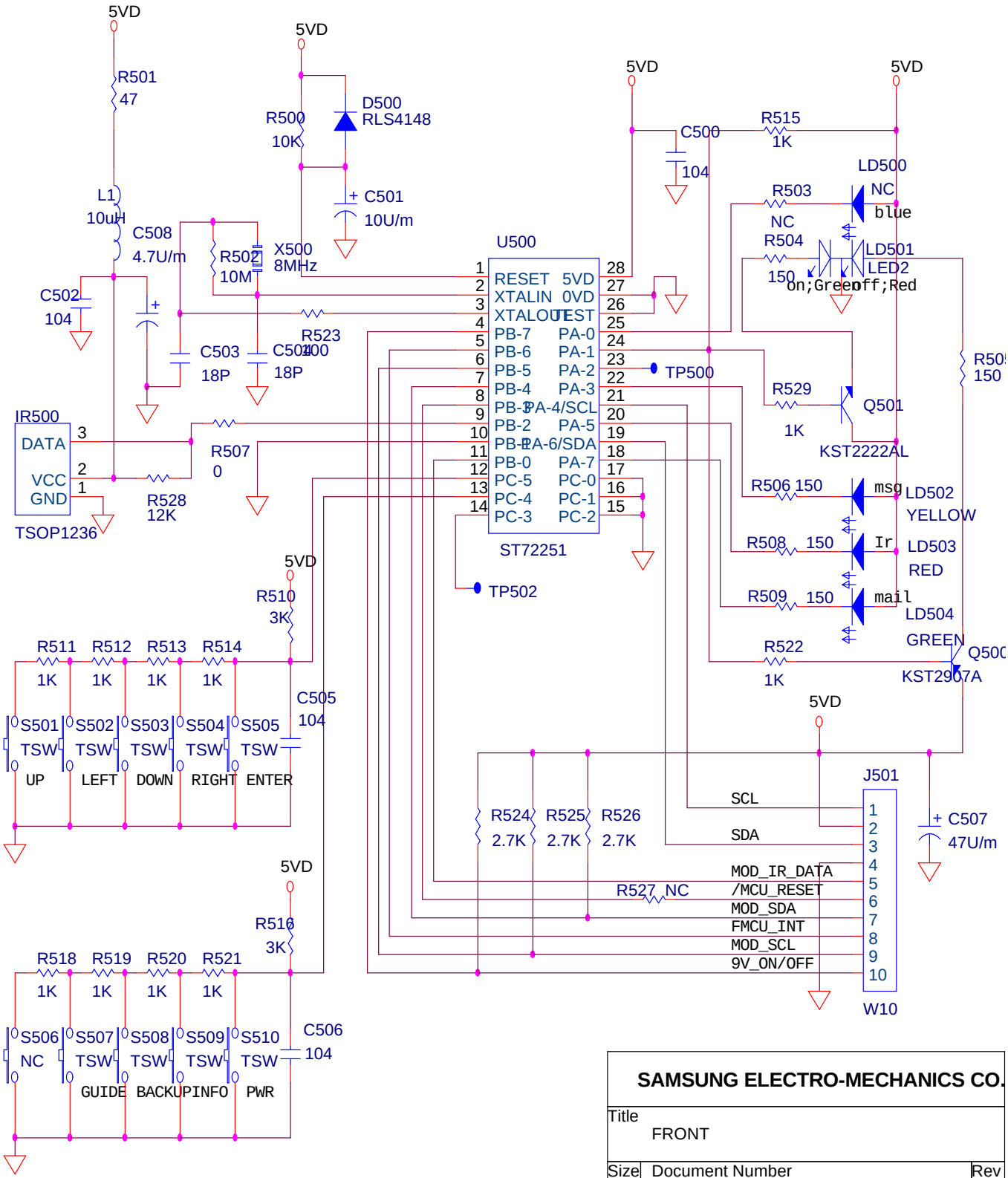
Date: Friday, October 16, 1998	Sheet 10 of 16	



SAMSUNG ELECTRO-MECHANICS CO.		
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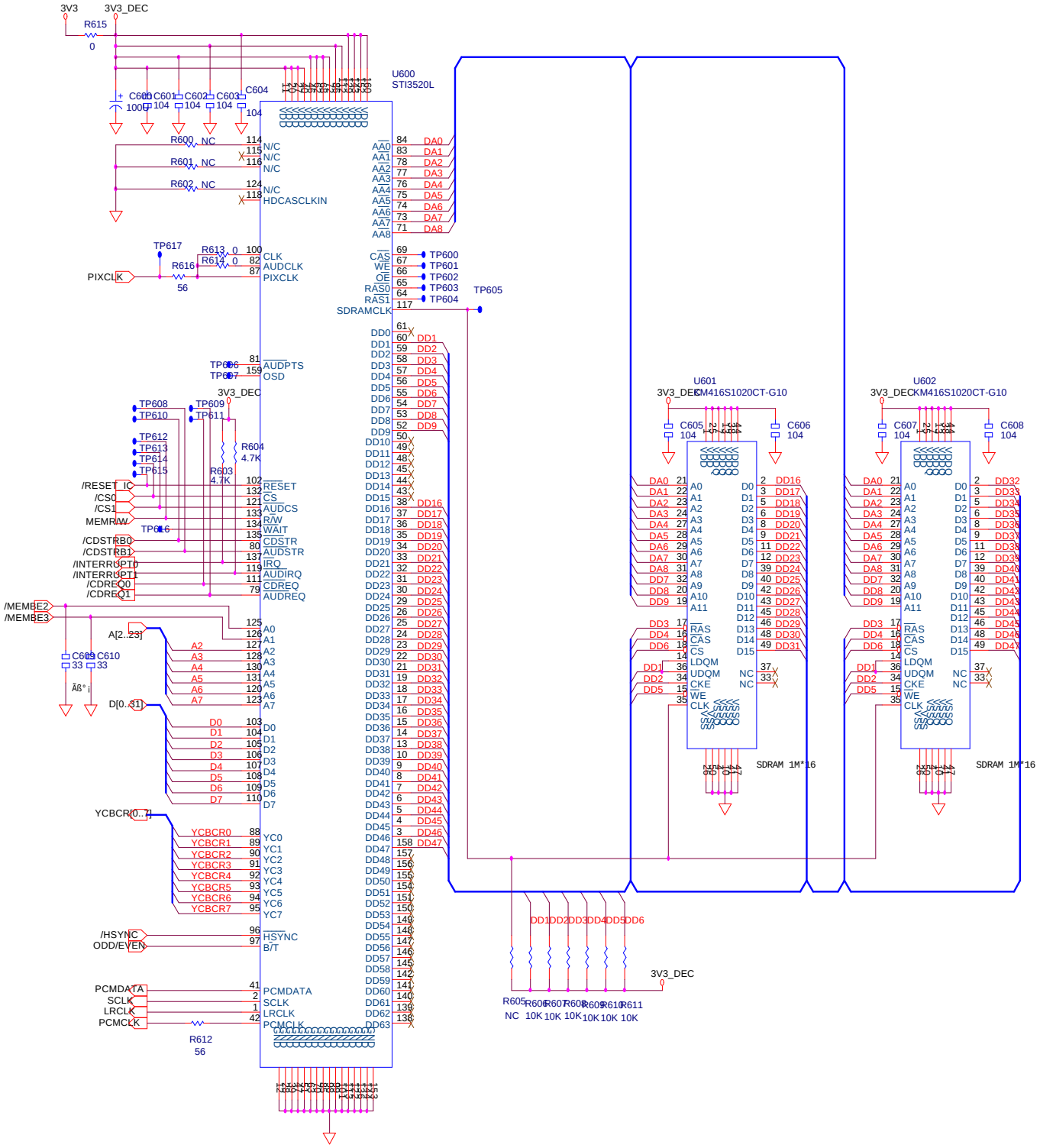
Date: Friday, October 16, 1998	Sheet 12 of 18	



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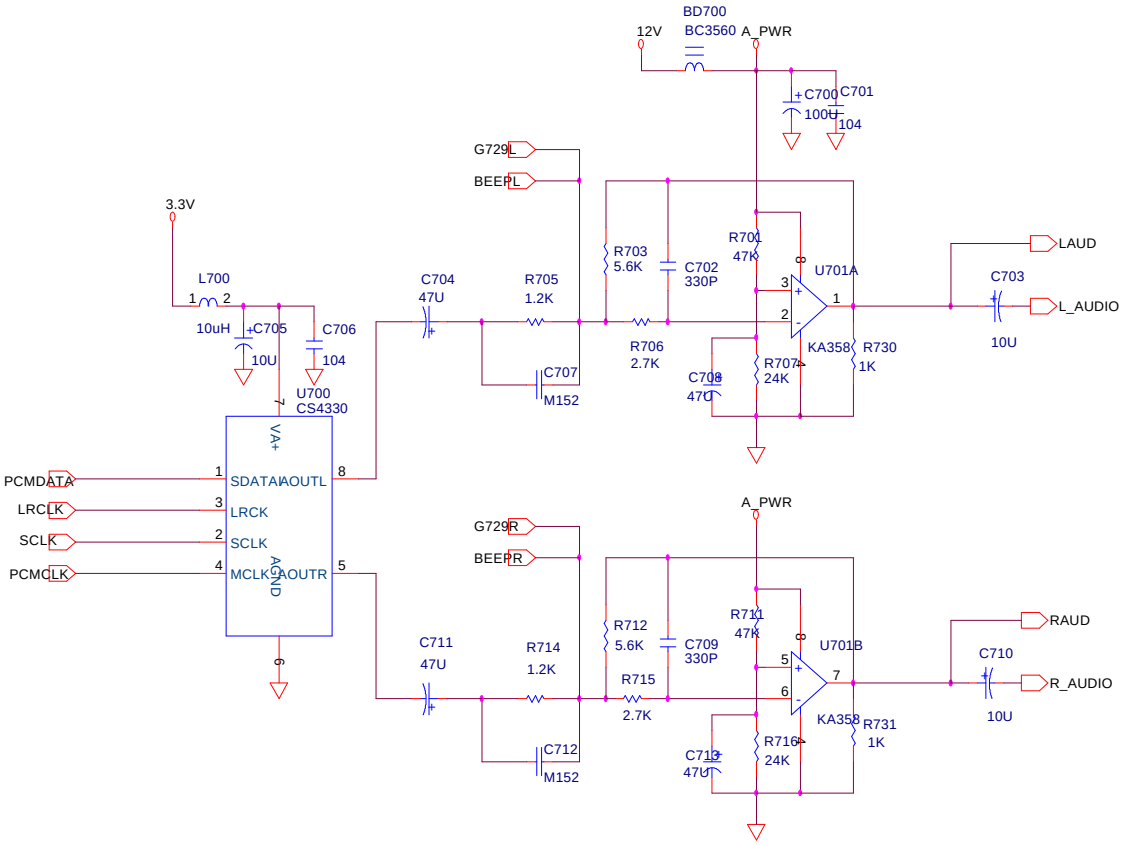

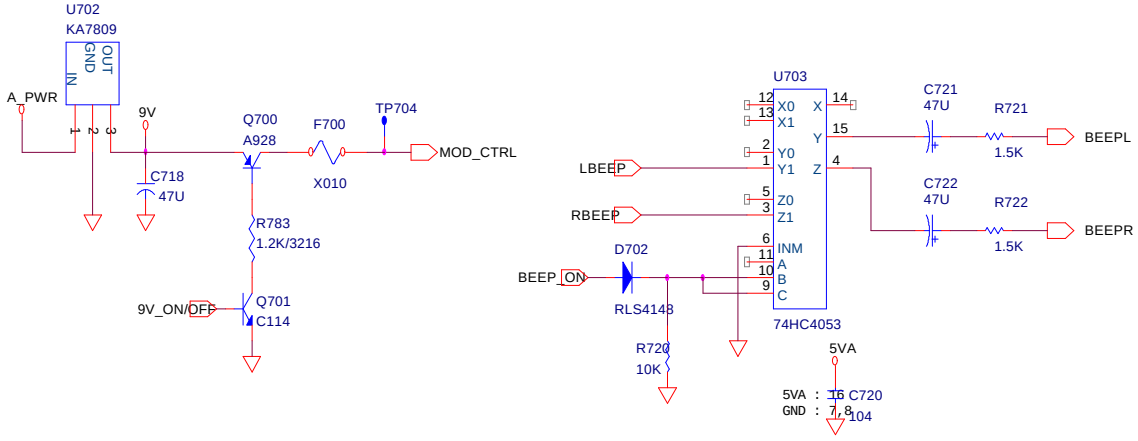

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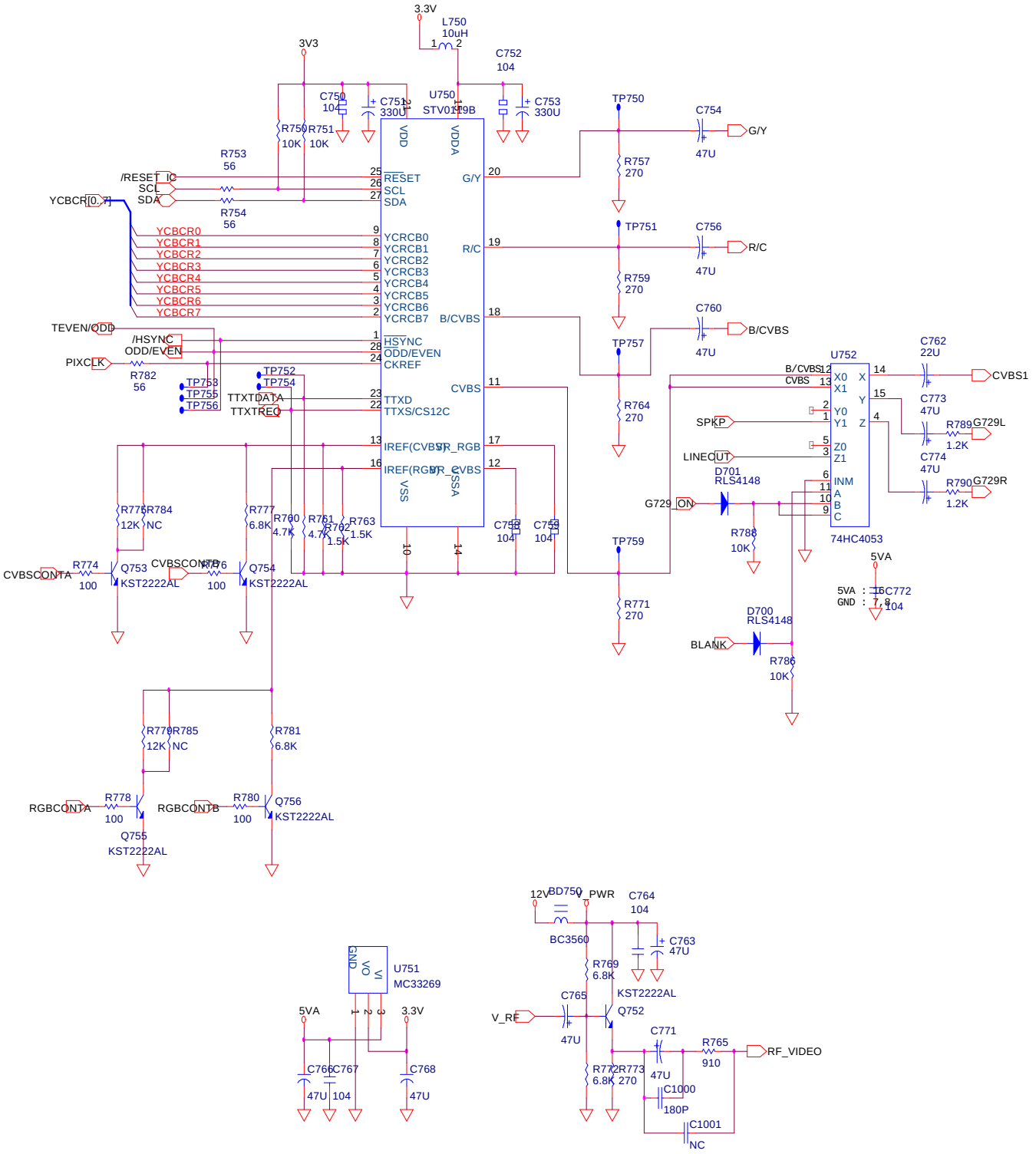

SAMSUNG ELECTRO-MECHANICS		
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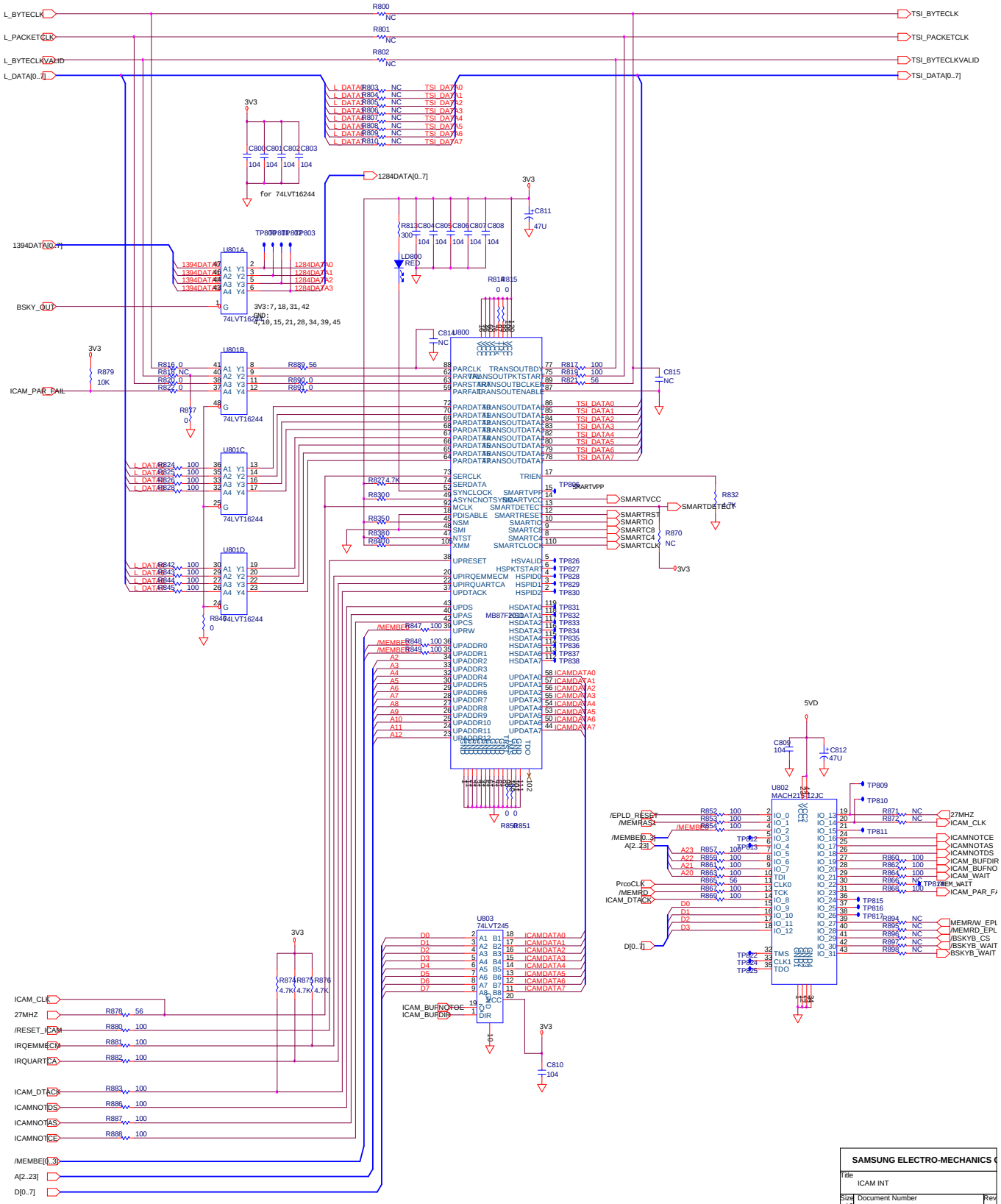
Date: Monday, October 19, 1998	Sheet 15 of 16	



SAMSUNG ELECTRO-MECHANICS

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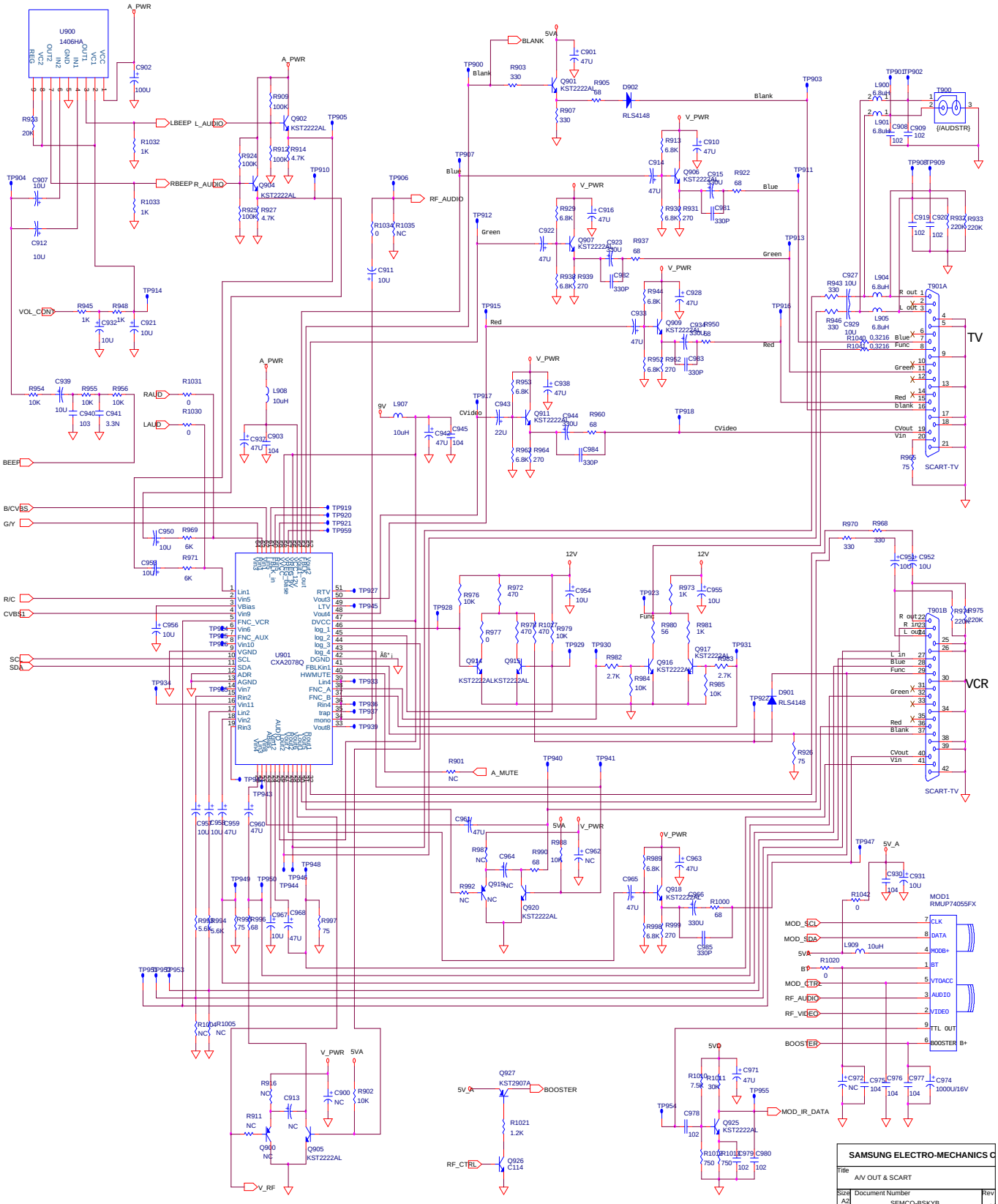
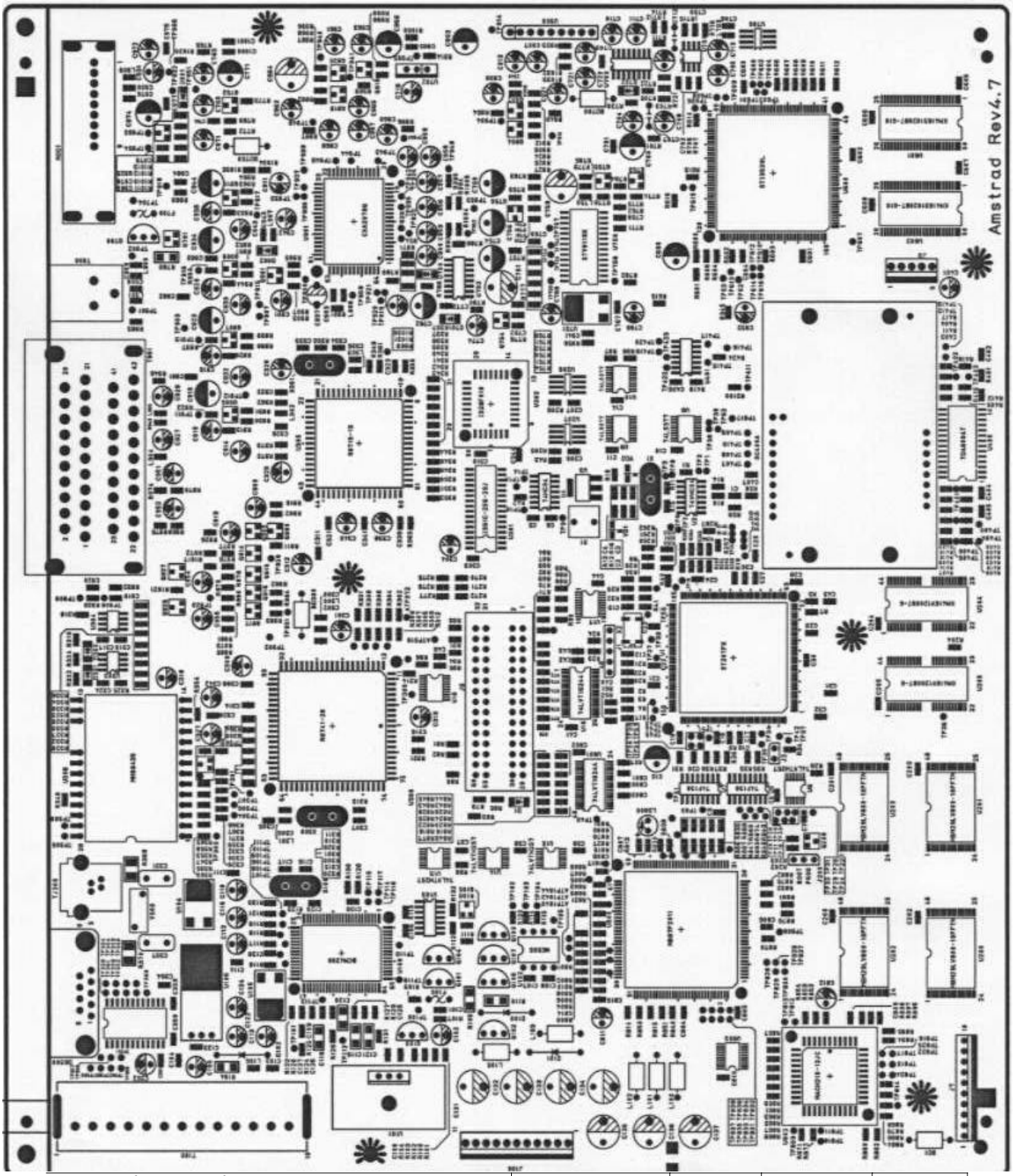
Date	Friday, October 16, 1998 Sheet 15 of 16

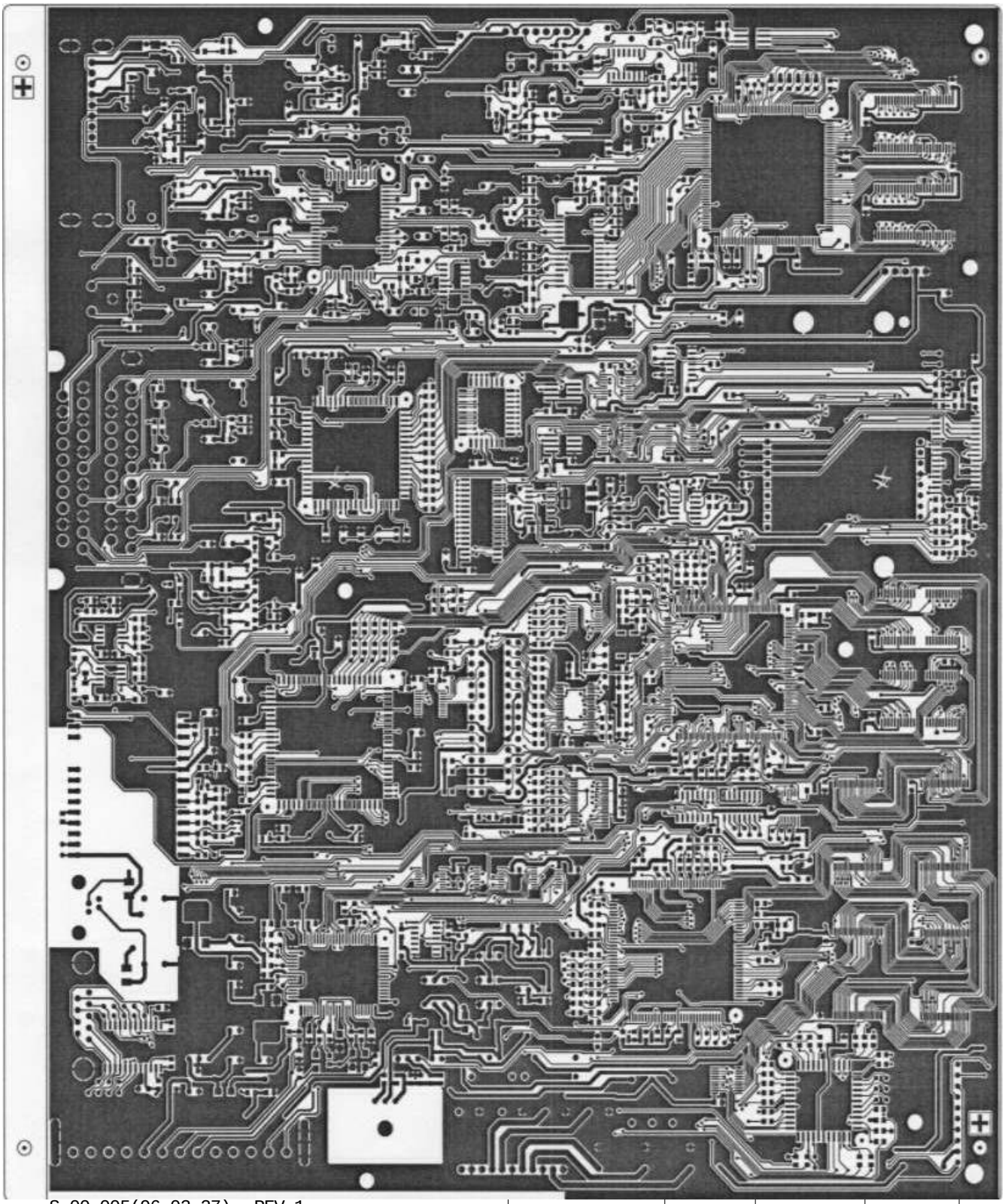


12. PCB Patterns

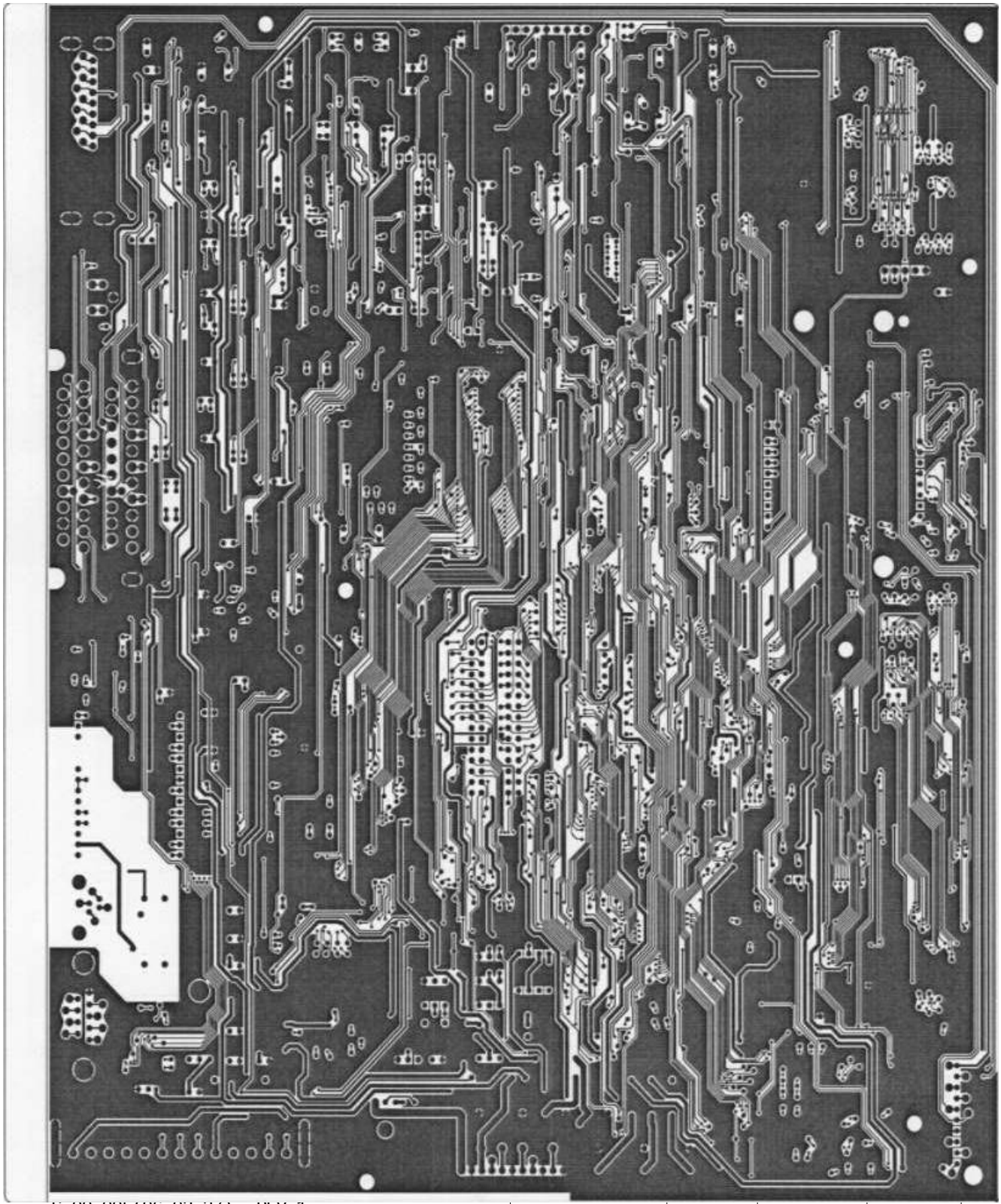
12-1. Main PCB (Silk Side)



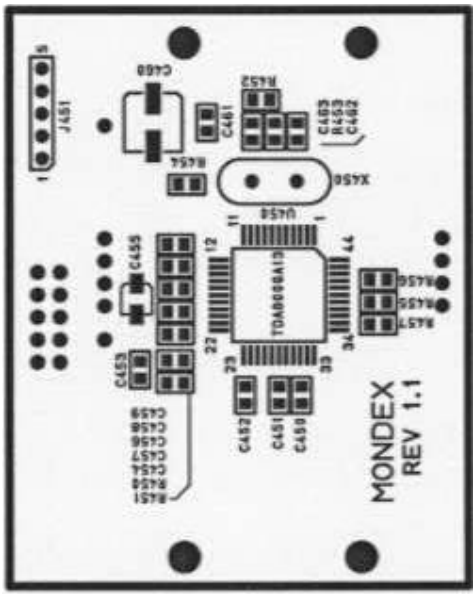
12-2. Main PCB (Cooper side A)



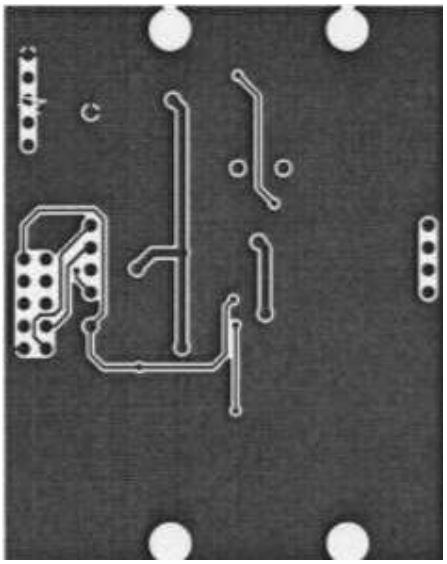
12-3. Main PCB (Cooper side B)

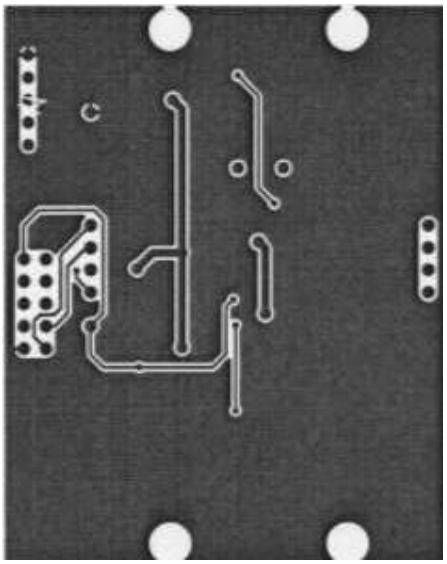


12-4. Second Smart Card PCB (Silk Side)

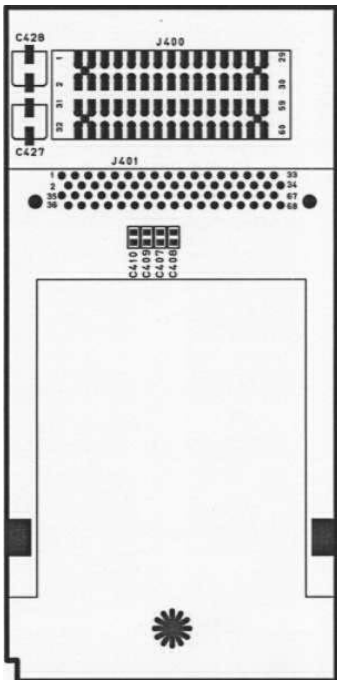


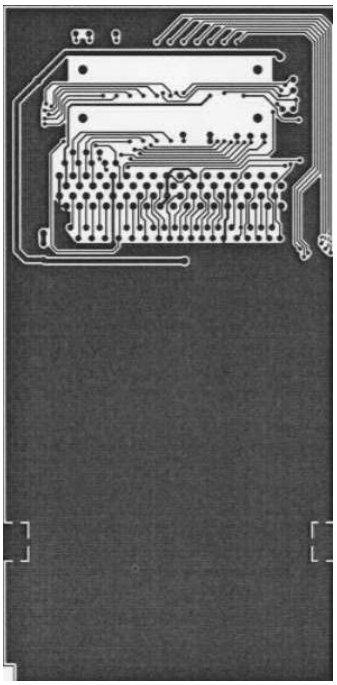
12-5. Second Smart Card PCB (Cooper Side A,B)

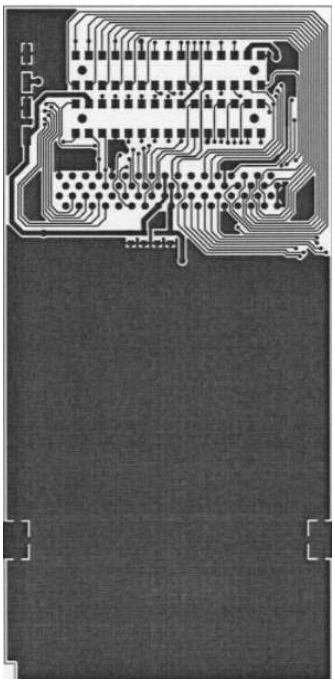




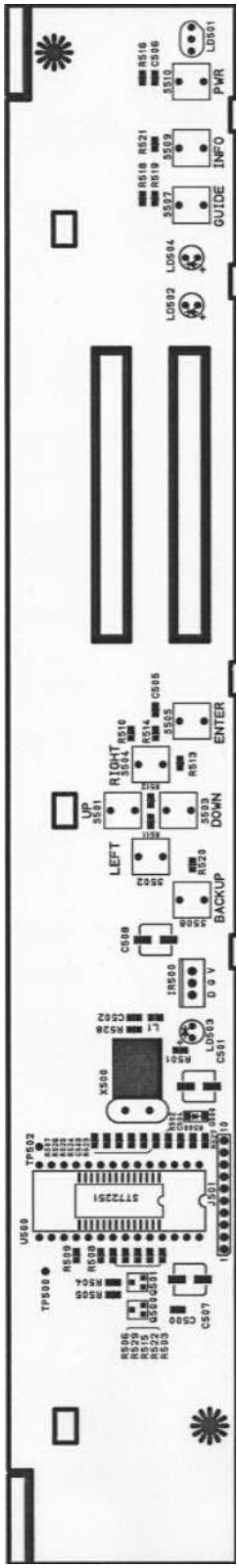
12-6. IEEE1394 PCB

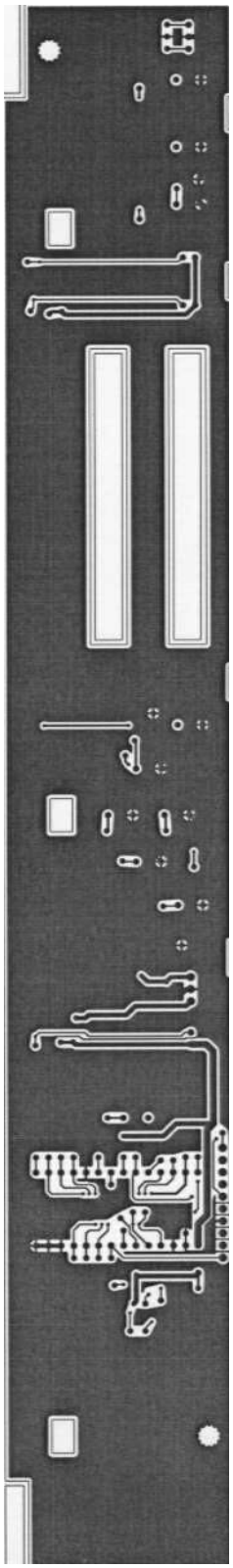


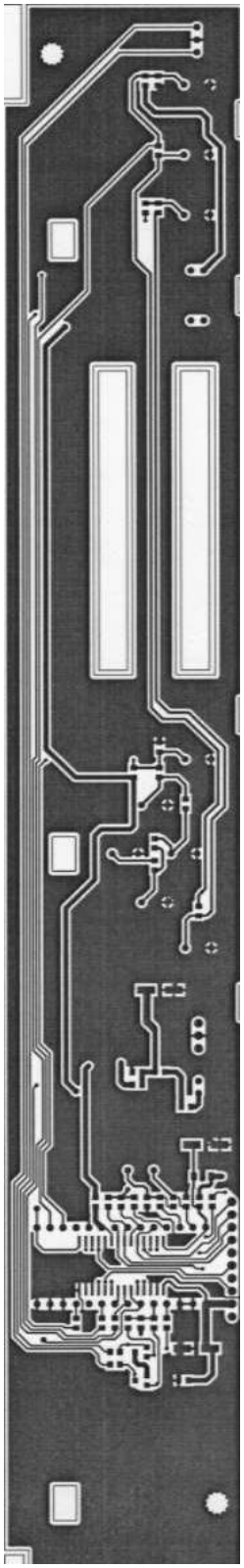




12-7. Front PCB







13. Mechanical Diagram