PTV TRAINING

Leaders In Technical Education

HITACHI

August, 2001

Training Materials Prepared by: Daniel Newman

PROJECTION TELEVISION

DLP-1 CHASSIS



CONTENTS... **2001 DLP-1 Chassis Projection Television Information**

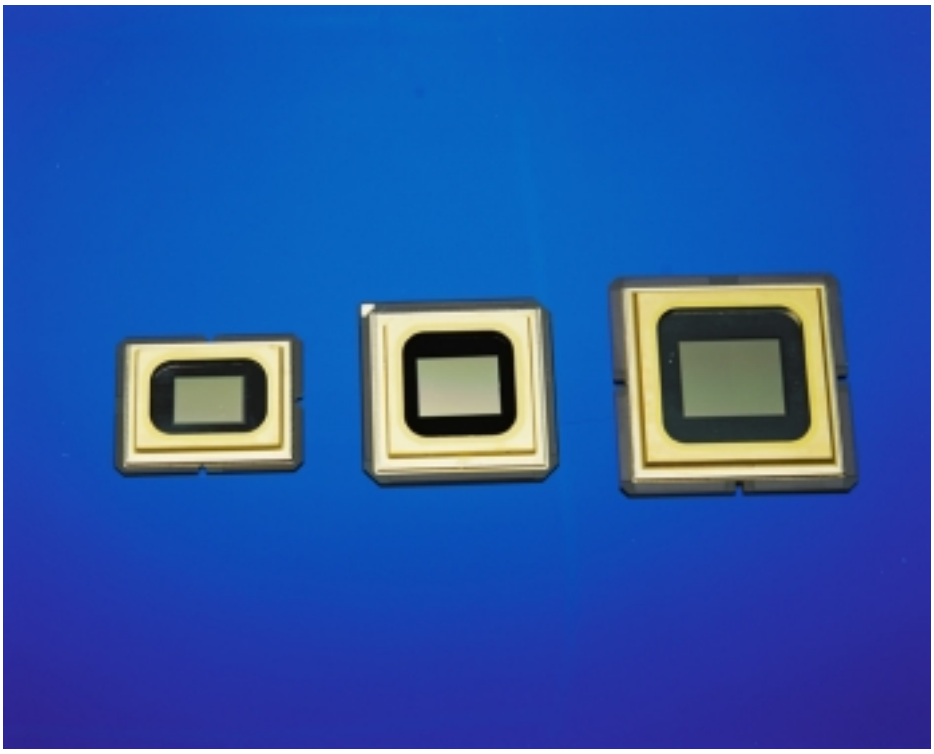
INSTRUCTOR… **Alvie Rodgers C.E.T.**

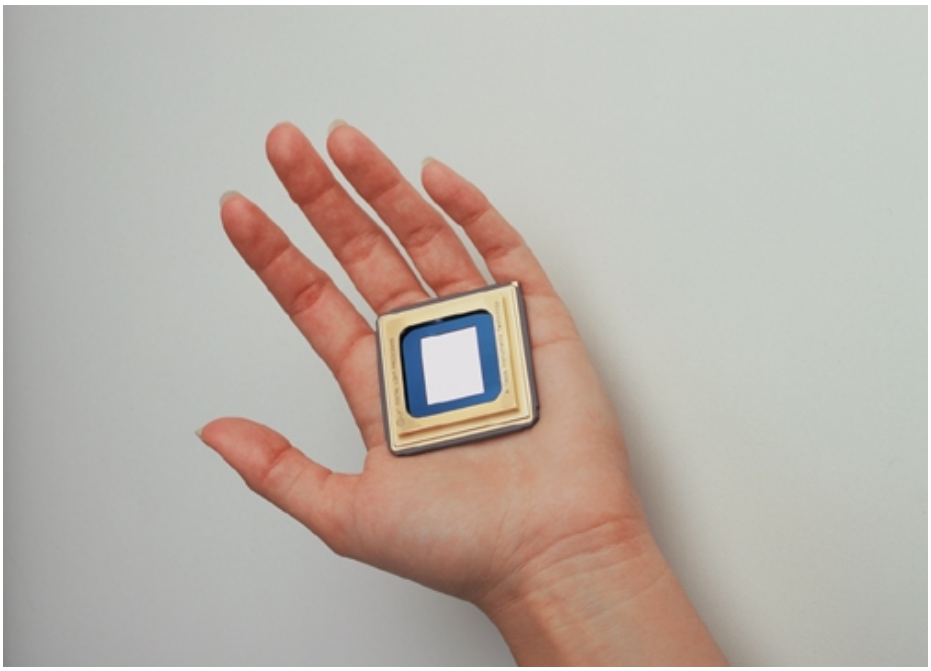
DLP-1 Chassis

DLP Basics

DMD™ Roadmap

SVGA: 848x600; 508, 800 mirrors
XGA: 1024x768 chip with black aperture; 786,432 mirrors
SXGA: 1280x1024; 1,310,720 mirrors

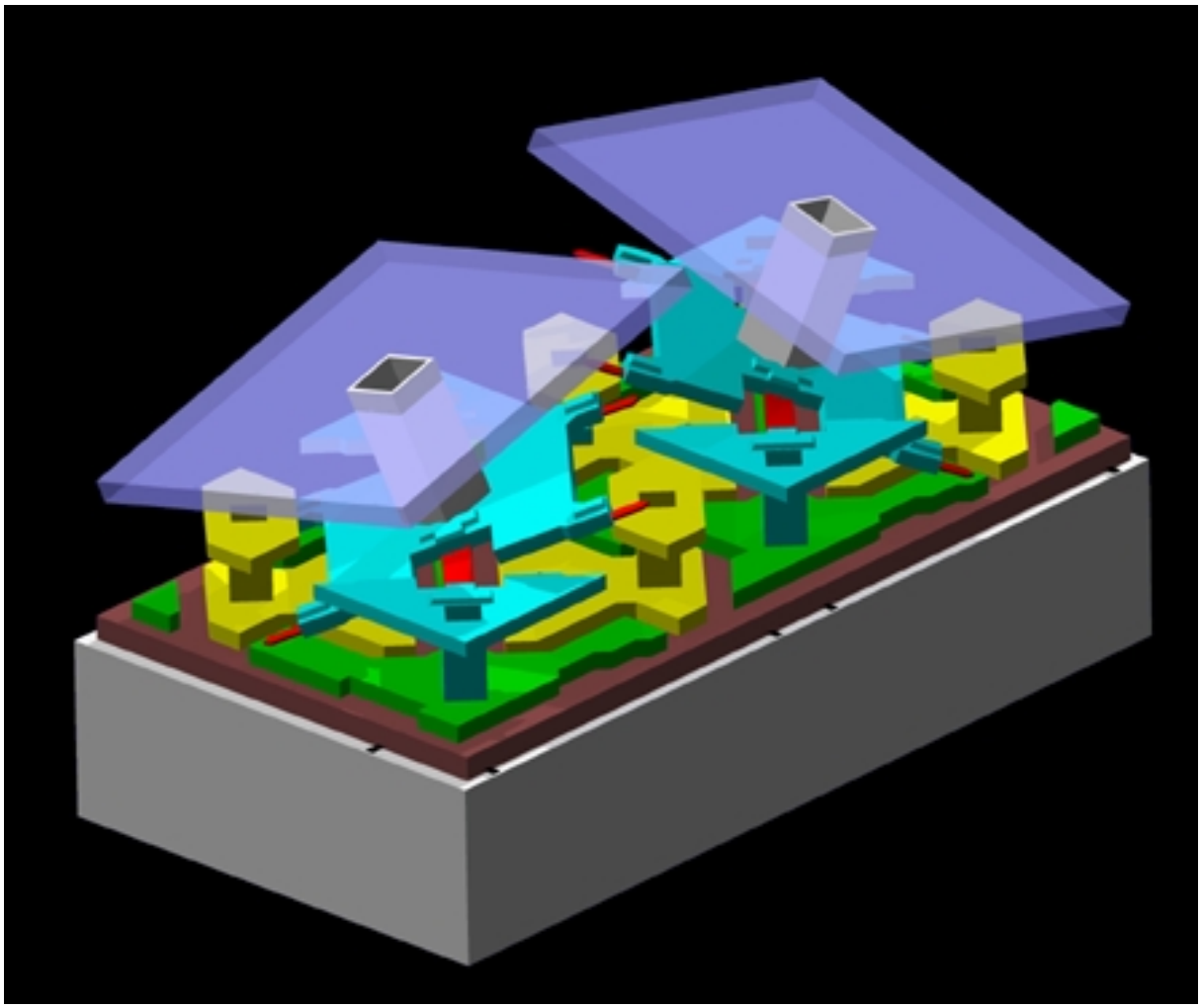




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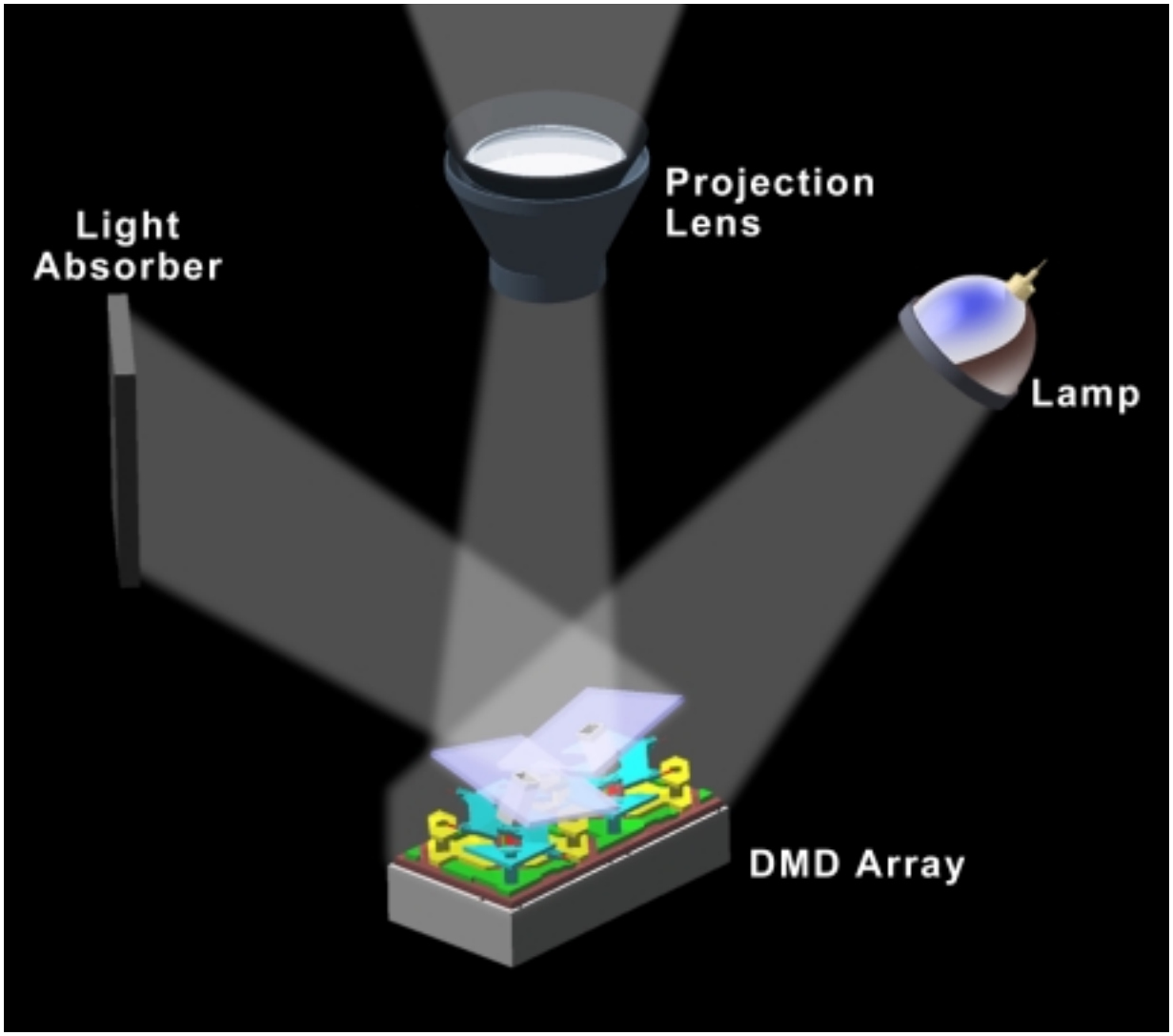
Two Mirrors

The illustration shows a blow up of two mirrors on the DMD, one on and one off. Light hitting the "on" mirror will reflect through the projection lens to the screen. Light hitting the off mirror will reflect to a light absorber. Each mirror is individually controlled and is totally independent of all other mirrors. Each frame of a movie is separated into its red, blue, and green components and digitized into 1,310,000 samples for each color. Each mirror in the system is controlled by one of these samples.



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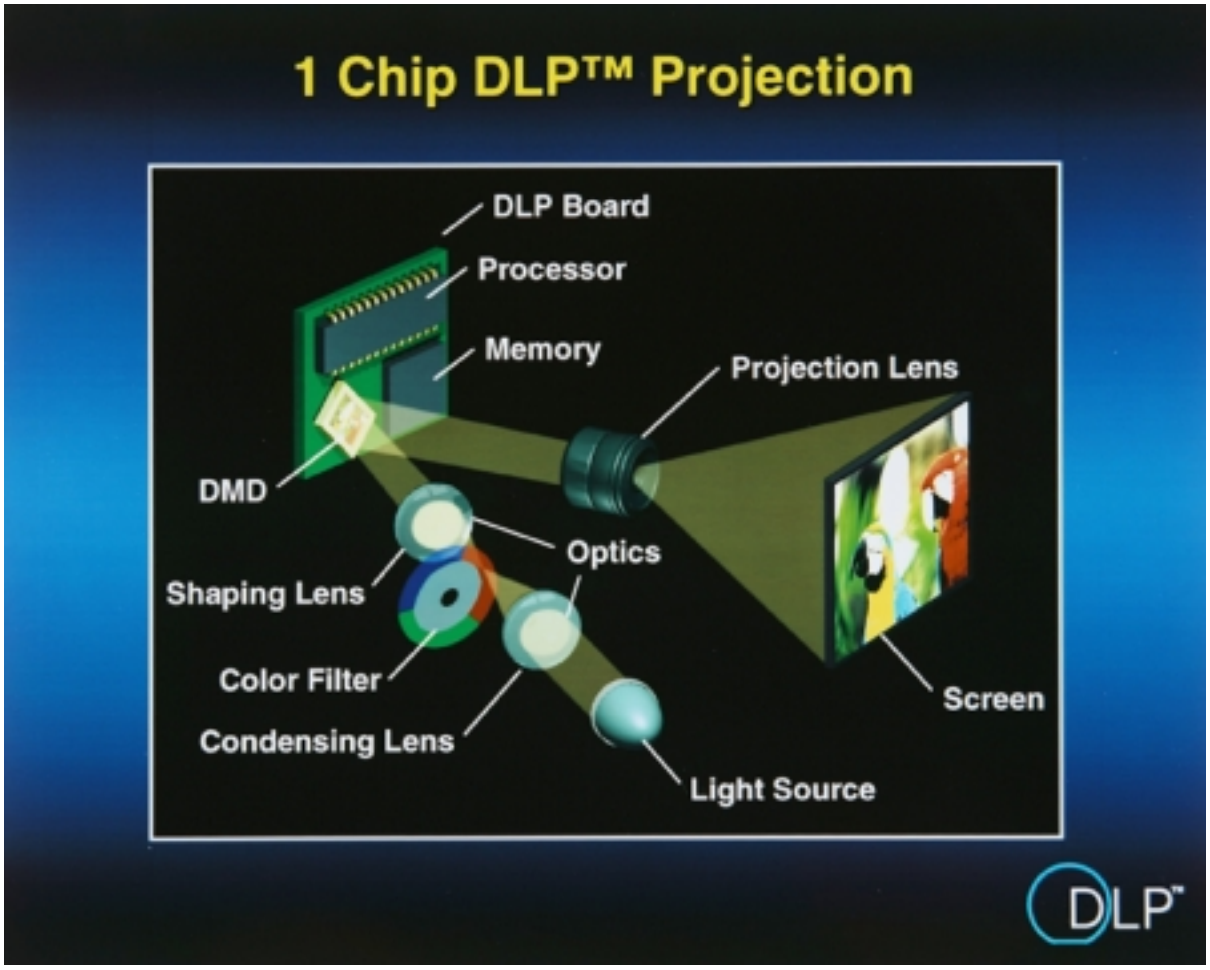
Two Mirrors With Lamp, Projection, Lens, and Light Absorber
The "on" mirror reflects light into the lens and the "off" mirror reflects light into the light absorber.



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1-Chip DLP™ Projection System

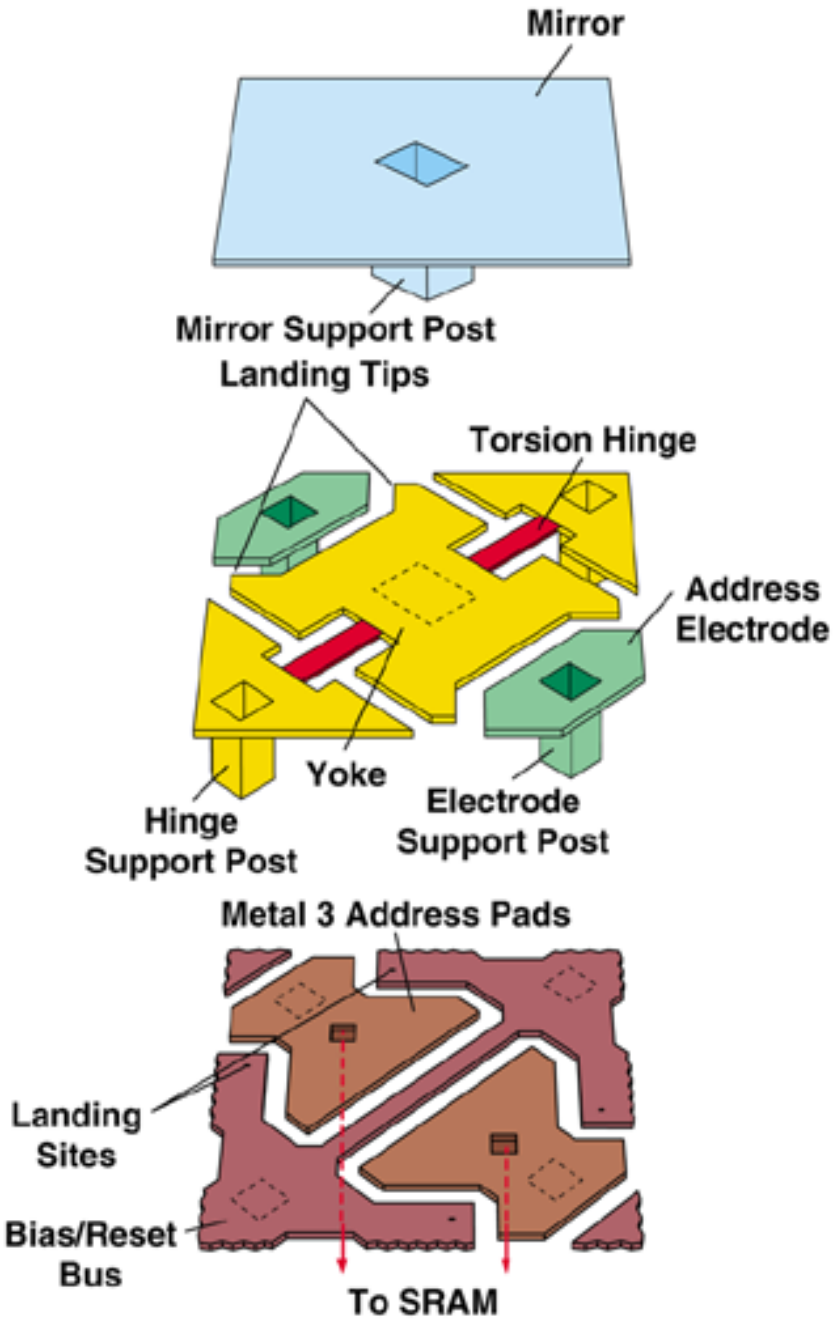
White light is forced down onto a color wheel filter. This wheel spins in sequence with the red, green and blue video signal being sent to the DMD™. Mirrors are turned on, depending on where and how much of each color is needed for each TV field. The human visual system integrates the sequential color and sees a full-color image.



(continued)

DMD™ Architecture

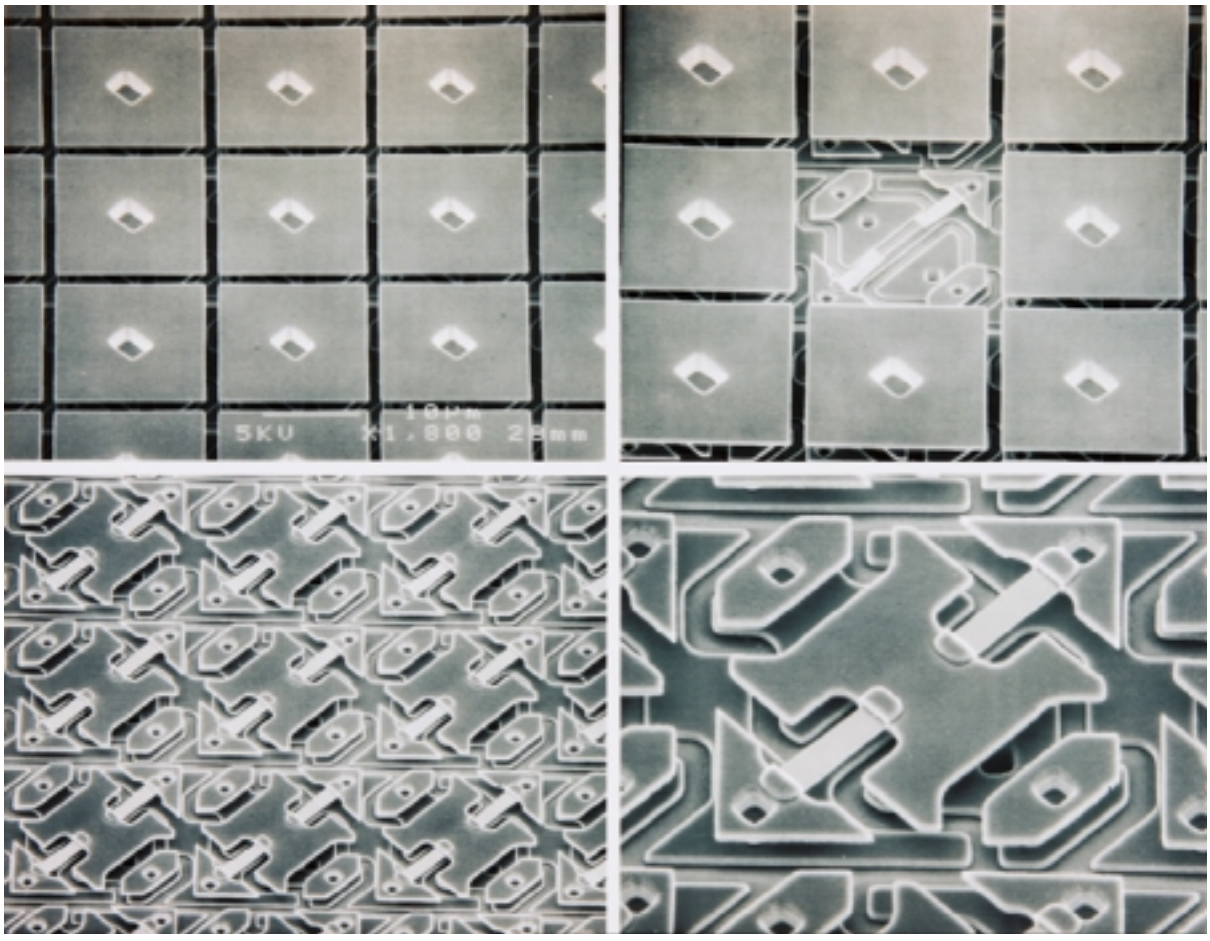
Exploded view of an individual mirror on a DMD. Each 16 μm^2 mirror on a DMD consist of these three physical layers and two "airgap" layers. The airgap layers separate the three physical layers and allow the mirror to tilt +10 or -10 degrees.



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DMD™ with Mirror Removal

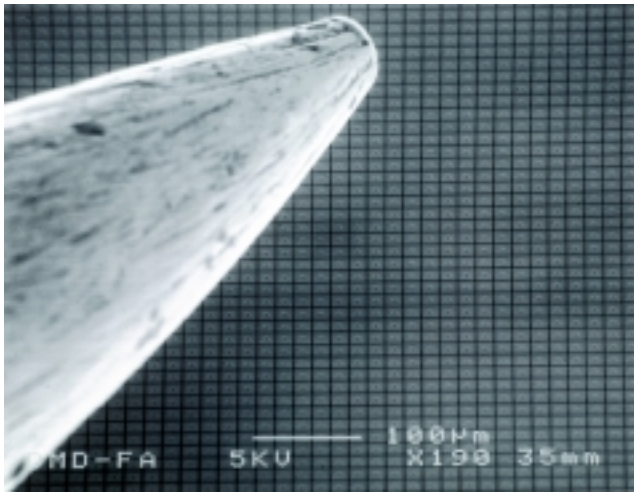
The top left view shows nine mirrors. The top right view shows the central mirror removed to expose the underlying, hidden-hinge structure. The bottom right shows a close-up view of the mirror substructure. The mirror post, which connects to the mirror, sits directly on the center of this underlying surface. Lastly the bottom left view shows several pixels with the mirror removed.

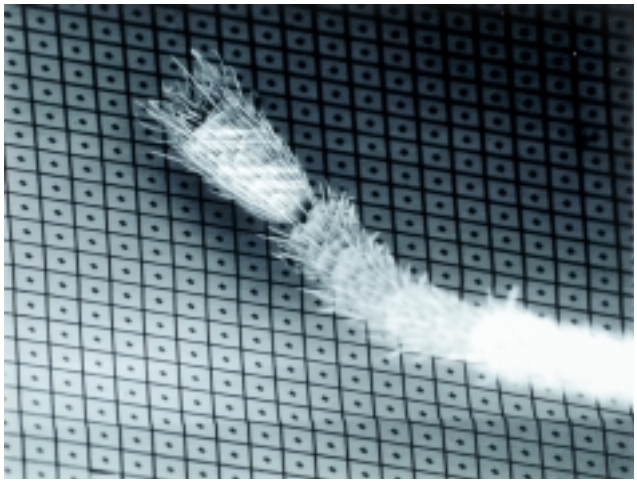


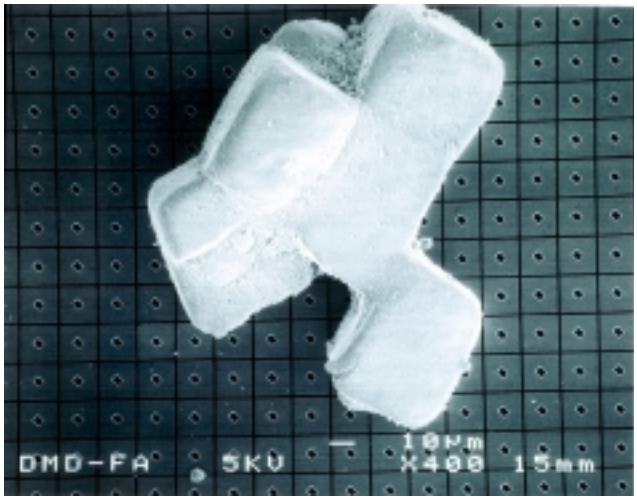
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DMD™ Size Comparisons

Micrographic photos of the tip of a pin, an ant's leg, and one granule of salt on the surface of a DMD. Each mirror is 16 μm^2 with 1 µm separation between pixels.



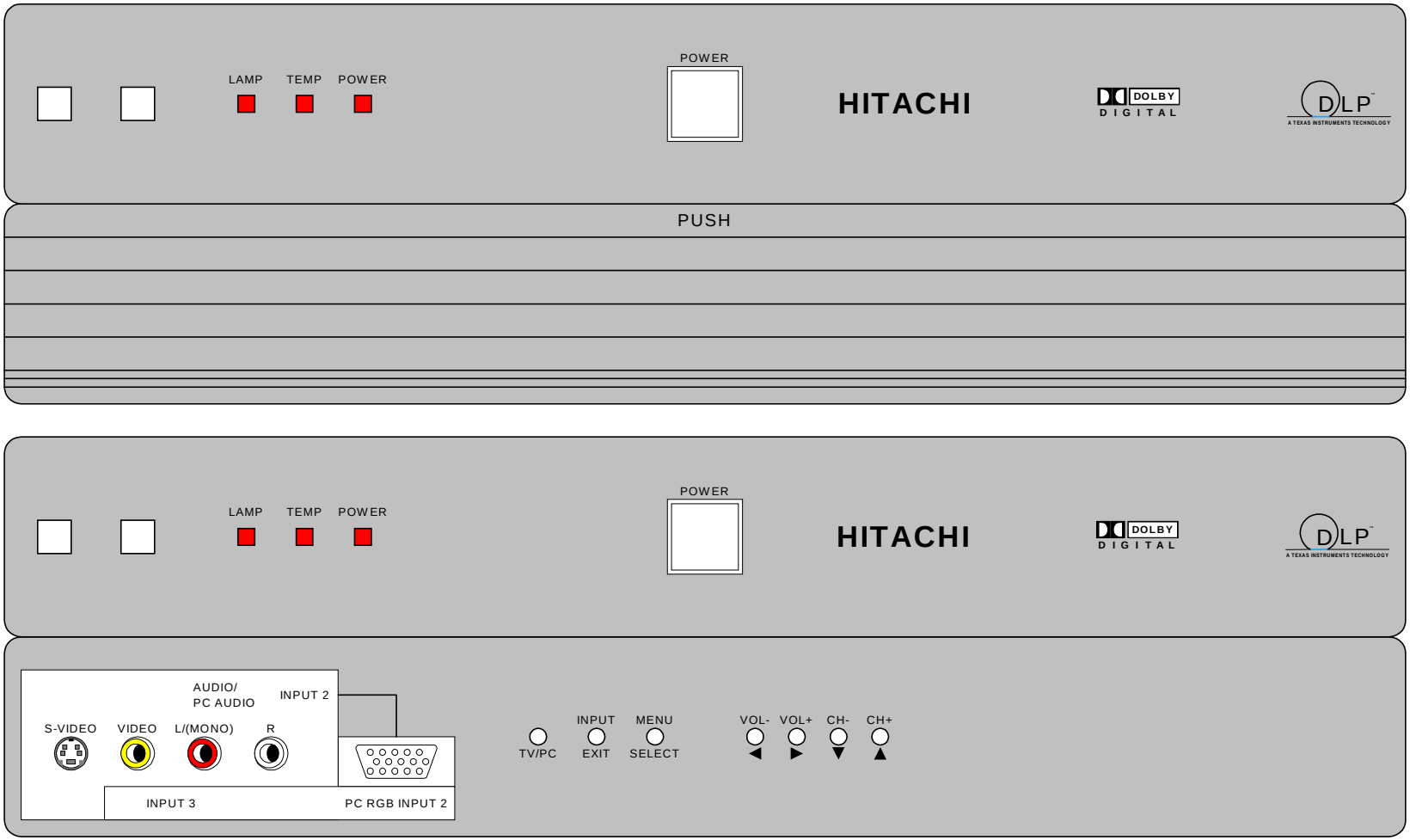




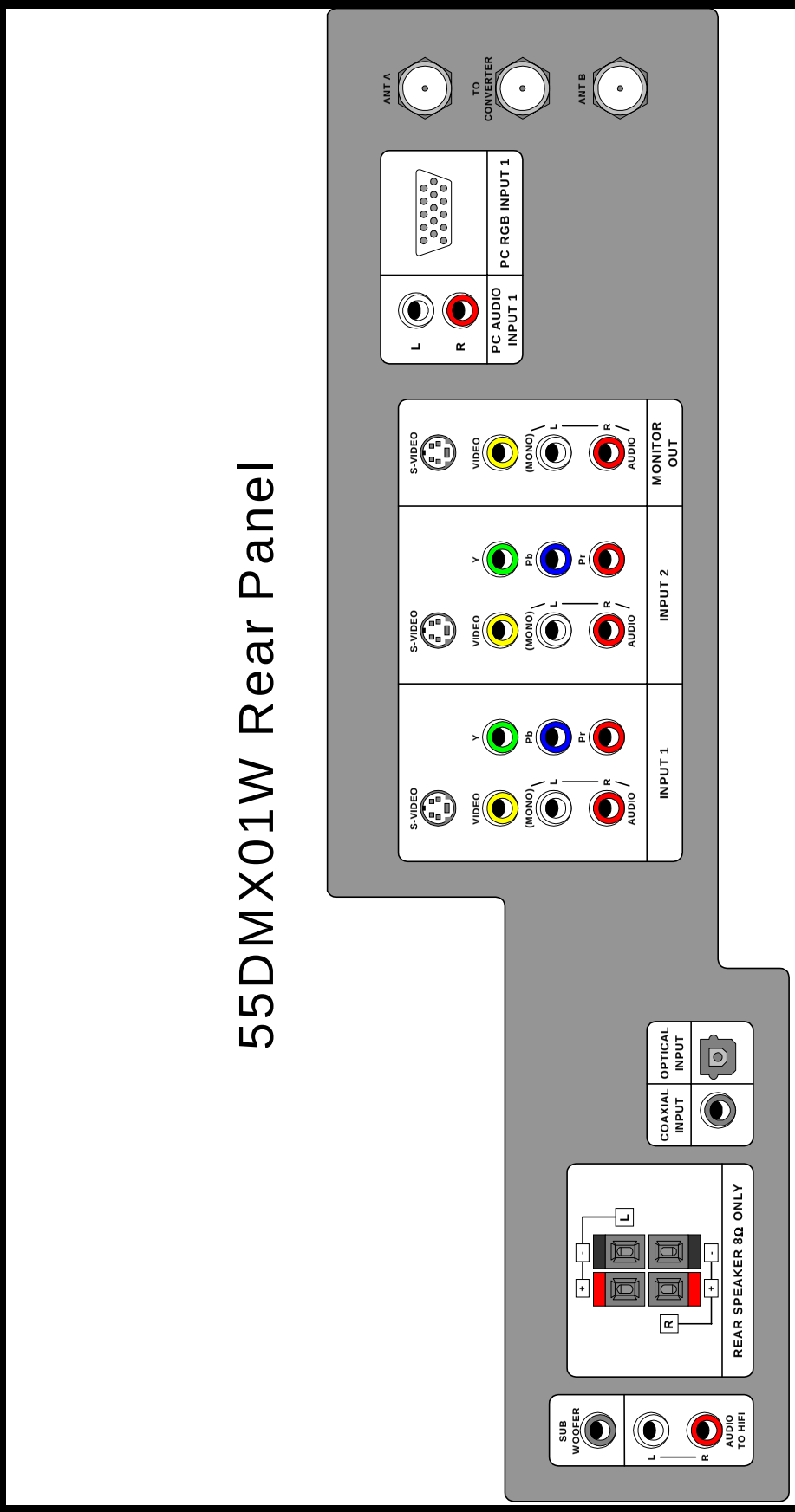
DLP-1 CHASSIS

Front & Rear Panels

55DMX01W Front Panel



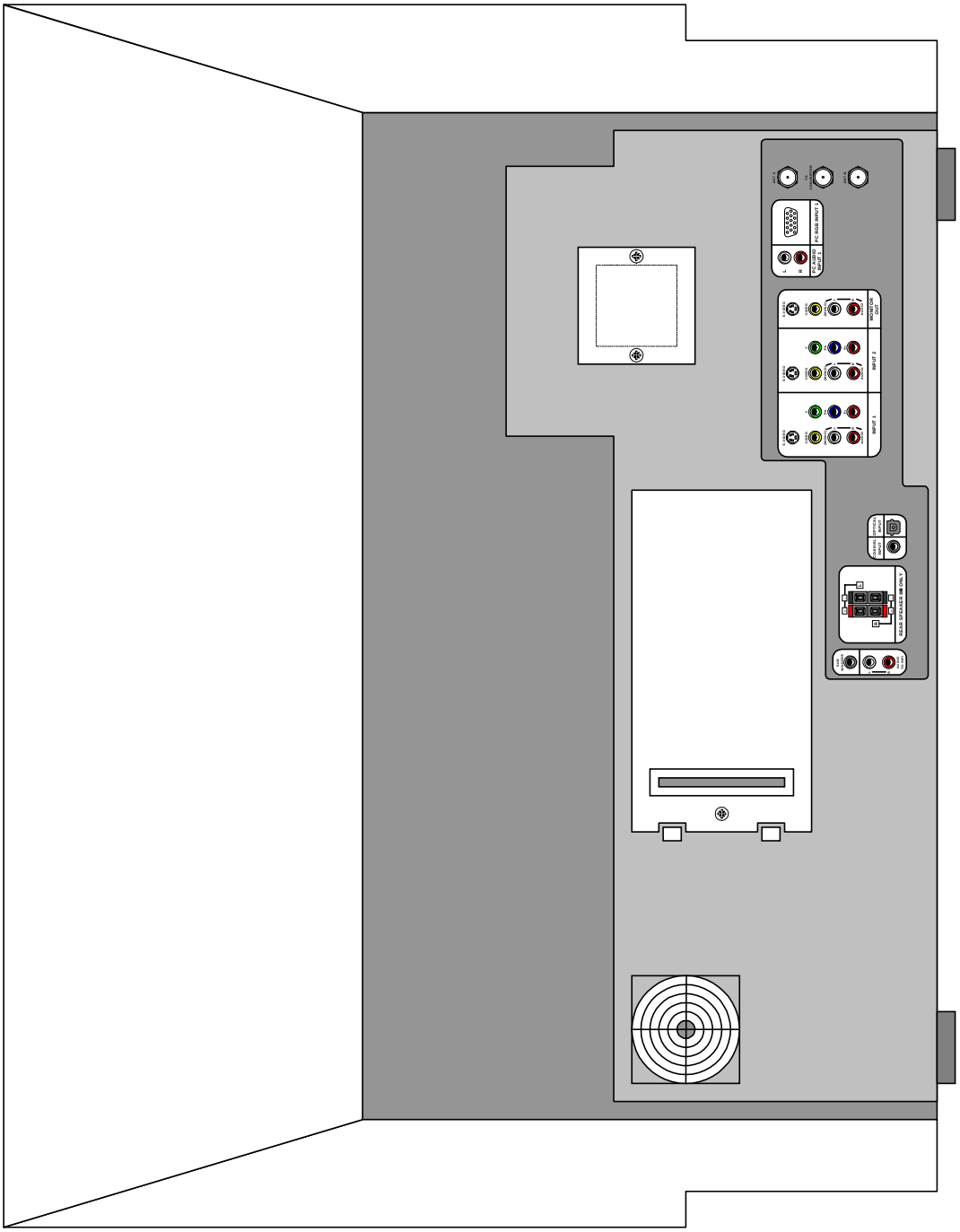
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55DMX01W Rear Panel
ANT A
TO CONVERTER
ANT B
PC RGB INPUT 1
PC AUDIO INPUT 1
L
R
S-VIDEO
VIDEO
(MONO)
AUDIO
Y
Pb
Pr
MONITOR OUT
INPUT 2
INPUT 1
OPTICAL INPUT
COAXIAL INPUT
REAR SPEAKER 8Ω ONLY
SUB WOOFER
AUDIO TO HIFI

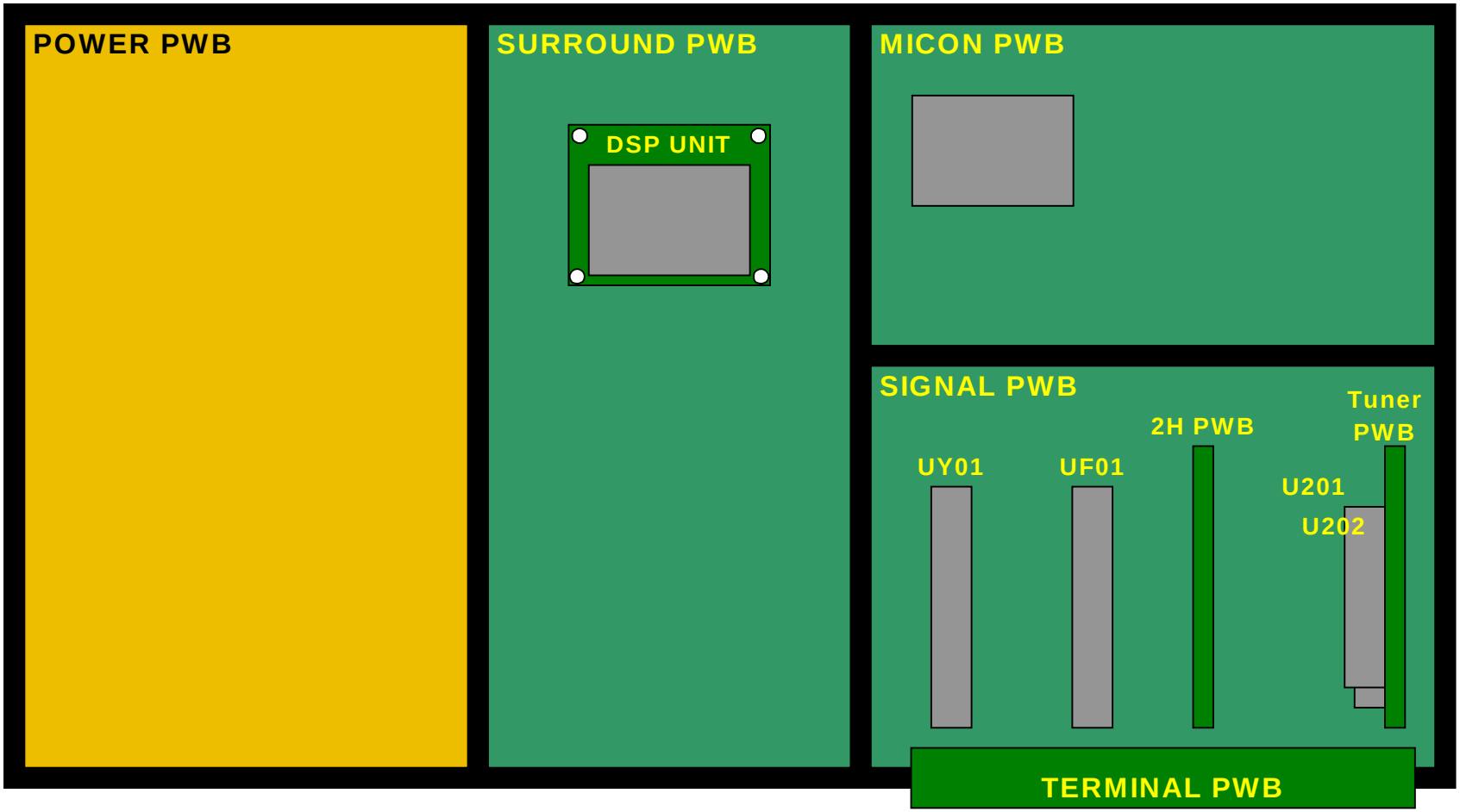
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DLP-1 Chassis Controls and Connections

55DMX01W Rear View



55DMX01W PWB Layout



DLP-1 Chassis

Power Distribution

DLP-1 Chassis Power Distribution

POWER PWB

When AC is applied, the Switched Mode Power Supply (A) circuit consisting of I901 and T901 (***see Figure 1***) will start producing the following DC voltages: +13V, +18V, -15V, and +42V. When the unit is turned on, the power relay contacts close, and AC will be applied to the Switched Mode Power Supply (B) circuit consisting of I902 and T902 (***see Figure 2***), which will then produce the following DC voltages: +370V, +28V, +12V, and +8V.

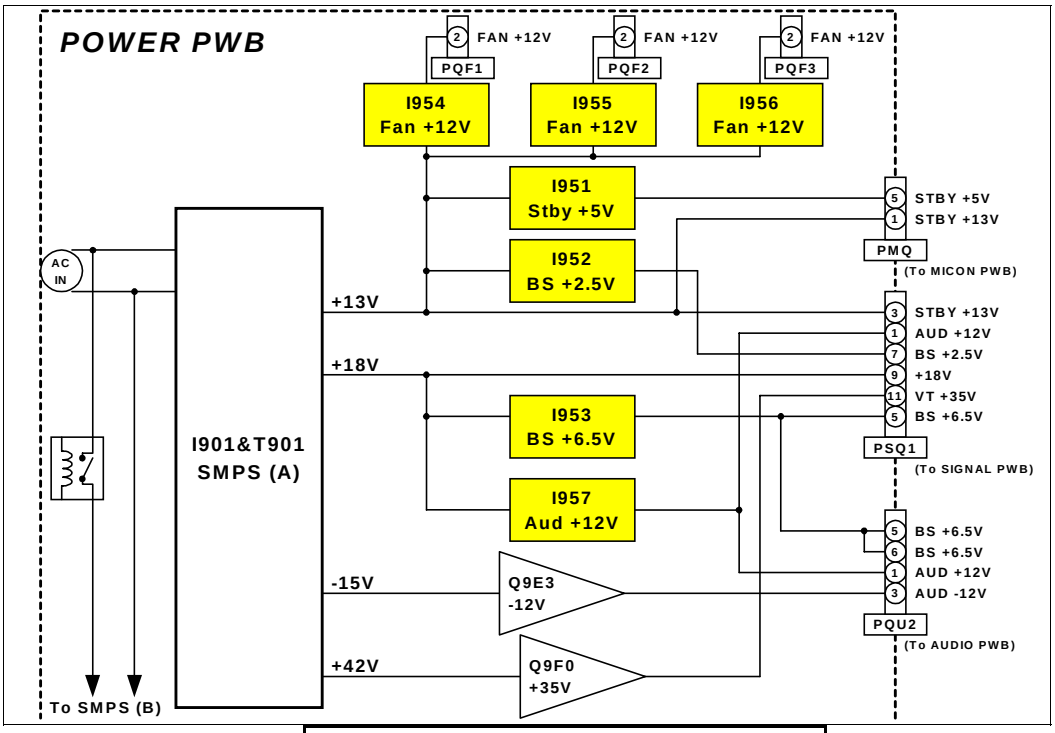


Figure 1 - Switched Mode Power Supply (A)

SMPS (A) (See Figure 1)

+13V

The +13 volt supply is the source for several lower supply voltages:
I954 Fan +12V Regulator IC
I955 Fan +12V Regulator IC
I956 Fan +12V Regulator IC
I951 STBY +5V Regulator IC
I952 BS +2.5V Regulator IC
It is also sent directly out to the SIGNAL PWB via connector PSQ1[3], and to the MICON PWB via connector PMQ[1], where it is then called STBY +13V.

+18V

The +18 volt supply is the source for several lower supply voltages:
I953 BS +6.5V Regulator IC
I957 AUD +12V Regulator IC
It is also sent directly out to the SIGNAL PWB via connector PSQ1[9].

-15V

The –15 volt supply is the source for the AUD –12V supply regulated by Q9E3.

+42V

The +42 volt supply is the source for the VT+35V supply regulated by Q9F0.

FAN +12V Supply (I954, I955, I956)

The FAN +12V supplies are supplied by the +13V source from T901 and are regulated by I954, I955, and I956, and then sent out to the Fans via connectors PQF1[2], PQF2[2], and PQF3[2].

(continued)

STBY +5V Supply (I951)
The STBY +5V supply is supplied by the +13V source from T901 and is regulated by I951 and is sent out to the MICON PWB via connector PMQ[5].

BS +2.5V Supply (I952)
The BS +2.5V supply is supplied by the +13V source from T901 and is regulated by I952 and is sent out to the SIGNAL PWB via connector PSQ1[7].

BS +6.5V Supply (I953)
The BS +6.5V supply is supplied by the +18V source from T901 and is regulated by I953 and is sent out to the SIGNAL PWB via connector PSQ1[5] and the AUDIO PWB via connector PQU2[5,6].

AUD +12V Supply (I957)
The AUD +12V supply is supplied by the +18V source from T901 and is regulated by I957 and is sent out to the SIGNAL PWB via connector PSQ1[1] and the AUDIO PWB via connector PQU2[1].

AUD -12V Supply (Q9E3)
The AUD -12V supply is supplied by the -15V source from T901 and is regulated by Q9E3 and is sent out to the AUDIO PWB via connector PQU2[3].

VT +35V Supply (Q9F0)
The VT +35V supply is supplied by the +42V source from T901 and is regulated by Q9F0 and is sent out to the SIGNAL PWB via connector PSQ1[11].

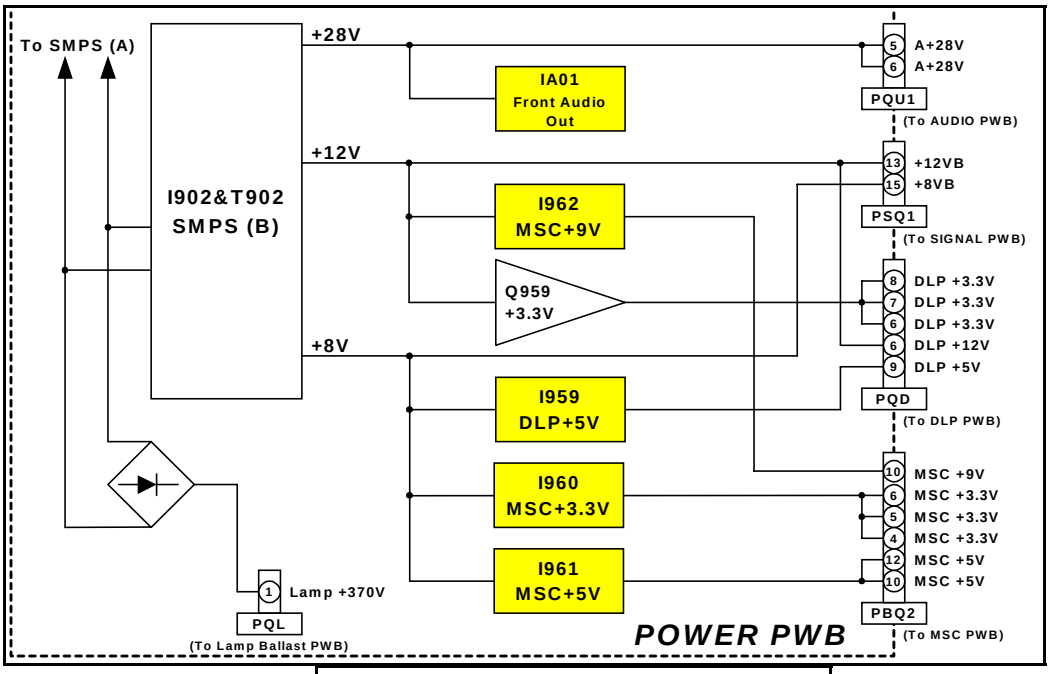


Figure 2 - Switched Mode Power Supply (B)

SMPS (B) (See Figure 2)

+28V
The +28 volt supply is sent directly out to the AUDIO PWB via connector PQU1[5,6], where it is then called A+28V. It is also applied to IA01 which is the Front Audio Output IC.

+12V
The +12 volt supply is the source for several lower supply voltages:
I962 MSC +9V Regulator IC
Q959 3.3V Regulator Transistor
It is also sent directly out to the SIGNAL PWB via connector PSQ1[13] where it is then called +12VB, and out to the DLP PWB via connector PQD[10] where it is then called DLP +12V.

(continued)

+8V
The +8 volt supply is the source for several lower supply voltages:
I959 DLP +5V Regulator IC
I960 MSC +3.3V Regulator IC
I961 MSC +5V Regulator IC
It is also sent directly out to the SIGNAL PWB via connector PSQ1[15], where it is then called +8VB.

+370 Volt Supply (Unregulated)
The +370V supply is basically raw B+ and sent to the Lamp Ballast PWB via connector PQL[1].

MSC +9V Supply (I962)
The MSC +9V supply is supplied by the +12V source from T902 and is regulated by I962 and is sent out to the MSC PWB via connector PBQ2[14].

DLP +3.3V Supply (Q959)
The DLP +3.3V supply is supplied by the +12V source from T902 and is regulated by Q959 and is sent out to the DLP PWB via connector PQD[6,7,8].

DLP +5V Supply (I959)
The DLP +5V supply is supplied by the +8V source from T902 and is regulated by I959 and is sent out to the DLP PWB via connector PQD[9].

MSC +3.3V Supply (I960)
The MSC +3.3V supply is supplied by the +8V source from T902 and is regulated by I960 and is sent out to the MSC PWB via connector PBQ2[4,5,6].

MSC +5V Supply (I961)
The MSC +5V supply is supplied by the +8V source from T902 and is regulated by I961 and is sent out to the MSC PWB via connector PBQ2[10,12].

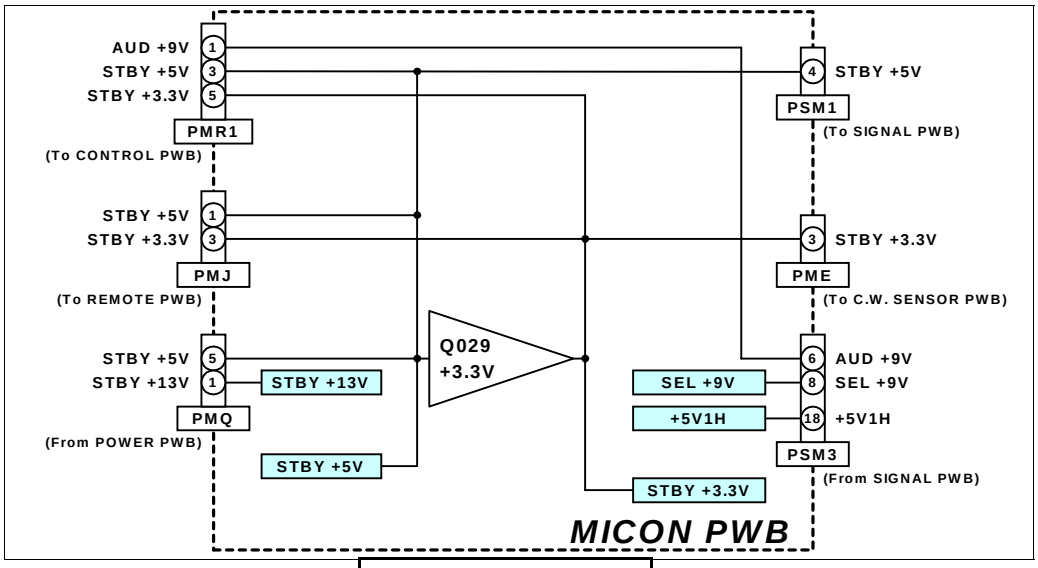


Figure 3 - MICON PWB

MICON PWB (See Figure 3)

STBY +3.3V Supply (Q029)
The STBY +3.3V supply is supplied by the STBY +5V source on the POWER PWB and is regulated by Q029 and is used on the MICON PWB. It is also sent out to the REMOTE PWB via connector PMJ[3], the CONTROL PWB via connector PMR1[5], and the C.W. SENSOR PWB via connector PME[3].

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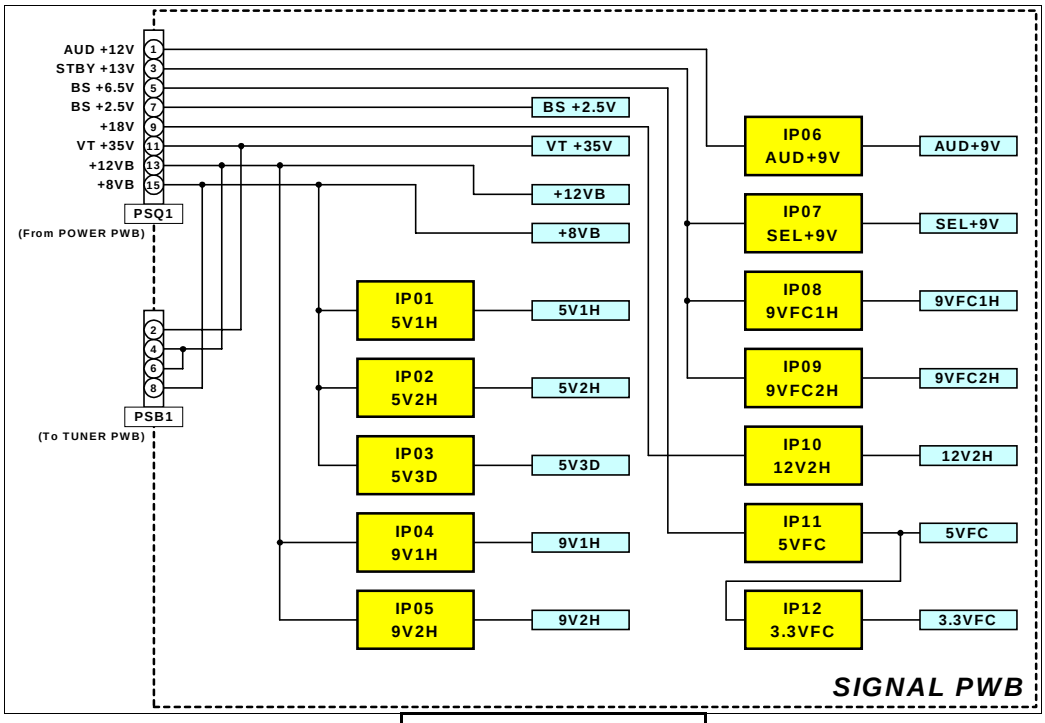


Figure 4 - SIGNAL PWB

SIGNAL PWB (See Figure 4)

5V1H Supply (IP01)
The 5V1H is a +5 volt supply which is supplied by the +8VB supply on the POWER PWB, which is then regulated by IP01. It is made available to the 1H video circuitry on the SIGNAL PWB.

5V2H Supply (IP02)
The 5V2H is a +5 volt supply which is supplied by the +8VB supply on the POWER PWB, which is then regulated by IP02. It is made available to the 2H video circuitry on the SIGNAL PWB.

5V3D Supply (IP03)
The 5V3D is a +5 volt supply which is supplied by the +8VB supply on the POWER PWB, which is then regulated by IP03. It is made available to the 3DYC comb filter circuitry on the SIGNAL PWB.

9V1H Supply (IP04)
The 9V1H is a +9 volt supply which is supplied by the +12VB supply on the POWER PWB, which is then regulated by IP04. It is made available to the 1H video circuitry on the SIGNAL PWB.

9V2H Supply (IP05)
The 9V2H is a +9 volt supply which is supplied by the +12VB supply on the POWER PWB, which is then regulated by IP05. It is made available to the 2H video circuitry on the SIGNAL PWB.

AUD+9V Supply (IP06)
The AUD+9V is a +9 volt supply which is supplied by the AUD+12V supply on the POWER PWB, which is then regulated by IP06. It is made available to the audio circuitry on the SIGNAL PWB.

SEL+9V Supply (IP07)
The SEL+9V is a +9 volt supply which is supplied by the STBY+13V supply on the POWER PWB, which is then regulated by IP07. It is made available to various circuitry on the SIGNAL PWB.

(continued)

9VFC1H Supply (IP08)
The 9VFC1H is a +9 volt supply which is supplied by the STBY+13V supply on the POWER PWB, which is then regulated by IP08. It is made available to the Flex Converter (1H portion) on the SIGNAL PWB.

9VFC2H Supply (IP09)
The 9VFC2H is a +9 volt supply which is supplied by the STBY+13V supply on the POWER PWB, which is then regulated by IP09. It is made available to the Flex Converter (2H portion) on the SIGNAL PWB.

12V2H Supply (IP10)
The 12V2H is a +12 volt supply which is supplied by the +18V supply on the POWER PWB, which is then regulated by IP10. It is made available to the 2H video circuitry on the SIGNAL PWB.

5VFC Supply (IP11)
The 5VFC is a +5 volt supply which is supplied by the BS+6.5V supply on the POWER PWB, which is then regulated by IP11. It is made available to the Flex Converter circuitry on the SIGNAL PWB.

3.3VFC Supply (IP12)
The 3.3VFC is a +3.3 volt supply which is supplied by the 5VFC supply on the SIGNAL PWB, which is then regulated by IP12. It is made available to the Flex Converter circuitry on the SIGNAL PWB.

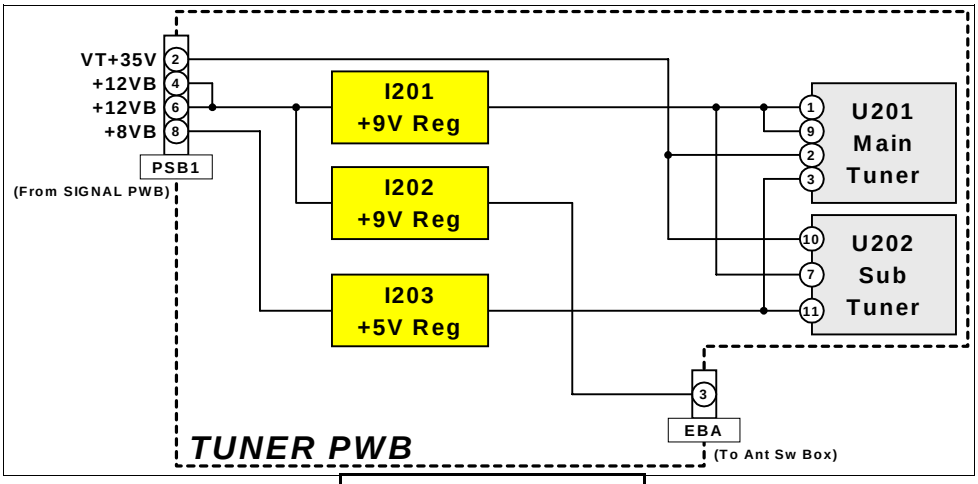


Figure 5 - TUNER PWB

TUNER PWB (See Figure 5)

+9V Supply (I201)
This +9V is a +9 volt supply which is supplied by the +12VB supply on the POWER PWB, which is then regulated by I201. It is made available to the two tuners on the TUNER PWB.

+9V Supply (I202)
This +9V is a +9 volt supply which is supplied by the +12VB supply on the POWER PWB, which is then regulated by I202. It is made available to the Antenna Switch Box via connector EBA [3].

+5V Supply (I203)
This +5V is a +5 volt supply which is supplied by the +8VB supply on the POWER PWB, which is then regulated by I203. It is made available to the two tuners on the TUNER PWB.

(continued)

AUDIO PWB (See Figure 6)

AUD+5V Supply (IS13)

The AUD+5V is a +5 volt supply which is supplied by the BS +6.5V supply on the POWER PWB, which is then regulated by IS13. It is made available to the audio circuitry on the AUDIO PWB and also to the DSP (Digital Surround Processor) Module via connector PMU1[1].

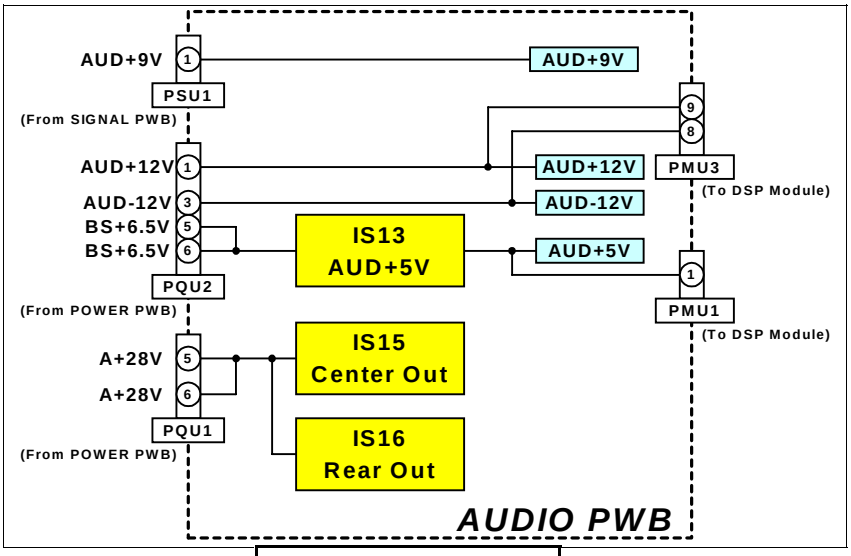
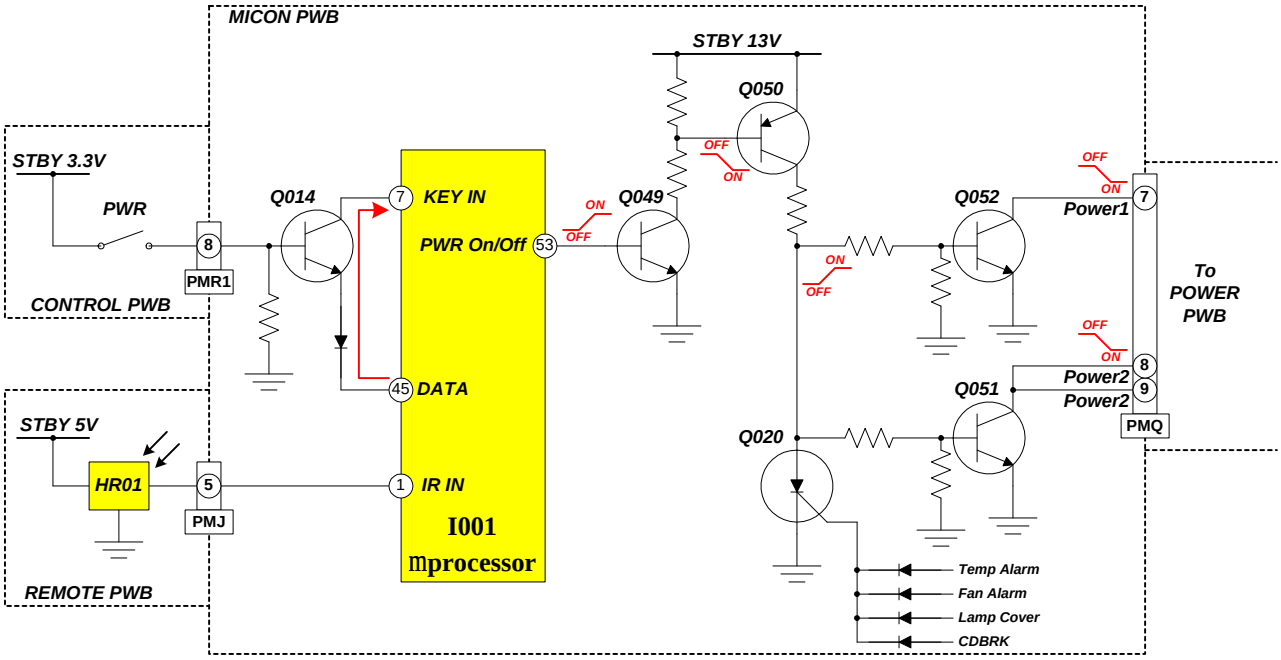
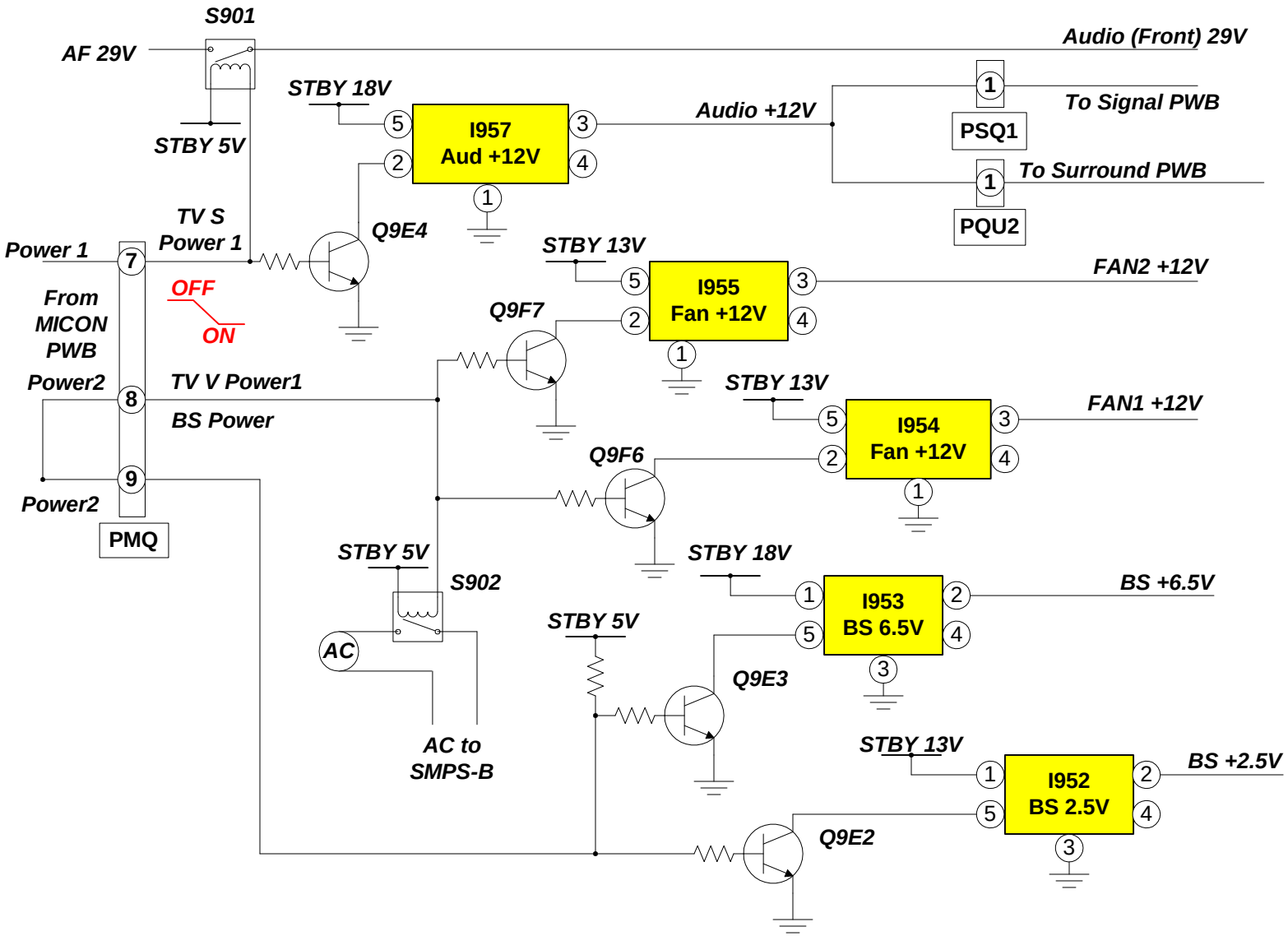


Figure 6 - AUDIO PWB

DLP 55DMX01W POWER ON/OFF CIRCUIT DIAGRAM (Microprocessor Side)



DLP 55DMX01W POWER ON/OFF CIRCUIT DIAGRAM (Microprocessor Side)



DLP-1 Chassis

Video Circuit Explanation

DLP-1 Chassis Video Circuit Explanation

(See ***Figure 1*** on Page 2-04)

TERMINAL PWB

The TERMINAL PWB is where most of the video inputs come into and go out of. The main components on this PWB are I301 (A/V Select IC) and IT01 (PiP 3-Line Comb Filter).

I301 (A/V Select)

This IC receives the following video inputs:

TV1	Main Tuner video (NTSC)
TV2	Sub Tuner video (NTSC)
V1	Composite video from AUX VIDEO INPUT 1
V1(Y)	Luminance portion of S-Video from AUX VIDEO INPUT 1
V1(C)	Chrominance portion of S-Video from AUX VIDEO INPUT 1
Comp 1 Y	Luminance portion of Component Video from AUX VIDEO INPUT 1
V2	Composite video from AUX VIDEO INPUT 2
V2(Y)	Luminance portion of S-Video from AUX VIDEO INPUT 2
V2(C)	Chrominance portion of S-Video from AUX VIDEO INPUT 2
Comp 2 Y	Luminance portion of Component Video from AUX VIDEO INPUT 2
V3	Composite video from AUX VIDEO INPUT 3 via the front panel connector PTR
V3(Y)	Luminance portion of S-Video from AUX VIDEO INPUT 3 via the front panel connector PTR
V3(C)	Chrominance portion of S-Video from AUX VIDEO INPUT 3 via the front panel connector PTR
Y In1	Luminance portion of Sub Video from IT01 PiP Comb Filter
C In1	Chrominance portion of Sub Video from IT01 PiP Comb Filter

This IC also provides the following outputs:

V Out1	Sub Video out which is sent to IT01 PiP Comb Filter
V/Y Out2	Main Video out or Luminance portion of main S-video which is sent to the SIGNAL PWB
C Out2	Chrominance portion of main S-video which is sent to the SIGNAL PWB
Mon Out V	Composite video sent to MONITOR OUTPUT
Mon Out (Y)	Luminance portion of S-Video sent to MONITOR OUT
Mon Out (C)	Chrominance portion of S-Video sent to MONITOR OUT

IT01 (PiP 3-Line Comb Filter)

This IC receives Sub Video from I301 on pin 3. It outputs Sub Y on pin 25 and Sub C on pin 23.

TUNER PWB

The TUNER PWB is where the two tuners are located. The main components on this PWB are U101 (Main Tuner) and U102 (Sub Tuner).

U101 (Main Tuner)

This non-repairable unit outputs Main Tuner NTSC Video to connector PSB5[4], where it goes to the SIGNAL PWB, then to the TERMINAL PWB on connector PST1[4].

U102 (Sub Tuner)

This non-repairable unit outputs Sub Tuner NTSC Video to connector PSB5[10], where it goes to the SIGNAL PWB, then to the TERMINAL PWB on connector PST1[10].

SIGNAL PWB

The SIGNAL PWB receives and processes the following signals:

Sub (Y / C)
Main (V or Y / C)
Component 1 (Y/Cr/Cb or Y/Pr/Pb)
Component 2 (Y/Cr/Cb or Y/Pr/Pb)

(continued)

Sub Video
The Sub Y and Sub C signals are applied to IY02, which basically converts the Sub C (chrominance) signal into two color difference signals, which are called Sub R-Y or Sub Cr and Sub B-Y or Sub Cb. It then outputs all three signals to IX01, which is the Y/CR/CB Select IC.

Main Video
The Main video signal, whether it's V or Y / C, is applied to UY01 3DYC Comb Filter. If the Main video wasn't Y / C when it came in, it will be when it comes out. Main Y and Main C signals are applied to IY01 which basically converts the Main C (chrominance) signal into two color difference signals, which are called Main R-Y or Main Cr and Main B-Y or Main Cb. It then outputs all three signals to IX01 which is the Y/CR/CB Select IC.

Component 1
The component 1 video signal can be any of the approved ATSC or NTSC formats; 480i, 480p, 1080i, etc. This signal is inserted directly into IX01 which is the Y/CR/CB Select IC.

Component 2
The component 2 video signal can be any of the approved ATSC or NTSC formats; 480i, 480p, 1080i, etc. This signal is inserted directly into IX01 which is the Y/CR/CB Select IC.

IX01 (Y/CR/CB Select IC)
This IC receives four different inputs, Sub (Y/Cr/Cb), Main (Y/Cr/Cb), Component 1 (Y/Cr/Cb or Y/Pr/Pb), and Component 2 (Y/Cr/Cb or Y/Pr/Pb). Note that since both the Sub and Main signals ultimately come from NTSC sources, it is not possible for them to be Y/Pr/Pb. IX01 provides two outputs; Main and Sub, which are then applied to UF01, which is the Picture in Picture / Flex Converter Unit.

UF01 (Picture in Picture / Flex Converter Unit)
The Picture in Picture / Flex Converter Unit receives two inputs, Main and Sub, and provides one combined or processed output. If any PiP request is made by the customer, it will combine/split the two signals into one signal as long as both of the input signals contain the same original format; i.e. 480i, 480p, etc. It will also up-convert the frequency (base H) of incoming 15.734 KHz to approximately 2.86H or 45 KHz or 720p.

2H VIDEO PWB

The 2H VIDEO PWB receives and processes the following signals:
PiP/Flex Converter Output (2H Y/Cr/Cb)
Main Output from IX01
Rear PC RGB
Front PC RGB

PiP/Flex Converter Output
As previously mentioned, the PiP/Flex Converter output sends out a processed signal (PiP information added) that is (possibly) as high as 45 KHz located on connector PSH1[9,11,13]. Also found on that same connector [2,4,6] is a set of signals that mirror the main input to the PiP/Flex Converter. This set of signals will be used in the case of a non-480i (480p, 1080i, etc.) input via the component 1 or component 2 inputs, and is applied to I501.

2H Y/Cr/Cb
The Y portion of the 2H Y/Cr/Cb is sent directly to I501. The 2H Cr/Cb is sent to two places; I502 and the YCBCR/YIQ converter circuitry.

YCRCB/YIQ Converter
The purpose of the YCRCB/YIQ Converter circuitry is to phase shift the color information contained in the YCRCB signal by 33 degrees. This is done so that the auto-flesh tone or auto-color circuitry in IK01 RGB processor can function properly. The auto-color function only works with YIQ signals, so the output from the Flex Converter must be converted (phase shifted) if the original signal was NTSC. The Cr/Cb signal can also be termed U/V. The phase shifted signal is then applied to I502.

(continued)

I502 (NTSC/Other Select IC)
I502 receives two sets of red and blue color difference information; one in the form of Cr/Cb or U/V and the other in the form of I/Q. Selection is made by the sensing of NTSC or non-NTSC. If NTSC is sensed, then the I/Q input would be selected. The output is sent to I501.

I501 (15.75 KHz / Other Select IC)
This IC receives two sets of signals; one directly from the output of IX01 (main out) via connector PSH1[2,4,6] and the other from I502 NTSC/Other Select IC. In the case of an input signal other than 480i, or 15.75 KHz, the Flex Converter does not need to up-convert the signal, so this signal is sent directly to I501 as this will typically be a high(er) definition source such as 1080i. The other signal available to I501 will be the processed signal from I502 via the Flex Converter and phase shifted if necessary. Selection is made by the sensing of a non-15.75 KHz input signal. The output is sent to IK01 RGB Processor in the form of Y/I/Q or Y/U/V.

IK01 (RGB Processor)
This IC receives two sets of inputs; one from the output of I501 which would be video, and the other from the MICOM PWB in the form of OSD R, OSD G, and OSD B. It processes and combines the two signals (when applicable) and outputs main RGB to IC02, which is the TV / PC Select IC.

IC01 (Front / Rear PC Select)
This IC receives two sets of PC RGB signals; one from the front panel via connector PHR[1,3,5] and the other from the TERMINAL PWB via connector PHT[1,3,5]. The IC then selects whichever one the customer selects via the main control menu. The output is sent to IC02, which is the TV / PC Select IC.

IC02 (TV / PC Select IC)
This IC receives two sets of signals; one which is main video from the RGB processor IC IK01, and the other from the Front / Rear PC Select IC IC01. The output is sent to the MSC PWB in the form of RGB.

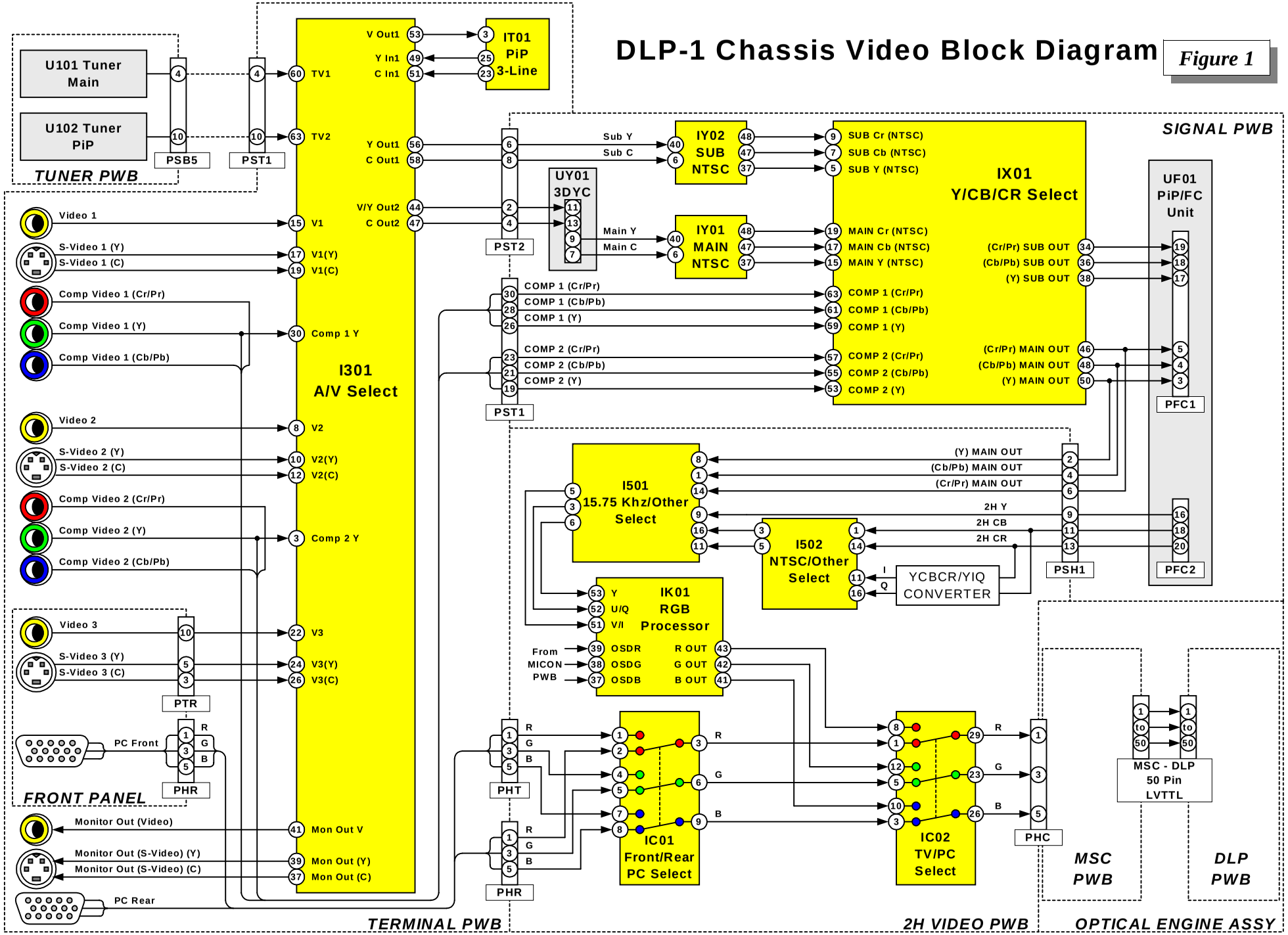
MSC PWB
This PWB is located physically on the Optical Engine Assembly. Nothing is known about what goes on inside this module, although there appears to be an output which consists of a flat 50 pin cable which includes signals called A0-LVTTL, A1-LVTTL, B2-LVTTL, C3-LVTTL, etc., which may possibly stand for Low-Voltage-Transistor-Transistor-Logic, since there is a 3.3 volt power source sent to this PWB.

DLP PWB
This PWB is also located physically on the Optical Engine Assembly. Nothing is known about what goes on inside this module either, although this is where the actual Micro-Mirror-Device is located.

(continued)

DLP-1 Chassis Video Block Diagram

Figure 1



DLP-1 Chassis

Audio Circuit Explanation

DLP-1 Chassis Audio Circuit Explanation

(See ***Figure 1*** on Page 3-04)

TERMINAL PWB

The TERMINAL PWB is where the analog audio inputs come into. The main components on this PWB are I301 (A/V Select IC) and I302 (Audio Switch IC).

I301 (A/V Select)

This IC receives the following audio inputs:

TV1(L)	Main Tuner audio (Left)
TV1(R)	Main Tuner audio (Right)
V1(L)	Left Channel audio from AUX VIDEO INPUT 1
V1(R)	Right Channel audio from AUX VIDEO INPUT 1
V2(L)	Left Channel audio from AUX VIDEO INPUT 2
V2(R)	Right Channel audio from AUX VIDEO INPUT 2
V3(L)	Left Channel audio from AUX VIDEO INPUT 3 via Audio Switch IC I302
V3(R)	Right Channel audio from AUX VIDEO INPUT 3 via Audio Switch IC I302

This IC also provides the following outputs:

SEL (L)	Selected Left Channel Audio which is sent to the SURROUND PWB
SEL (R)	Selected Right Channel Audio which is sent to the SURROUND PWB
Mon Out (L)	Selected Left Channel Audio which is sent to MONITOR OUTPUT
Mon Out (R)	Selected Right Channel Audio which is sent to MONITOR OUTPUT

I302 (Audio Switch IC)

This IC receives two sets of left and right audio input; one set from the front panel which is Aux Video 3 / PC, and one set from the rear PC audio input. It has one set of left and right audio output which is sent to the V3(L) and (R) inputs on I301. It is controlled by the PC F/R signal.

SURROUND PWB

The SURROUND PWB receives and processes the following signals:
SEL (L) and (R)
Digital Audio via Optical Input
Digital Audio via Coaxial Input
The SURROUND PWB processes and outputs the following signals:
Front Audio (L) and (R)
Rear Audio (L) and (R)
Center Channel
Subwoofer (LFE)
HiFi Outputs (L) and (R)

SURROUND PWB INPUTS

SEL (L) and (R)

The SEL (L) and (R) signals are the selected output from I301 (A/V Select IC) and are input to IS19 (Perfect Volume IC) via connector PSU1[12,13]. The output of IS19 is then divided and sent to two places; IS03 (Front Audio Control IC), and to the DSP (Digital Signal Processor) module via connector PMU2[1,3].

Digital Audio Input (Optical)

The Digital Audio Input (optical) is a fiber optic connection which is coupled to a transducer which converts the digital audio data via light pulses to an electrical signal, in fact very similar in operation to an Infra-Red remote receiver. It is widely regarded as inferior to coaxial digital connections. Also known as an "optical" or "Toslink" connection. After this signal has been converted, it is sent to IS17 (Digital Audio Selector IC).

(continued)

Digital Audio Input (Coaxial)
An RCA type cable with a central conductor surrounded by an insulating material, around which is another tubular conductor (known as the screen or shield). In digital audio, the coaxial cable yields better results than Toslink (optical) due to its higher quality connection and wider signal bandwidth. This signal is sent through a buffer stage IS18 (Coaxial Buffer IC) before going into IS17 (Digital Audio Selector IC).

IS17 (Digital Audio Selector IC)
This IC receives both the optical and coaxial sources of digital audio and selects which one is sent to the DSP (Digital Signal Processor) module as an input.

DSP (Digital Signal Processor) Module
This module is a separate PWB that is mounted piggyback on the SURROUND PWB. It receives Left and Right audio in from the Perfect Volume IC and creates the following outputs; Front Right, Front Left, Rear Right, Rear Left, Center Channel, and Subwoofer. It also is capable of receiving and processing a digital audio input signal, via either coaxial or optical inputs.

SURROUND PWB OUTPUTS

Front Audio (L) and (R)
The Front Audio left and right consist of the following components; IS03 (Front Audio Control IC), IS05 (Front Audio Graphic Equalizer IC), and IA01 (Front Audio Output IC).

IS03 (Front Audio Control IC)
This IC receives two sets of left and right audio; one set is the non-DSP processed left and right input from I301 (A/V Select IC) via IS19 (Perfect Volume IC), and the other set which has been processed by the DSP module. The output of IS03 is sent to IS05 (Front Audio Graphic Equalizer IC).

IS05 (Front Audio Graphic Equalizer IC)
This IC receives the Front Audio left and right from IS03 (Front Audio Control IC) and provides the user with five frequency ranges or bands which he can manipulate by approximately 12db in both the plus and minus directions. The frequency bands are 60 Hz, 125 Hz, 1 KHz, 3 KHz, and 10 KHz. The outputs from this IC are sent to two places; IA01 (Front Audio Output IC) via connector PQU3[2,4], and also to the HiFi Output jacks located on the rear of the SURROUND PWB.

IA01 (Front Audio Output IC)
This IC is not located on the SURROUND PWB but on the POWER PWB as previously discussed on page 1-02. It is a standard TA8200AH audio output IC. The outputs from this IC are sent to the two front speakers via connectors PL[2] and PR[2].

Rear Audio (L) and (R)
The Rear Audio left and right consist of the following components; IS11 (Rear Audio Control IC), and IS16 (Rear Audio Output IC).

IS11 (Rear Audio Control IC)
This IC receives Rear Audio left and right which has been processed by the DSP module. The outputs of IS11 are sent to IS16 (Rear Audio Graphic Equalizer IC).

IS16 (Rear Audio Output IC)
This IC is also a standard TA8200AH audio output IC. It outputs speaker level audio to the Rear Speaker jacks located on the rear of the SURROUND PWB.

(continued)

Center Channel Audio (Monaural)
The Center Channel Audio consists of the following components; IS08 (Center/Subwoofer Audio Control IC), IS10 (Center Channel Audio Graphic Equalizer IC), and IS15 (Center Channel Audio Output IC).

IS08 (Center Channel / Subwoofer Audio Control IC)
This IC receives Center Channel Audio which has been processed by the DSP module. The Center Channel Audio output of IS08 is sent to IS10 (Center Channel Audio Graphic Equalizer IC).

IS10 (Center Channel Audio Graphic Equalizer IC)
This IC receives the Center Channel Audio from IS08 (Center Channel / Subwoofer Audio Control IC) and provides the user with five frequency ranges or bands which he can manipulate by approximately 12db in both the plus and minus directions. The frequency bands are 60 Hz, 125 Hz, 1 KHz, 3 KHz, and 10 KHz. The Center Channel Audio output from this IC is sent to IS15 (Center Channel Audio Output IC).

IS15 (Center Channel Audio Output IC)
This IC is also a standard TA8200AH audio output IC. It outputs speaker level audio to the center speaker via connector PCL[2].

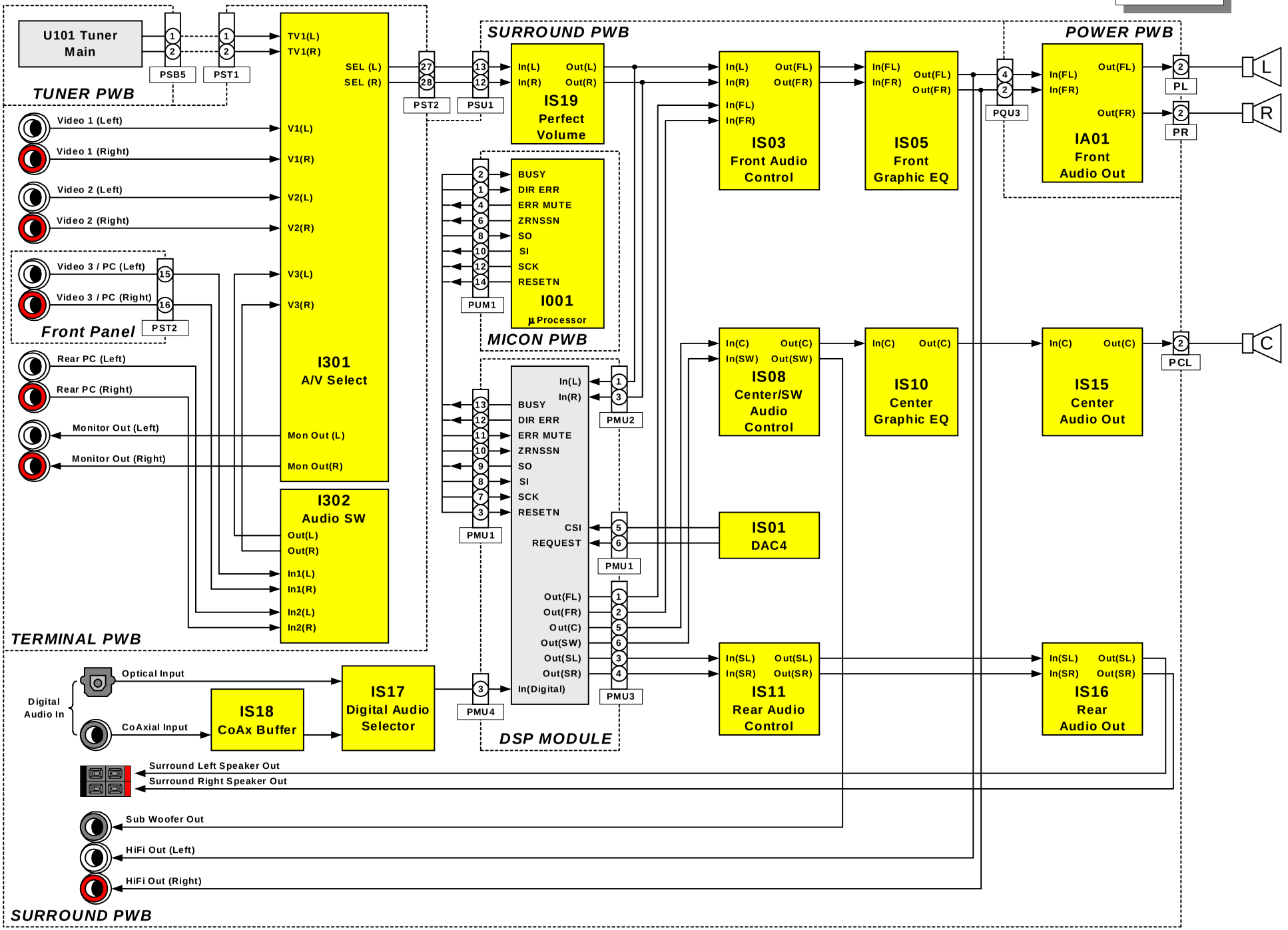
Subwoofer Audio (LFE)
The Subwoofer Audio (Low Frequency Effects) consists of IS08 (Center/Subwoofer Audio Control IC).

IS08 (Center Channel / Subwoofer Audio Control IC)
This IC receives Subwoofer (LFE) Audio which has been processed by the DSP module. The Subwoofer (LFE) audio output of IS08 is sent to the Subwoofer connector on the rear of the SURROUND PWB.

(continued)

DLP-1 Chassis Audio Block Diagram

Figure 1



DLP-1 Chassis

System Control Explanation

DLP-1 Chassis System Control Explanation

In the DLP-1 Chassis (***Figure 10***), as in many other Hitachi products, System Control starts at the microprocessor IC, I001. The following signals are generated by the microprocessor IC; (***see Figure 1***)

Clock/Data
0Clock/0Data
1Clock/1Data (also called SCL1 and SDA1)
2Clock/2Data (also called SCL2 and SDA2)
M Enable - Main Tuner Enable
P Enable - PiP Tuner Enable
FC Enable - Flex Converter Enable
MSC Enable - MultiScan Converter Enable

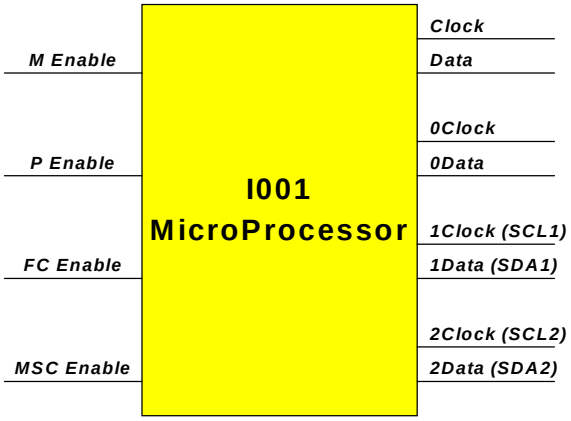


Figure 1 - System Control signals

Clock/Data

Clock and data are fed to the following circuits: Main tuner, PiP tuner, Flex Converter, and the MSC (MultiScan Converter) PWB. Additionally, each of these circuits also requires an Enable signal whenever that circuit activates. (***see Figures 2, 3, 4, and 5***) Also, note that 0Clock/0Data is only sent to the MSC PWB.

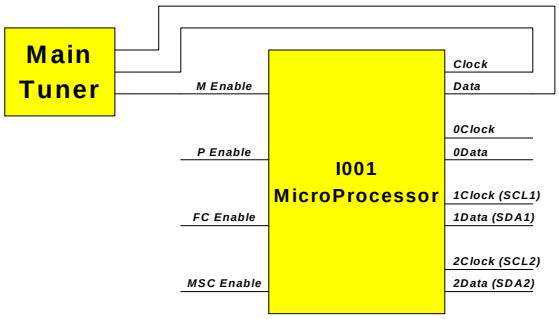


Figure 2 - Clock, Data, and Main Enable

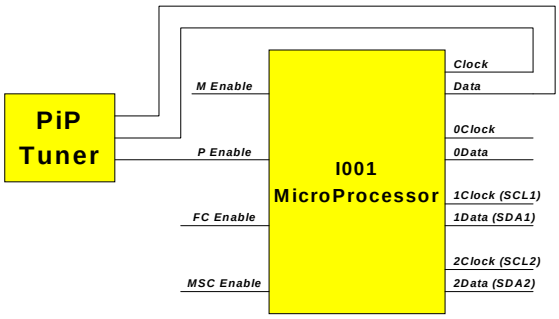


Figure 3 - Clock, Data, and PiP Enable

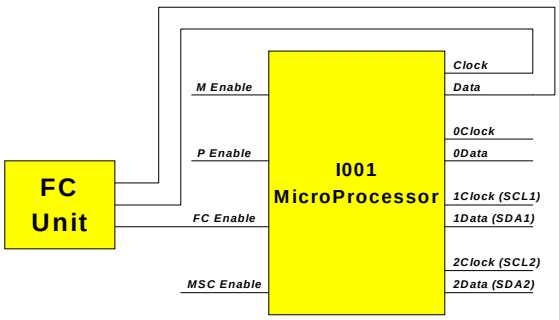


Figure 4 - Clock, Data, and Flex Converter Enable

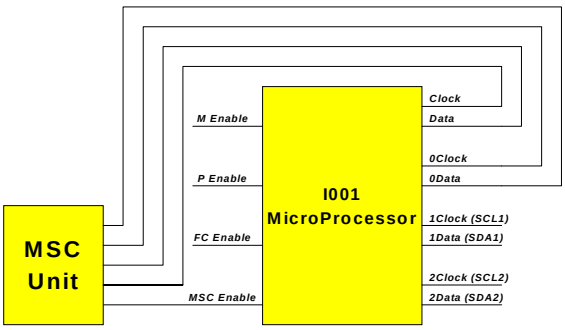


Figure 5 - Clock, Data, 0Clock, 0Data, and MultiScan Converter Enable

(continued)

1Clock/1Data (SCL1/SDA1)

The clock and data 1 lines are fed to the following: I002 E^2PROM, I004 DAC1, I003 DAC2, I017 DAC3, IS11 Rear Audio Control, and I301 A/V Select. (see ***Figure 6***). The use of DAC's (Digital to Analog Converter) are basically configured as fan-out IC's for the microprocessor. (***see Figure 7***). This allows the microprocessor IC to remain as a standard dual inline 64 pin configuration as far as the actual IC manufacturing process is concerned. Each DAC can communicate up to nine (9) separate functions back to the main microprocessor. Including the three DAC's, the clock/data 1 line communicates to 30 different devices.

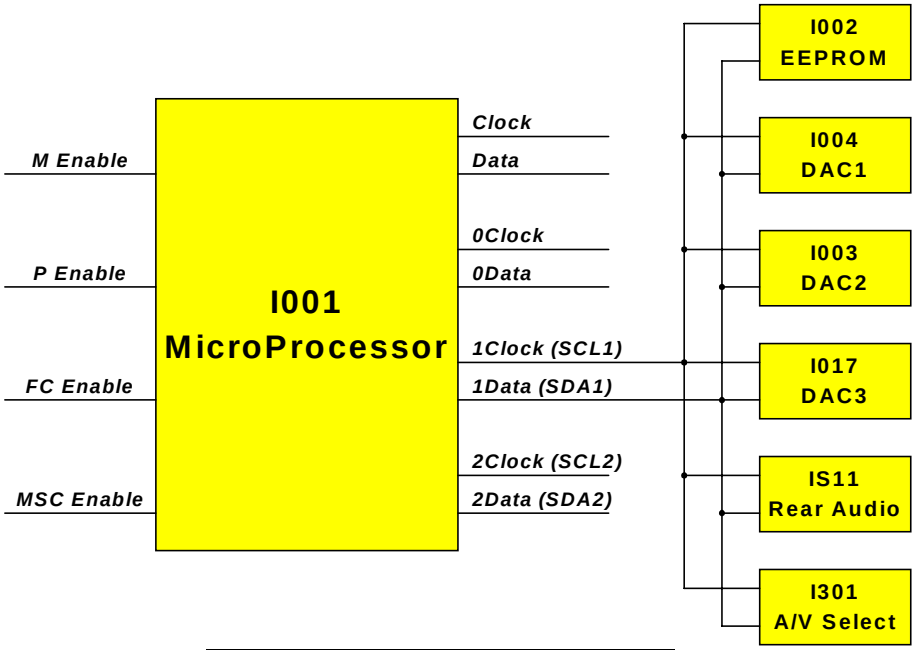


Figure 6 - 1Clock, 1Data, (SCL1, SDA1)

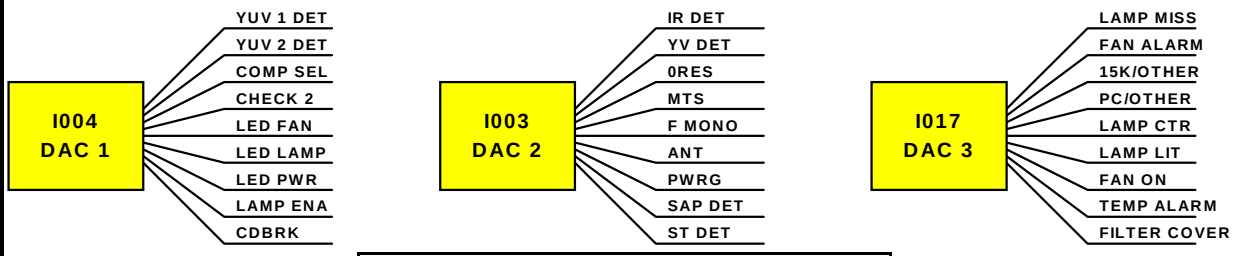


Figure 7 - DAC 1, DAC 2, and DAC 3 pin outs

(continued)

2Clock/2Data (SCL2/SDA2)

The clock and data 2 lines are fed to the following: UY01 3DYC Comb Filter, IT01 PiP 3Line Comb Filter, IX01 Y/Cb/Cr Select, I018 DAC5, IS05 Front Graphic EQ, IY01 Main NTSC processor, IL01 Main Sync processor, IK01 RGB processor, IS01 DAC4, IS08 Center/Subwoofer Control, IY02 Sub NTSC processor, IL02 Sub Sync processor, DLP PWB, IS03 Front Audio control, and IS10 Center Graphic EQ. (see ***Figure 8***). The use of DAC's (Digital to Analog Converter) are again configured as fan-out IC's for the microprocessor. (***see Figure 9***). Although it appears to be more loaded down than the SCL1/SDA1 line, the clock/data 2 line communicates to 31 different devices.

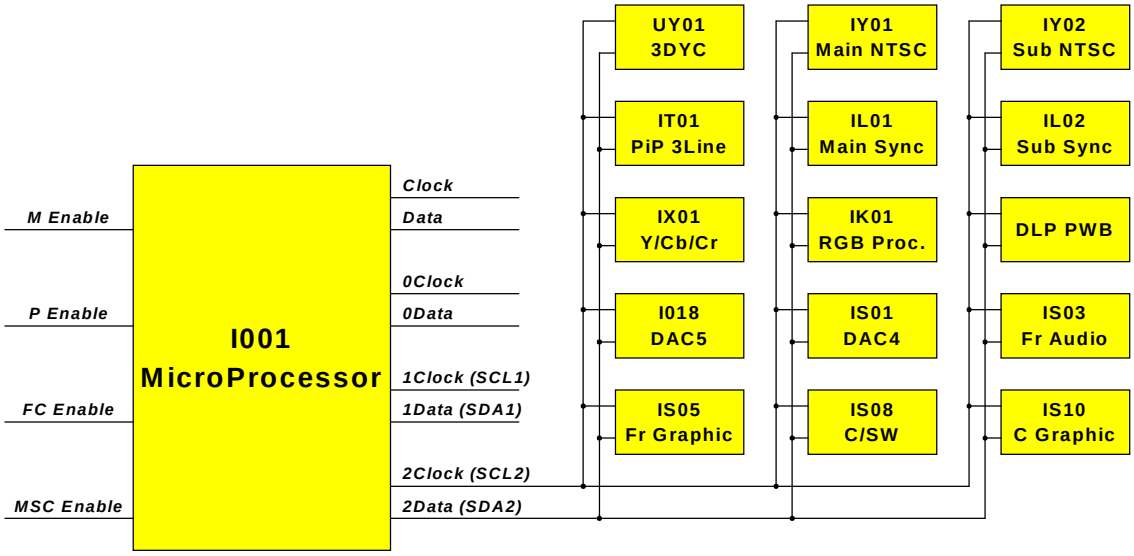


Figure 8 - 2Clock, 2Data, (SCL2, SDA2)

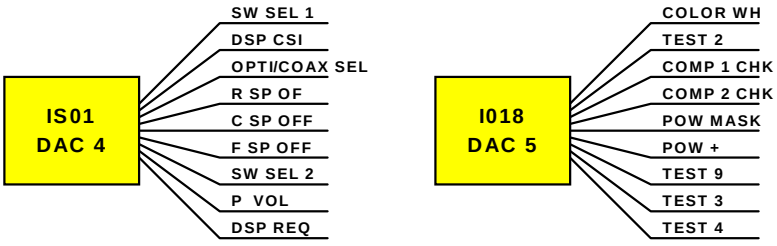


Figure 9 - DAC 4 and DAC 5 pin outs

(continued)

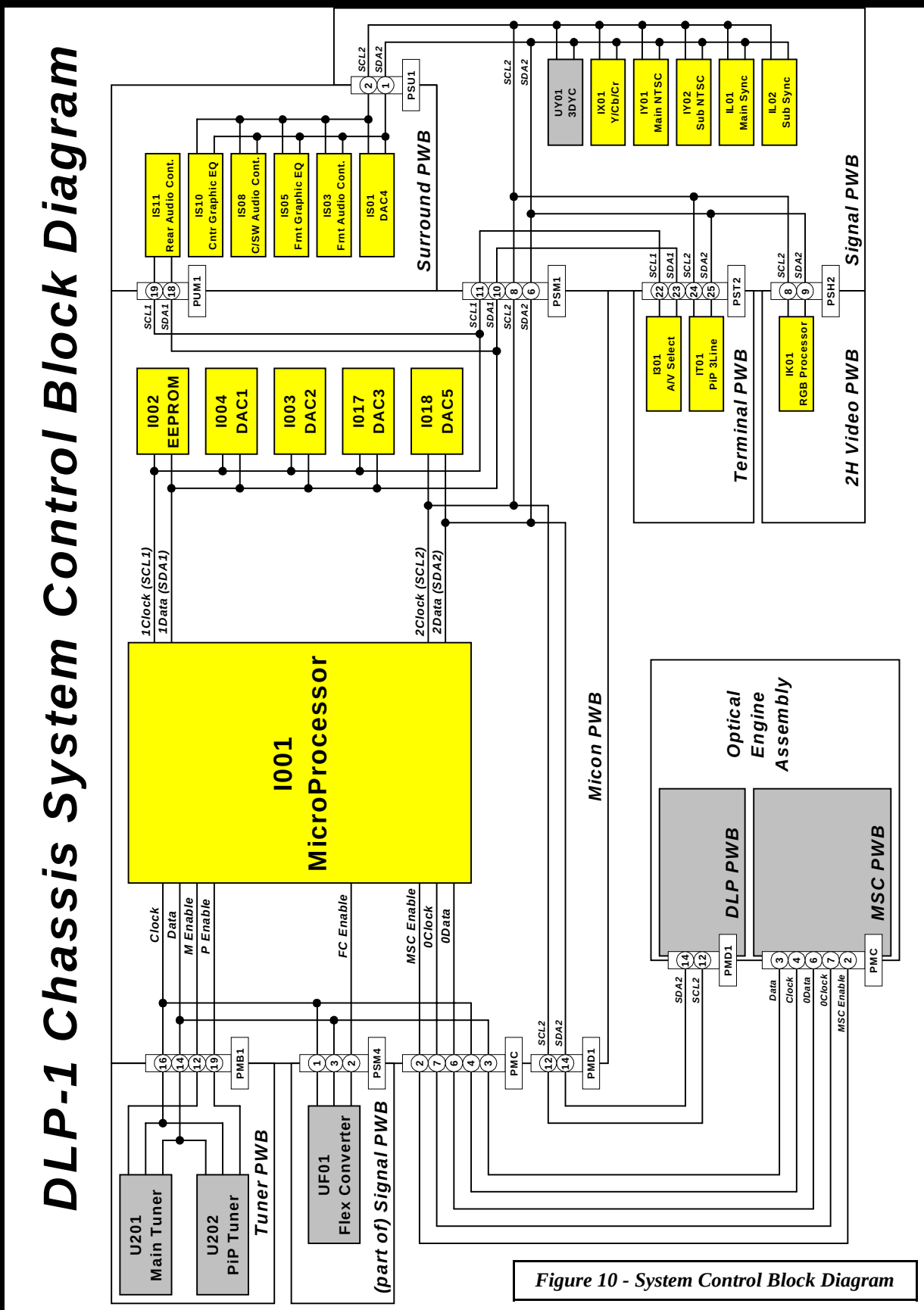


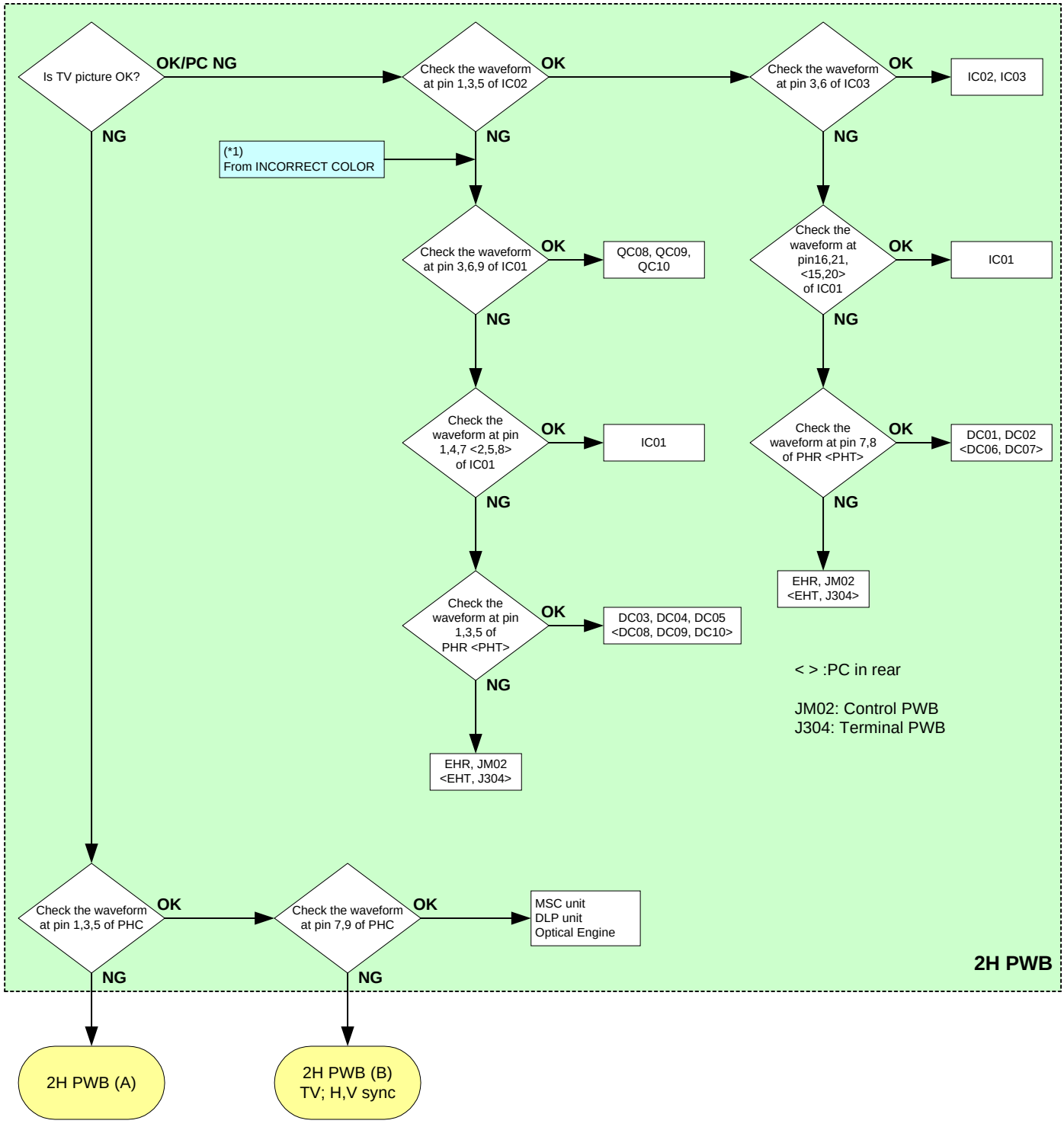
Figure 10 - System Control Block Diagram

DLP-1 Chassis

Troubleshooting

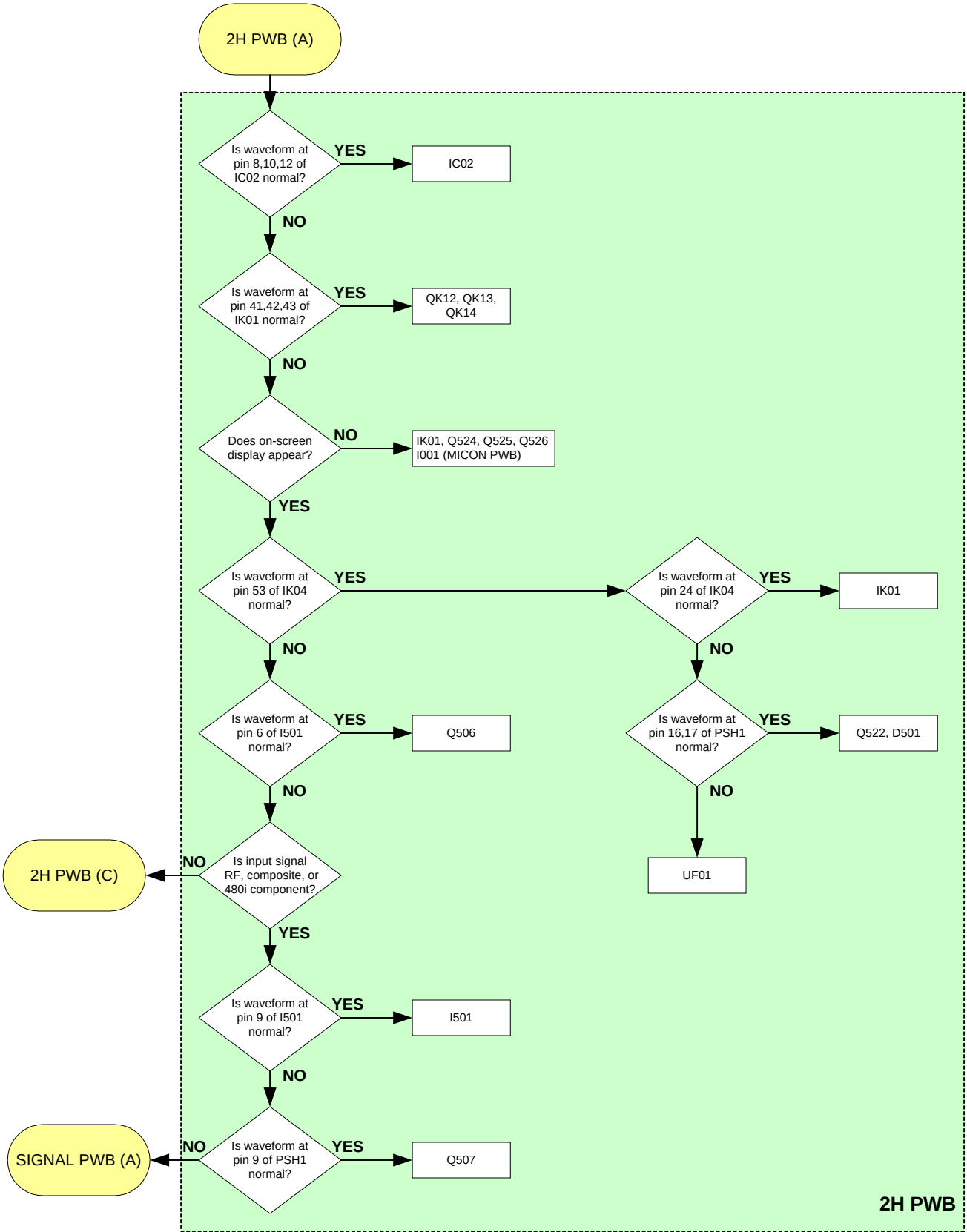
19.0 TROUBLE SHOOTING FLOW CHARTS

NO PICTURE 1



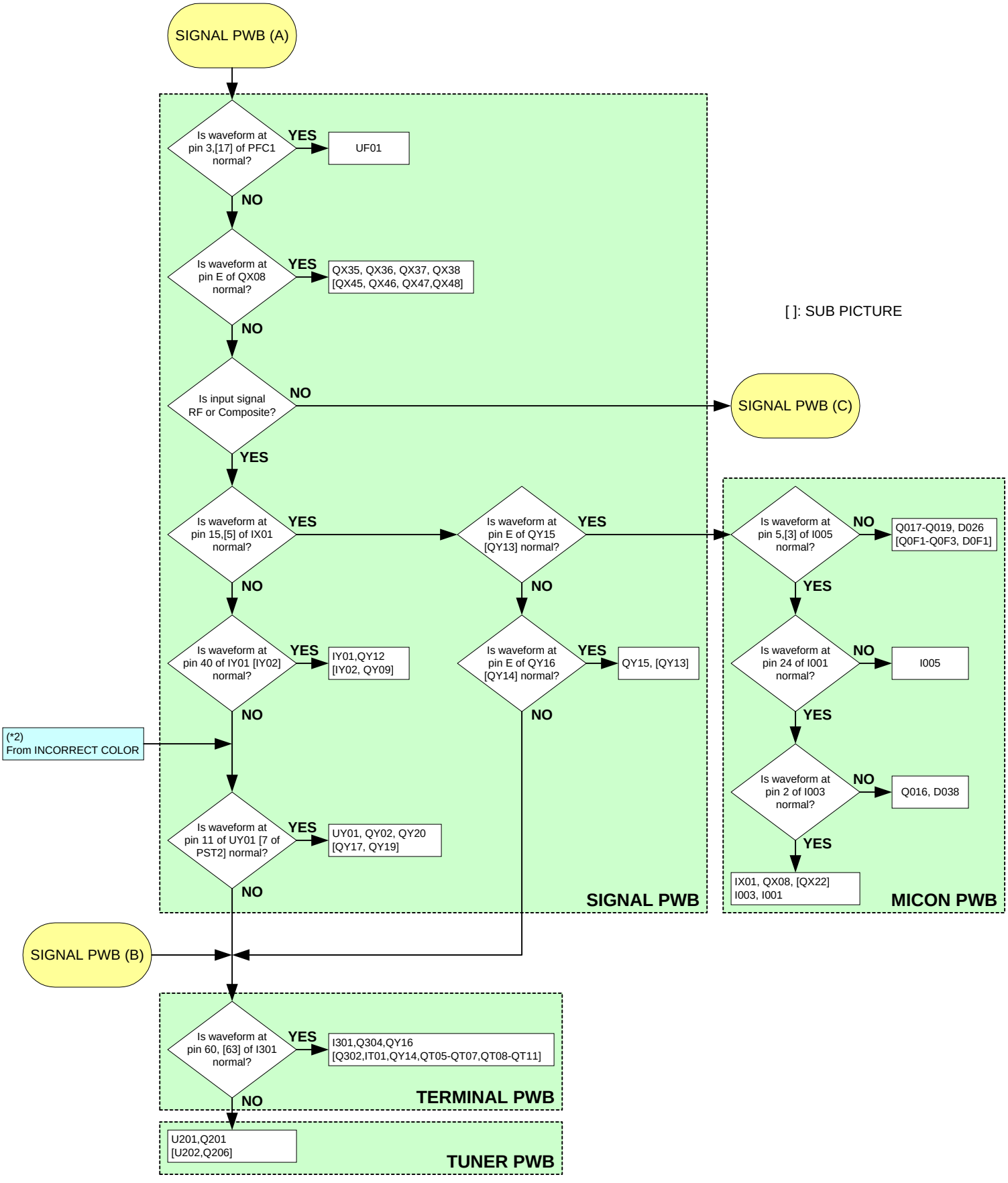
19.0 TROUBLE SHOOTING FLOW CHARTS

NO PICTURE 2



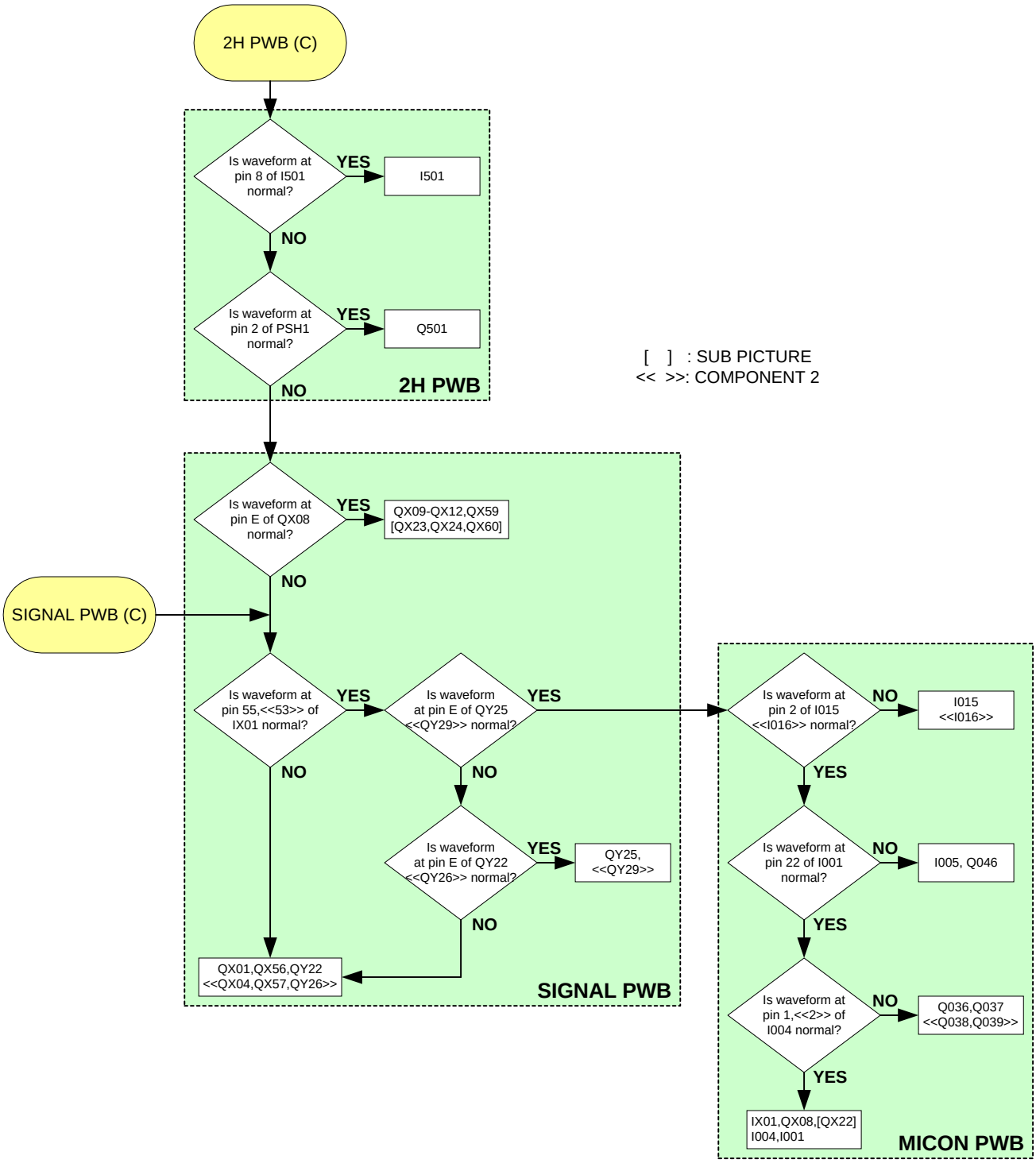
19.0 TROUBLE SHOOTING FLOW CHARTS

NO PICTURE 3



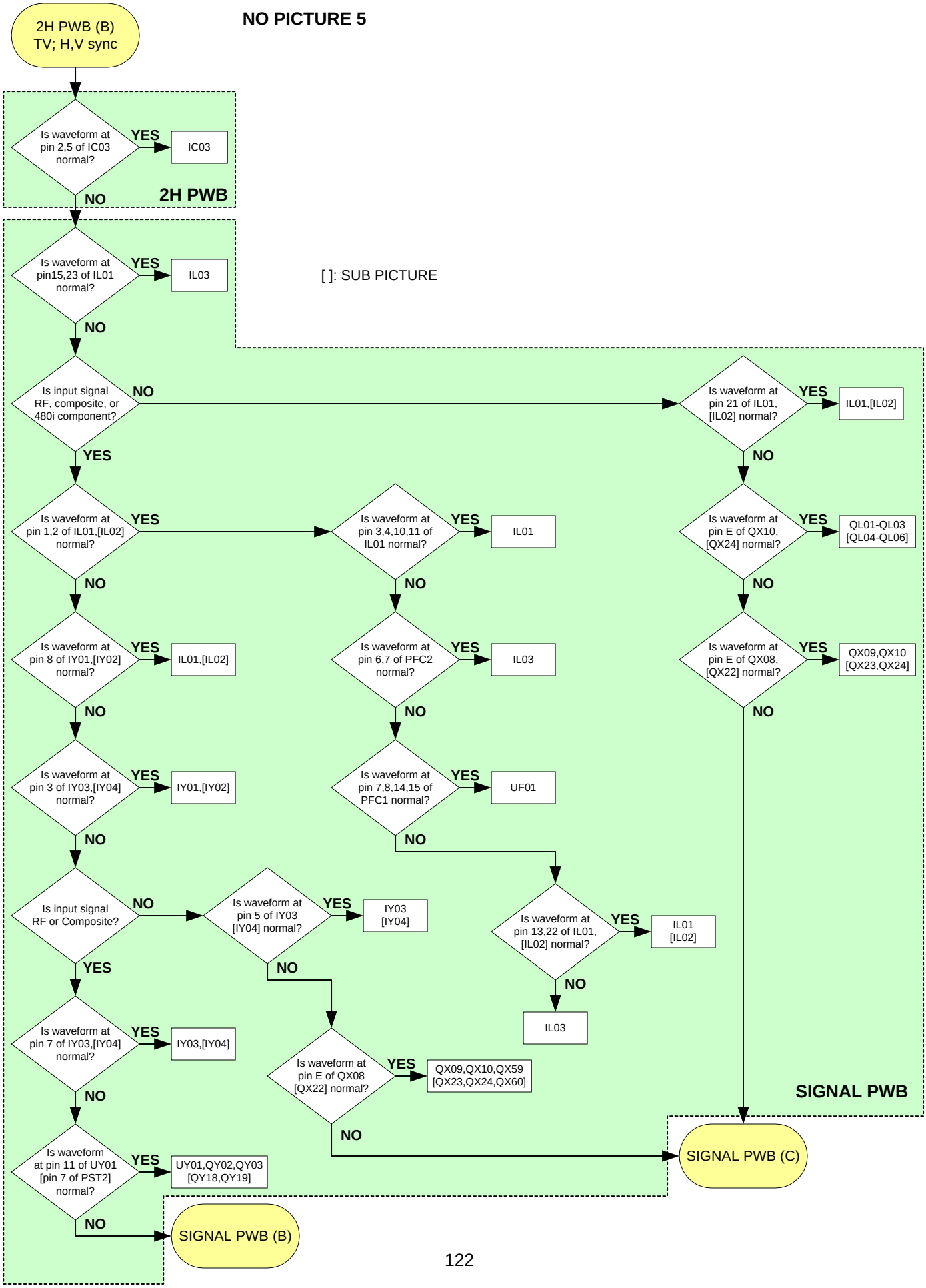
19.0 TROUBLE SHOOTING FLOW CHARTS

NO PICTURE 4



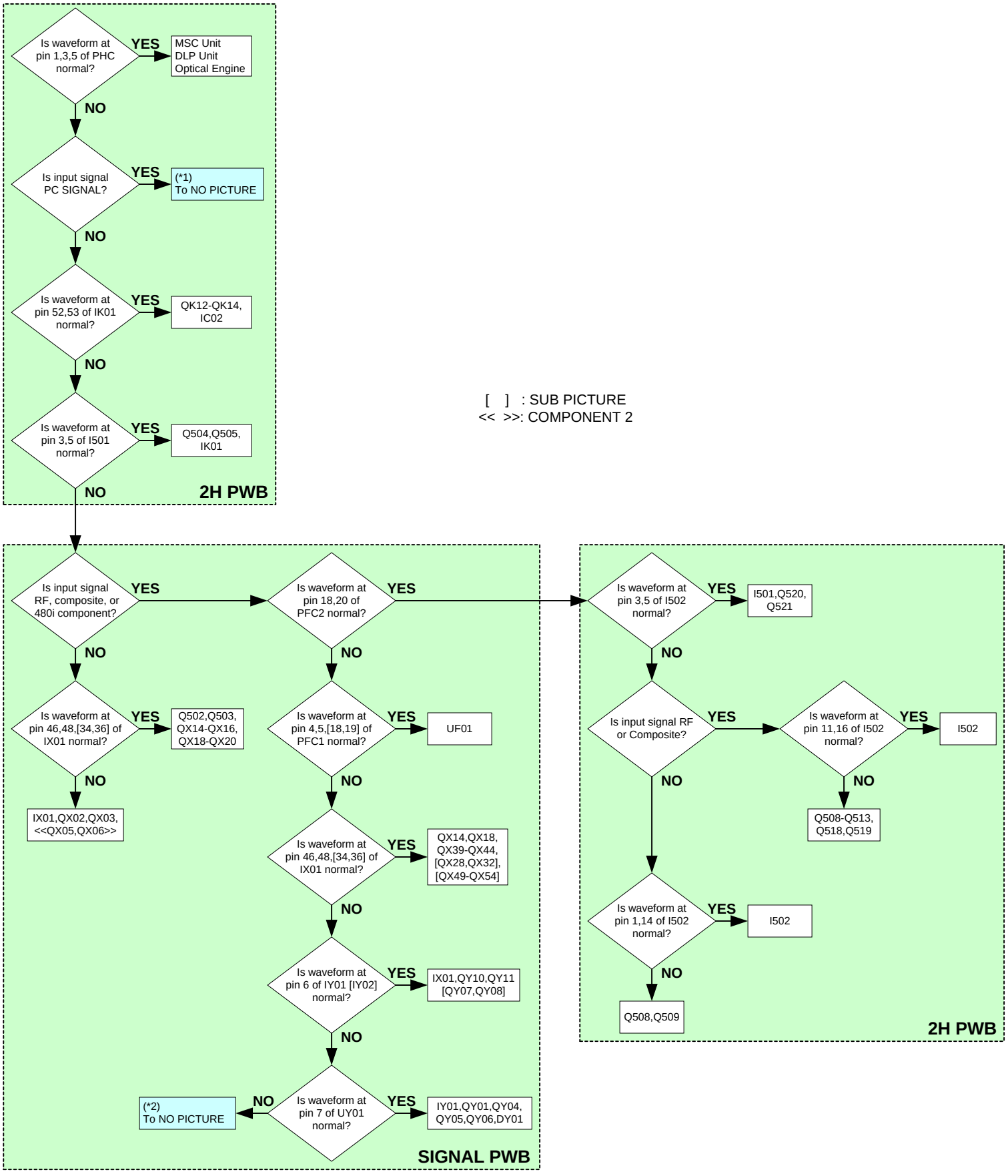
19.0 TROUBLE SHOOTING FLOW CHARTS

NO PICTURE 5



19.0 TROUBLE SHOOTING FLOW CHARTS

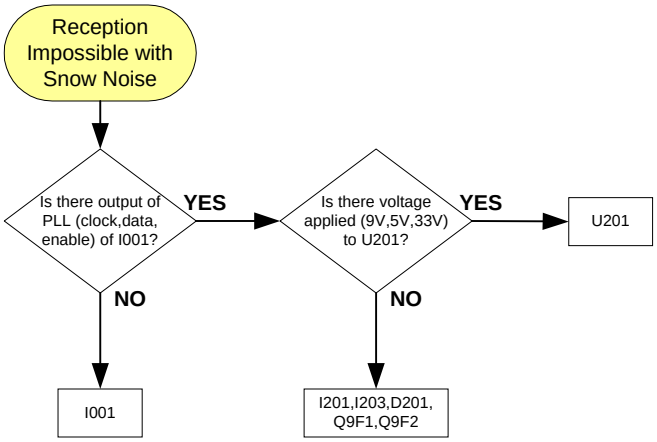
INCORRECT COLOR



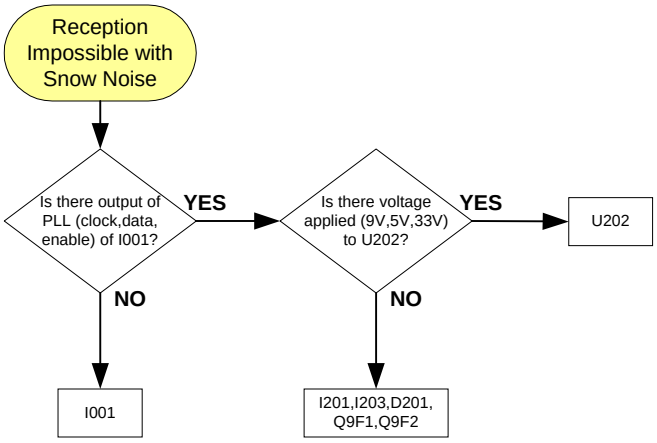
19.0 TROUBLE SHOOTING FLOW CHARTS

SNOW NOISE

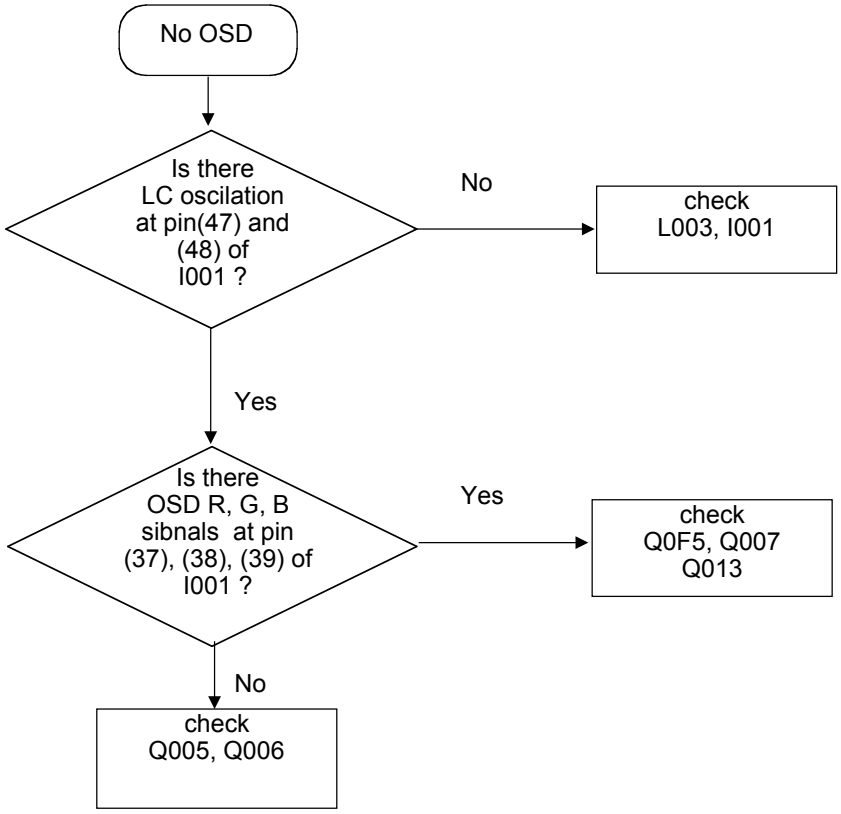
MAIN PICTURE



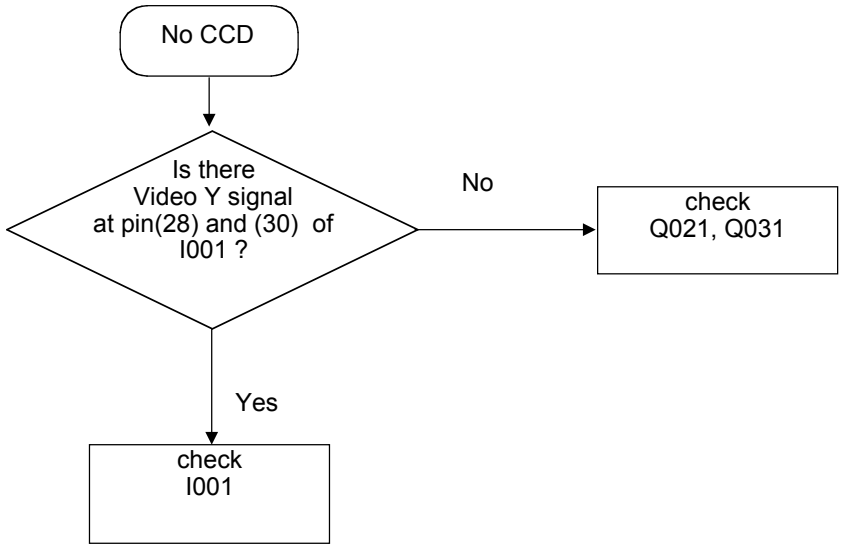
SUB PICTURE



19.0 TROUBLE SHOOTING FLOW CHARTS



19.0 TROUBLE SHOOTING FLOW CHARTS



Picture is not blocked by TV Rating/Movie Rating

