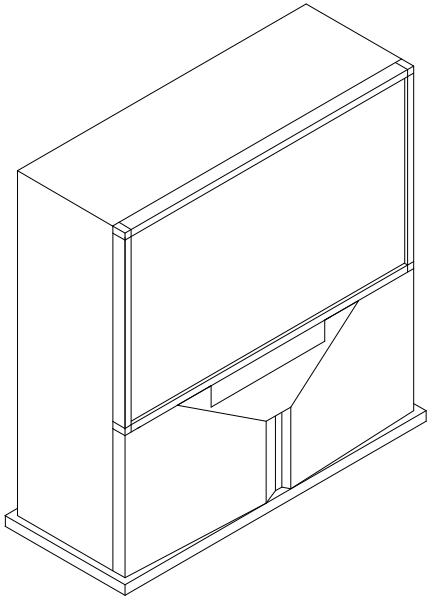
MITSUBISHI ELECTRIC

2003

Down to 1™

HIGH SPEED TROUBLESHOOTING
V20 & V21 CHASSIS



V20 Chassis		
VS-A50	WS-A48	WS-A65
VS-50111	WS-48311	WS-65311
VS-60111	WS-A55	WS-65411
	WS-55311	WS-73411
	WS-55411	

V21 Chassis		
WS-48511	WS-65511	WS-73711
WS-B55	WS-65611	
WS-55511	WS-65711	
WS-55711	WS-65712	

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Down To 1 - High Speed Troubleshooting

CONTENTS

INTRODUCTION

DOWN to 1 Goal: Isolate the faulty component 9 out of 10 times.

Required tools: Signal Generator such as Sencore VP300 or VP301

DOWN to 1™ High Speed Troubleshooting

The troubleshooting of any PTV chassis involves one of two methods. The first involves an exhaustive checking of all suspect DC and AC voltages, waveforms, and the like. This is all possible given the necessary time and equipment. The second occurs most frequently in field service, where time is often insufficient and equipment unavailable or impractical. It is then that all of a technician's practical experience must be brought to bear in order to make an educated guess as to where the product failure or difficulty may lie.
This second method is the focus of this publication and the ***DOWN to 1*** discipline.

Color, Pattern and Perception

Observation is key to an overall evaluation strategy. The details gathered from a precise observation can go a long way toward arriving at a repair solution in a timely and efficient manner. With this understanding, MDEA has brought the combined technical expertise of its years to bear in creation of the ***DOWN to 1™*** method. For simplicity and easy memorization, color, pattern and perception are employed as the primary tools.

Color

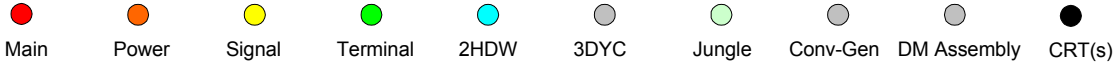
- Each component has its corresponding unique color.

Pattern

- For each troubleshooting case, the component to replace is identified by an oval color pad at the terminating end of its path.

Perception

- A perceived problem provides deductive reasoning clues to its solution.



SAFETY PRECAUTIONS

NOTICE: Observe all cautions and safety related notes located inside the receiver cabinet and on the receiver chassis.

WARNING:

1. Operation of this receiver outside the cabinet or with the cover removed presents a shock hazard from the receiver's power supplies. Work on the receiver should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high voltage equipment.
2. Do not install, remove or handle the picture tubes in any manner unless shatterproof goggles are worn. People not so equipped should be kept away while the picture tube is being handled. Keep the picture tube away from the body while handling.
3. When service is required, observe the original lead dress. Extra precaution should be taken to assure correct lead dress in the high voltage area. Where a short-circuit has occurred, replace those components that indicate evidence of overheating.

X-Radiation warning

The surface of the cathode ray tubes (CRTs) may generate X-Radiation, so take proper precautions when servicing. It is recommended that a lead apron be used for shielding while handling the CRT. Use this method if possible.

When replacing the CRTs, use only the designated replacement part since it is a critical component with regard to X-Radiation. High voltage must be set as prescribed in the V21 Service Manual under the section titled Electrical Adjustments.

Leakage current check

Before returning the receiver to the customer, it is recommended that leakage current be measured according to the following methods.

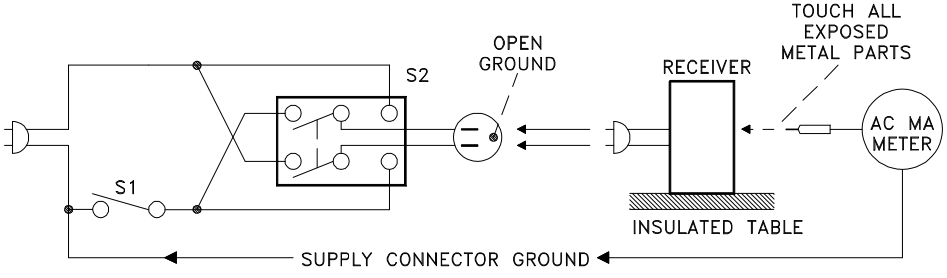
1. *Cold Check*
   With the alternating current (AC) plug removed from the AC source, place a jumper across the two AC plug prongs. Connect one lead of an ohm meter
   to the AC plug and touch the other lead to each exposed metal part (i.e. antennas, handle bracket, metal cabinet, screw heads, metal overlay, control shafts, (etc.), particularly any exposed metal part that has a return path to the chassis. The resistance of the exposed metal parts having a return path to the chassis **should be a minimum of 1Mega Ohm**. Any resistance below this value indicates an abnormal condition and requires corrective action.

(continued next page)

SAFETY PRECAUTIONS
(continued from preceding page)

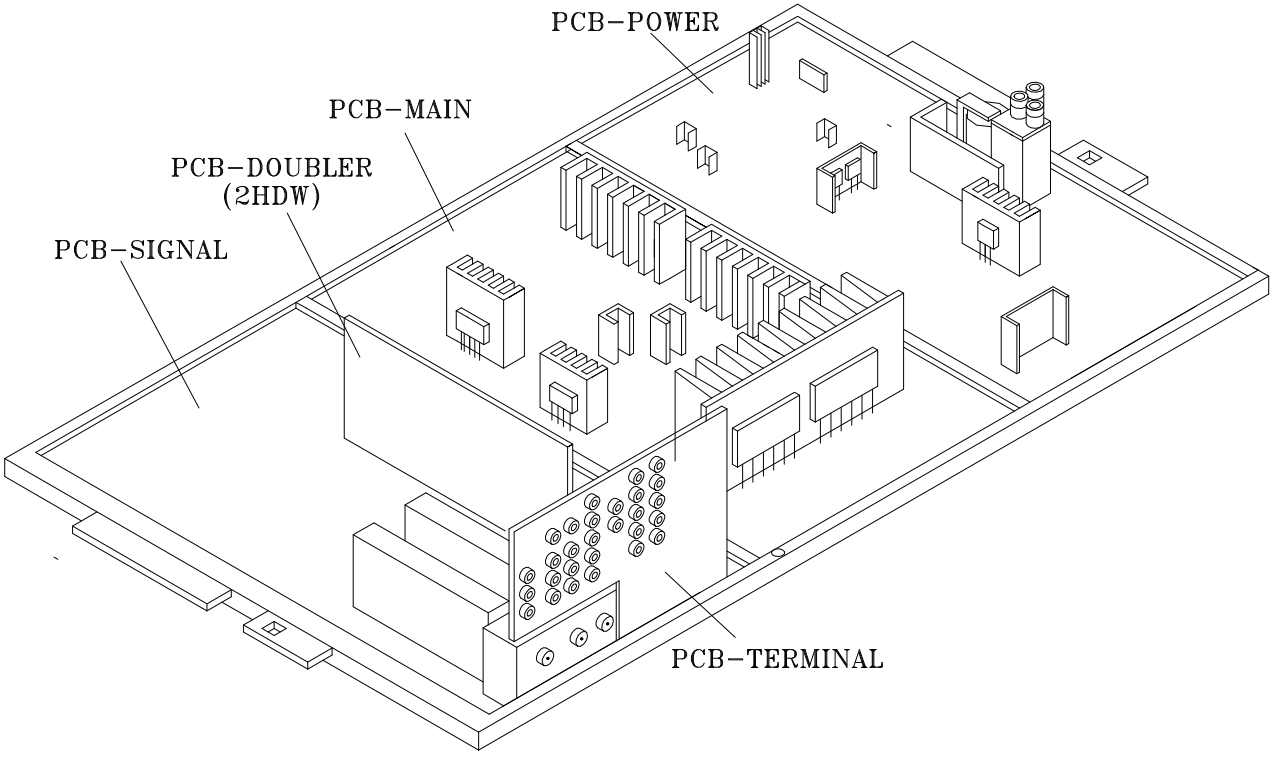
2. Hot Check ...Use the circuit shown below to perform the hot check test.

1. Keep switch S1 open and connect the receiver to the measuring circuit. Immediately after connection, and with the switching devices of the receiver in their operating positions, measure the leakage current for both positions of switch S2.
2. Close switch S1, energizing the receiver. Immediately after closing switch S1, and with the switching devices of the receiver in their operating positions, measure the leakage current for both positions of switch S2. Repeat the current measurements of items 1 and 2 after the receiver has reached thermal stabilization. **The leakage current must not exceed 0.5 milliampere (mA).**

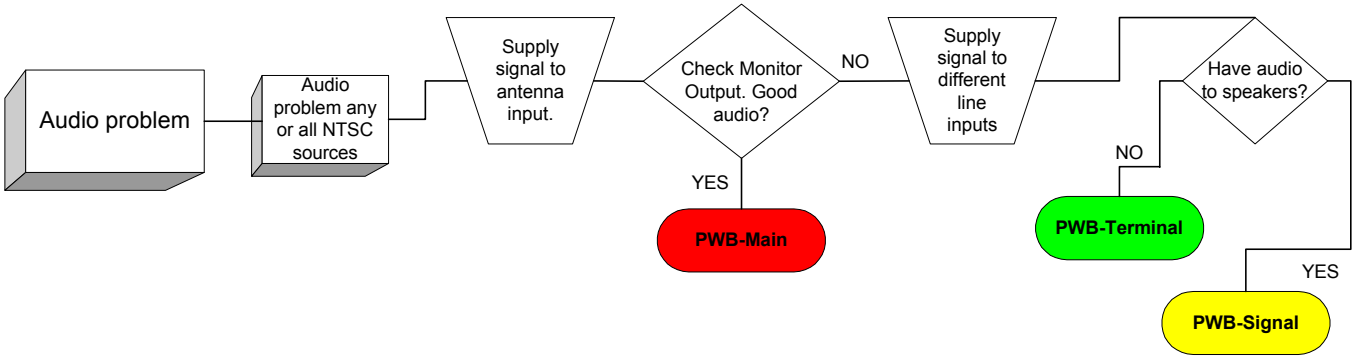


V20 Chassis - PCB Functions and Locations

PCB-Terminal	PCB-Signal	PCB-Doubler	PCB-Main	PCB-Power
A/V Inputs	Control uPC	PIP-POP	Horizontal Defl.	Power Supplies
A/V Selection	Tuning	Picture Format	Vertical Defl.	High Voltage
3D-Y/C	VCJ	3:2 Pull Down	Audio Amp.	SVM
NTSC Video Decoders	Convergence Generator	Line Double 480i to 480p	Convergence Amps.	
			DBF	

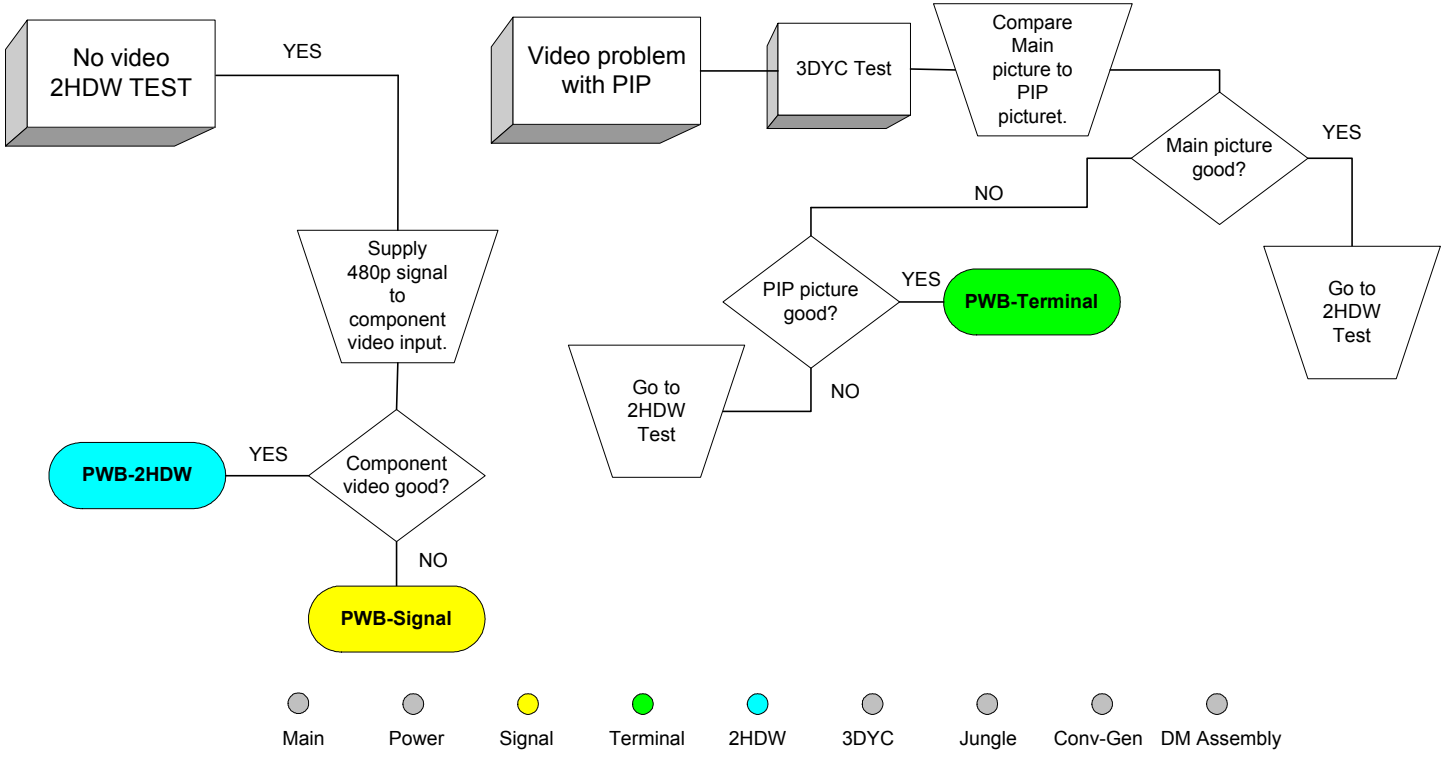


V20 Chassis - Audio Problem



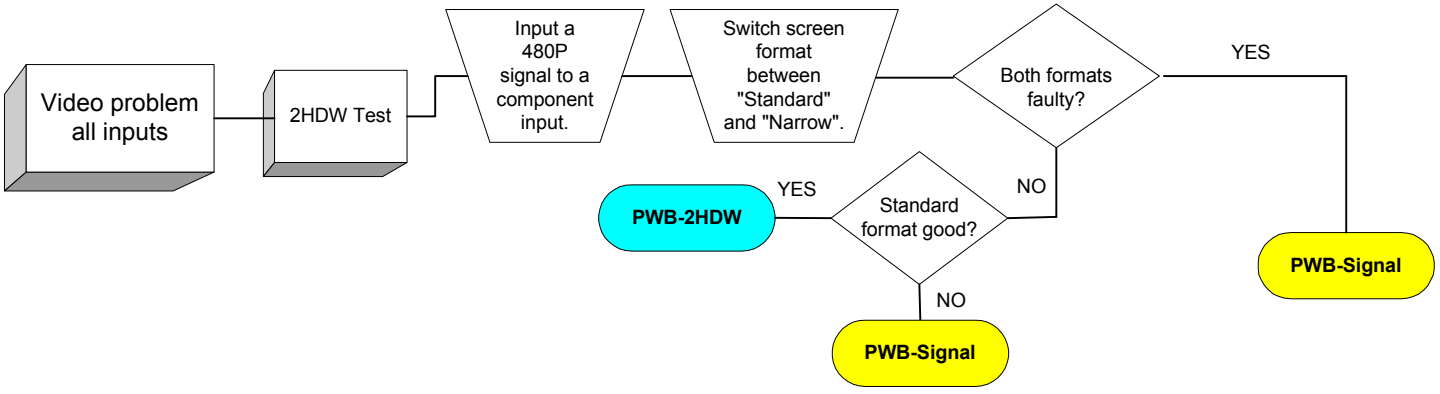
V20 Chassis - Video Problem

Video Problem - 1



V20 Chassis - Video Problem

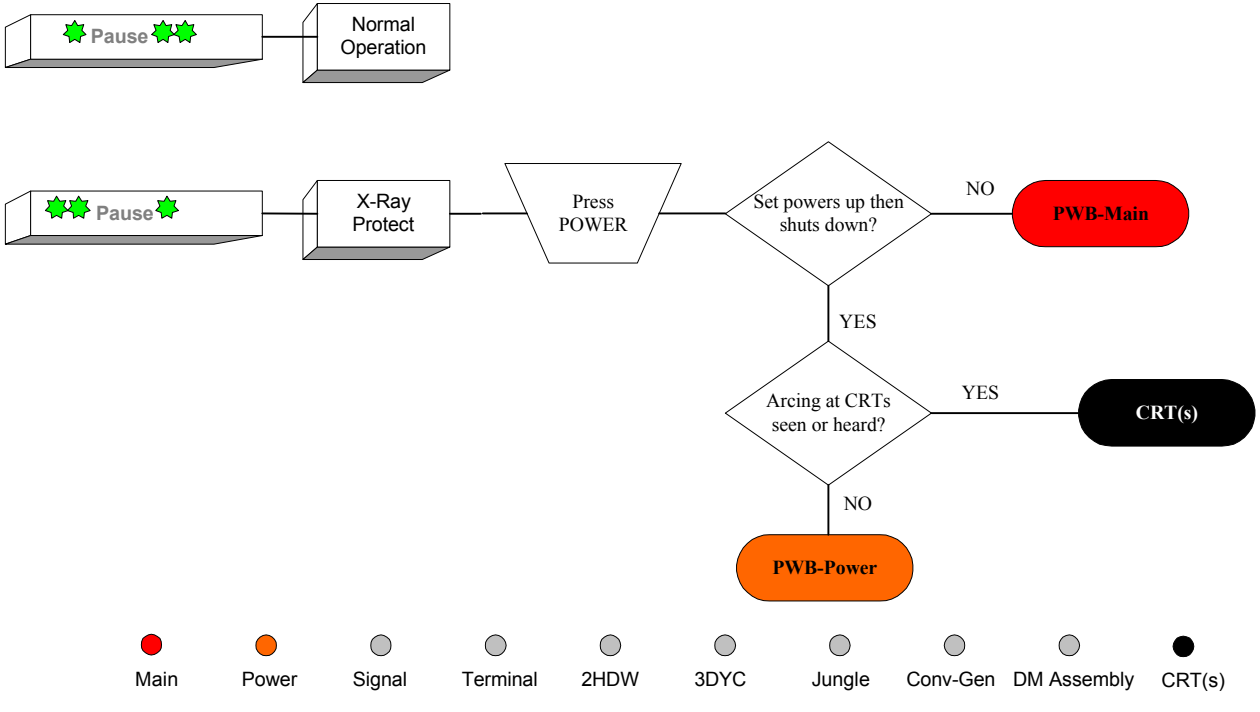
Video Problem - 2



V20 Chassis - Shut-Down Problem

Shut-Down Problem - 1

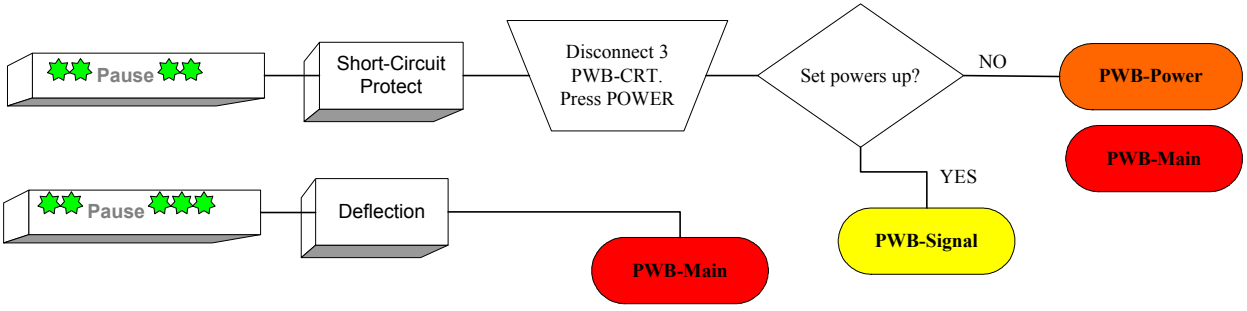
With the set OFF, Press and hold the Front Panel "Device" and "Menu" buttons for five seconds
Observe the flashing pattern of the front panel L.E.D.

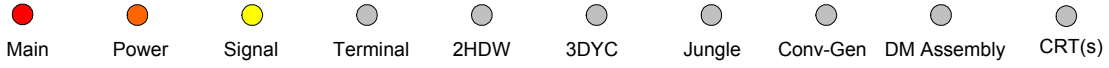


Shut-Down Problem

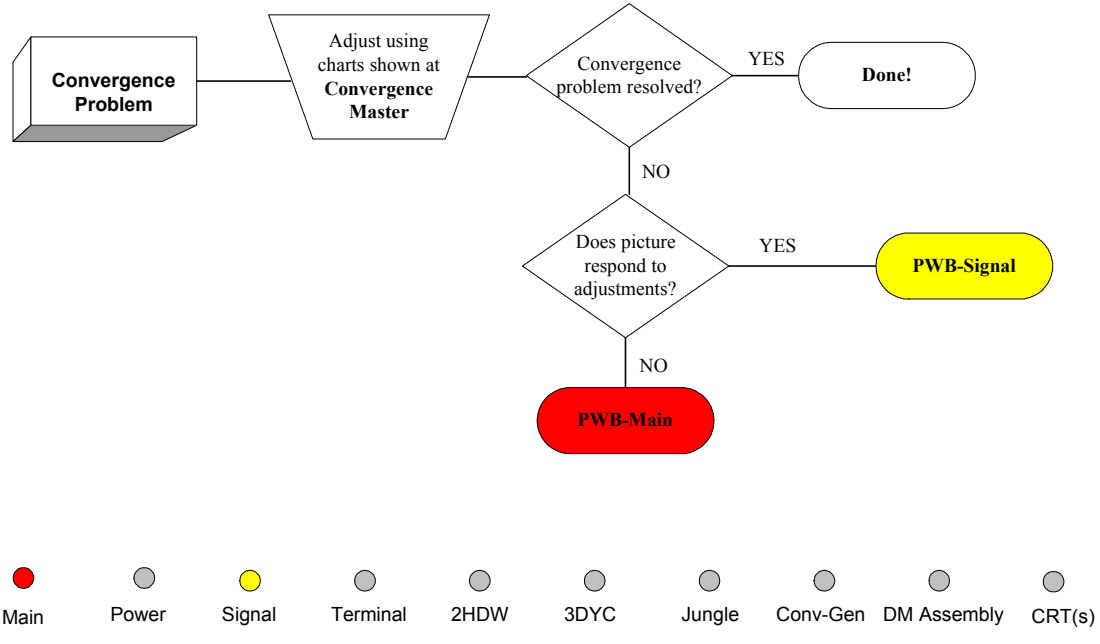
Shut-Down Problem - 2

With the set OFF, Press and hold the Front Panel "Device" and "Menu" buttons for five seconds
Observe the flashing pattern of the front panel L.E.D.





V20 Chassis - Convergence Problem



V20 Chassis - Convergence Master

CONV MISC. **MENU-2-2-5-9-6**

Item#	Abbrev.	Description	Data Range	SD	HD
1	HVOL	HV Adjust	0~352	150	150
2	VCNT	V-saw amplitude	0~127	29	29
3	VSTR	V-saw start timee	0~127	0	10
4	VOFS	V-saw offset	0~127	10	8
5	STLN	Start line	0~127	38	26
6	FPHS	Fine phase	0~352	296	288
7	CPHS	Coarse phase	0~31	15	15
8	HOFS	H-saw offset	0~127	22	22
9	DPHS	DF coarse horiz phase	0~31	1	1
10	DOFS	DF offset	0~127	34	34
11	TPHS	Test Pattern phase	0~352	39	31
12	TPVD	Test Pattern Vert. Position	0~127	22	39
13	ODEV	Odd/Even detection	0~352	200	125
14	HRTC	H-saw retrace	0~3	1	1
15	DRTC	DF retrace	0~3	1	1
16	DAC	External DAC selection	0~1	1	1
17	EPWP	EEPROM write protection	0~1	0	0

COARSE CONV GREEN (MENU-2-2-5-9-5)

#	Abbrev.	Description	WS-48311		VS-50111		WS-55311		WS-55411		VS-60111		WS-65311		WS-65411		WS-73411	
			SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD
1	HSTA	Horiz. Position	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	VSTA	Vert. Position	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	SKEW	Skew (Y axis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	TILT	Tilt (X axis)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	HWID	Width	0	10	5	5	20	20	0	0	5	5	0	0	0	0	0	0
6	HLIN	Horiz. Linearity	0	0	15	15	0	0	10	10	15	15	10	10	10	10	10	10
7	SPCC	Side PC Corr.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	HKEY	Horiz. Keystone	0	17	0	0	0	17	10	10	0	0	0	0	0	0	0	0
9	TBPC	Top/Bottom PC	-200	-169	-150	-150	-180	-190	-200	-190	-150	-150	-200	-170	-200	-170	-200	-180
10	VKEY	Vert. Keystone	0	14	0	20	0	10	15	10	0	20	15	10	15	10	15	10
11	VWID	Height	11	17	40	30	20	30	30	30	40	30	30	30	30	30	30	30
12	VLIN	Vert. Linearity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

COARSE CONV RED (MENU-2-2-5-9-5)

#	Abbrev.	Description	WS-48311		VS-50111		WS-55311		WS-55411		VS-60111		WS-65311		WS-65411		WS-73411	
			SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD
1	HSTA	Horiz. Position	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
2	VSTA	Vert. Position	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	SKEW	Skew (Y axis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	TILT	Tilt (X axis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	HLIN	Horiz. Linearity	-195	-170	-140	-125	-150	-170	-180	-170	-140	-125	-150	-150	-150	-150	-220	-190
6	HWID	Width	22	30	5	0	0	0	0	0	5	0	0	0	0	0	0	0
7	VKEY	Vert. Keystone	-100	-85	15	-87	-70	-90	-100	-95	15	-87	-90	-70	-90	-70	-100	-110
8	VWID	Height	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	VLIN	Vert. Linearity	0	0	0	0	20	20	0	0	0	0	0	0	0	0	0	0
10	TBPC	Top/Bottom PC	-200	-169	-150	-150	20	20	20	20	-150	-150	20	20	20	20	20	20
11	SDBW	Side Bow	0	0	0	0	30	30	30	30	0	0	30	30	30	30	30	30

COARSE CONV BLUE (MENU-2-2-5-9-5)

#	Abbrev.	Description	WS-48311		VS-50111		WS-55311		WS-55411		VS-60111		WS-65311		WS-65411		WS-73411	
			SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	HD
1	HSTA	Horiz. Position	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50
2	VSTA	Vert. Position	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	SKEW	Skew (Y axis)	0	0	0	10	0	0	0	0	0	10	0	0	0	0	0	0
4	TILT	Tilt (X axis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	HLIN	Horiz. Linearity	190	165	150	160	160	175	175	170	150	160	160	150	160	150	230	200
6	HWID	Width	-14	-25	-20	-30	0	0	0	0	-20	-30	0	0	0	0	0	0
7	VKEY	Vert. Keystone	100	90	75	75	75	80	70	75	75	75	90	65	90	65	80	90
8	VWID	Height	0	0	-20	-20	0	0	0	0	-20	-20	0	0	0	0	0	0
9	VLIN	Vert. Linearity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	TBPC	Top/Bottom PC	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
11	SDBW	Side Bow	0	0	0	0	-30	-30	-30	-30	0	0	-30	-30	-30	-30	-30	-30

V20 - Parts List

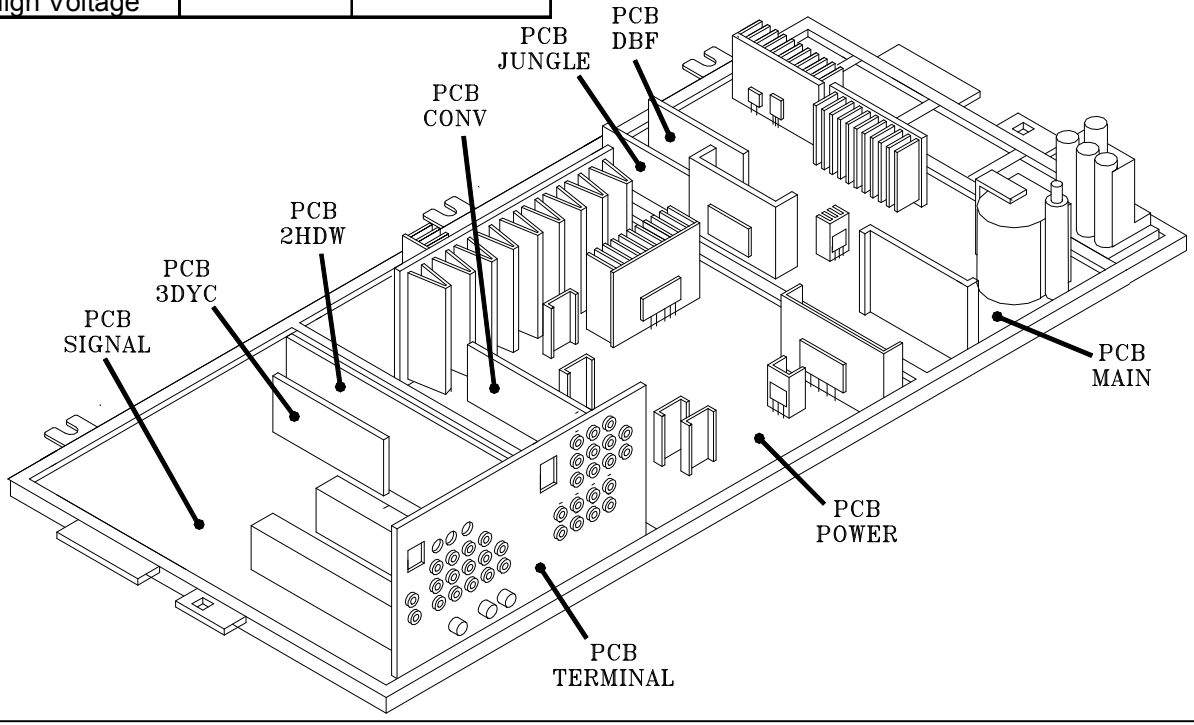
[#] Model Legend:
(1) VS-50111, (2) VS-60111, (3) WS-48311, (4) WS-55311, (5) WS-55411, (6) WS-65311, (7) WS-65411, (8) WS-73411, (9) VS-A50, (10) WS-A48, (11) WS-A55, (12) WS-A65

Part #	Part Name & Description	Reff[#]
	TUBES	
251C215010	ASSY-CRT-RED	1
251C215020	ASSY-CRT-GREEN	1
251C215030	ASSY-CRT-BLUE	1
251C215040	ASSY-CRT-RED	2
251C215050	ASSY-CRT-GREEN	2
251C215060	ASSY-CRT-BLUE	2
251C216010	ASSY-CRT-RED	3
251C216020	ASSY-CRT-GREEN	3
251C216030	ASSY-CRT-BLUE	3
251C216040	ASSY-CRT-RED	4
251C216050	ASSY-CRT-GREEN	4
251C216060	ASSY-CRT-BLUE	4
251C216070	ASSY-CRT-RED	5
251C216080	ASSY-CRT-GREEN	5
251C216090	ASSY-CRT-BLUE	5
251C217010	ASSY-CRT-RED	6
251C217020	ASSY-CRT-GREEN	6
251C217030	ASSY-CRT-BLUE	6
251C217040	ASSY-CRT-RED	7
251C217050	ASSY-CRT-GREEN	7
251C217060	ASSY-CRT-BLUE	7
251C217070	ASSY-CRT-RED	8
251C217080	ASSY-CRT-GREEN	8
251C217090	ASSY-CRT-BLUE	8
251C215070	ASSY-CRT-RED	9
251C215080	ASSY-CRT-GREEN	9
251C215090	ASSY-CRT-BLUE	9
251C218070	ASSY-CRT-RED	10
251C218080	ASSY-CRT-GREEN	10
251C218090	ASSY-CRT-BLUE	10
251C218010	ASSY-CRT-RED	11
251C218020	ASSY-CRT-GREEN	11
251C218030	ASSY-CRT-BLUE	11
251C218040	ASSY-CRT-RED	12
251C218050	ASSY-CRT-GREEN	12
251C218060	ASSY-CRT-BLUE	12
	PRINTED CIRCUIT BOARDS	
930B884001	ASSY-PWB-SIGNAL	3,4,6
930B884002	ASSY-PWB-SIGNAL	5,7
930B884003	ASSY-PWB-SIGNAL	1,2
930B884004	ASSY-PWB-SIGNAL	8
930B884006	ASSY-PWB-SIGNAL	9
930B884005	ASSY-PWB-SIGNAL	10,11,12
930B885001	ASSY-PWB-MAIN	3,4,5,10,11
930B885002	ASSY-PWB-MAIN	6,7,12
930B885003	ASSY-PWB-MAIN	1,2,9
930B885004	ASSY-PWB-MAIN	8
930B886001	ASSY-PWB-POWER	3,4,5,6,7,10,11,12
930B886002	ASSY-PWB-POWER	1,2,9
930B886003	ASSY-PWB-POWER	8
930B887001	ASSY-PWB-TERMINAL	3,4,5,6,7,10,11,12
930B887002	ASSY-PWB-TERMINAL	1,2,9
935C995001	ASSY-PWB-CRT	
935C996001	ASSY-PWB-DOUBLER	
935D619001	ASSY-PWB-PREAMP	1,2,3,4,6,9,10,11,12
935D619002	ASSY-PWB-PREAMP	5,7,8
935D620001	ASSY-PWB-FRONT	
935D621001	ASSY-PWB-CONTROL	

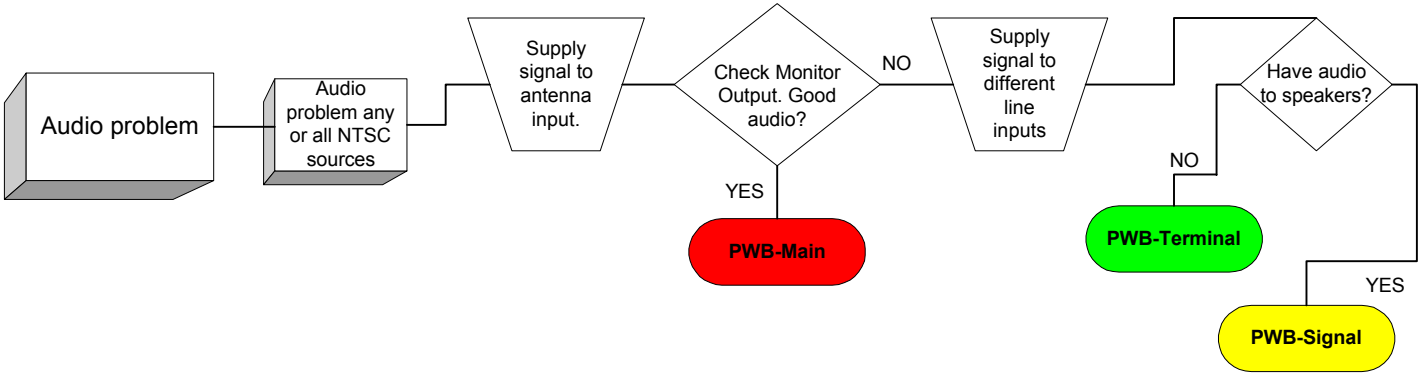
V21 Chassis - PCB Functions and Locations

PCB-Terminal	PCB-3DYC	PCB-Signal	PCB-2HDW	PCB-Conv
A/V Inputs	3D-Y/C	Control uPC	PIP-POP	Convergence
A/V Selection	NTSC Video	Tuning	Picture Format	Generator
	Decoders	VCJ	3:2 Pull Down	
			Line Double 480i to 480p	

PCB-Power	PCB-Main	PCB-Jungle	PCB-DBF
Power Supplies	Vertical Defl.	Vert Drive	Dyn. Focus
Audio Amp.	Horizontal Defl.	Horiz. Drive	
Conv. Amps	High Voltage		

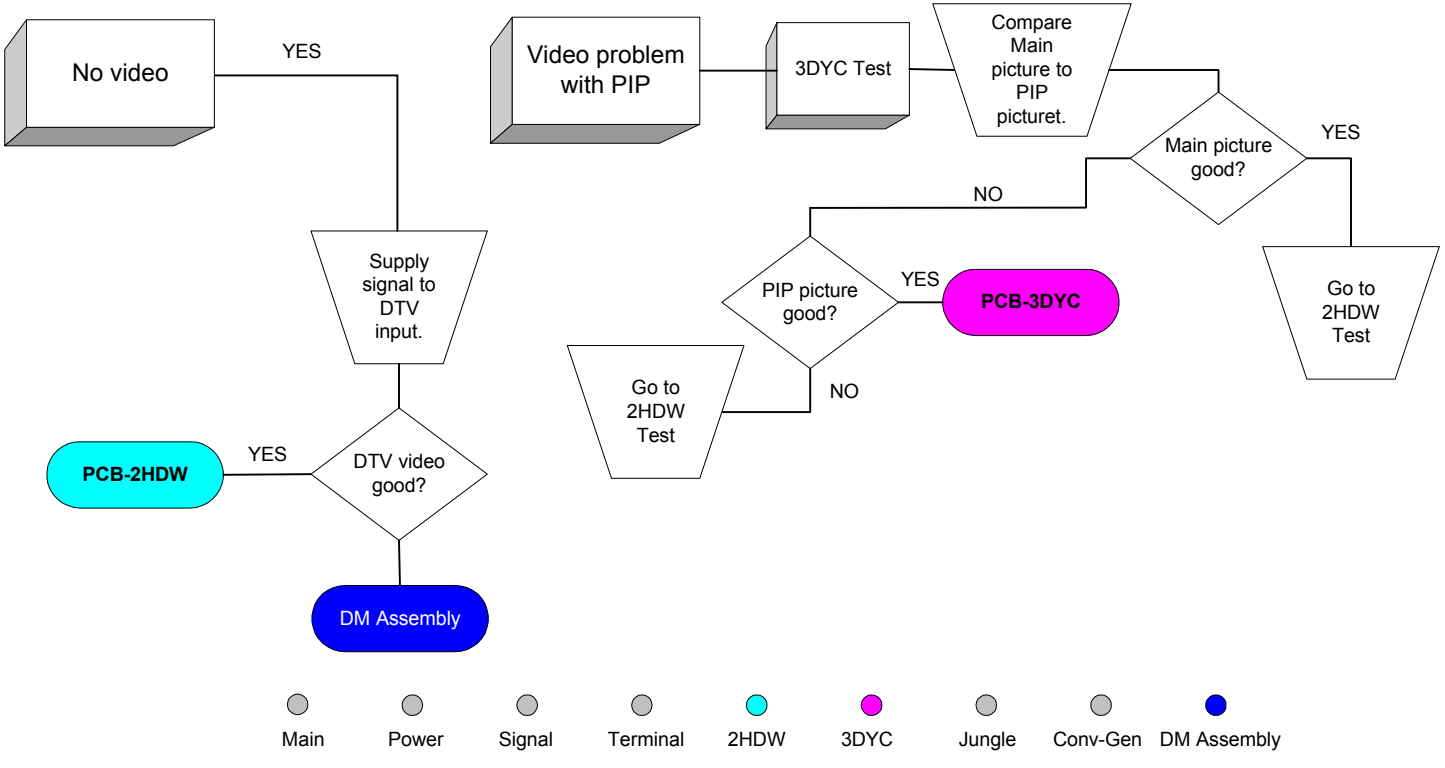


V21 Chassis - Audio Problem



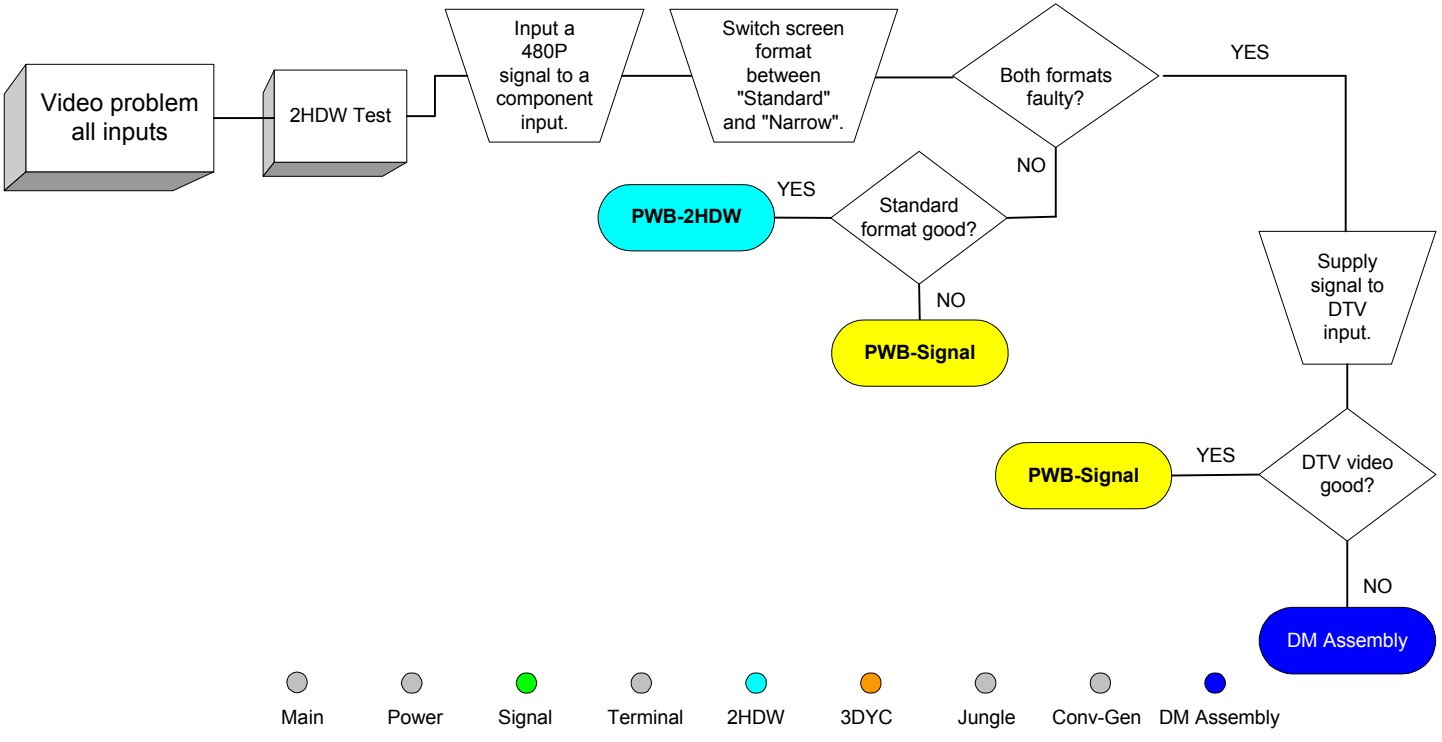
V21 Chassis - Video Problem

Video Problem - 1



V21 Chassis - Video Problem

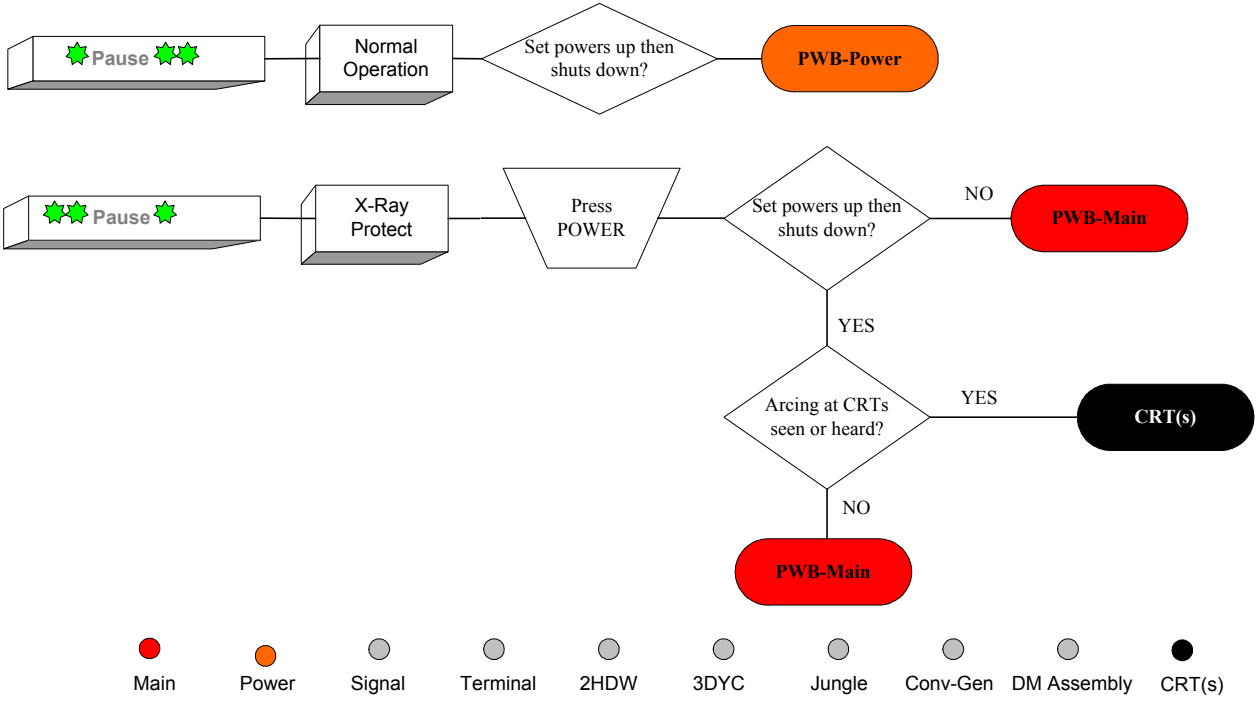
Video Problem - 2



V21 Chassis - Shut-Down Problem

Shut-Down Problem - 1

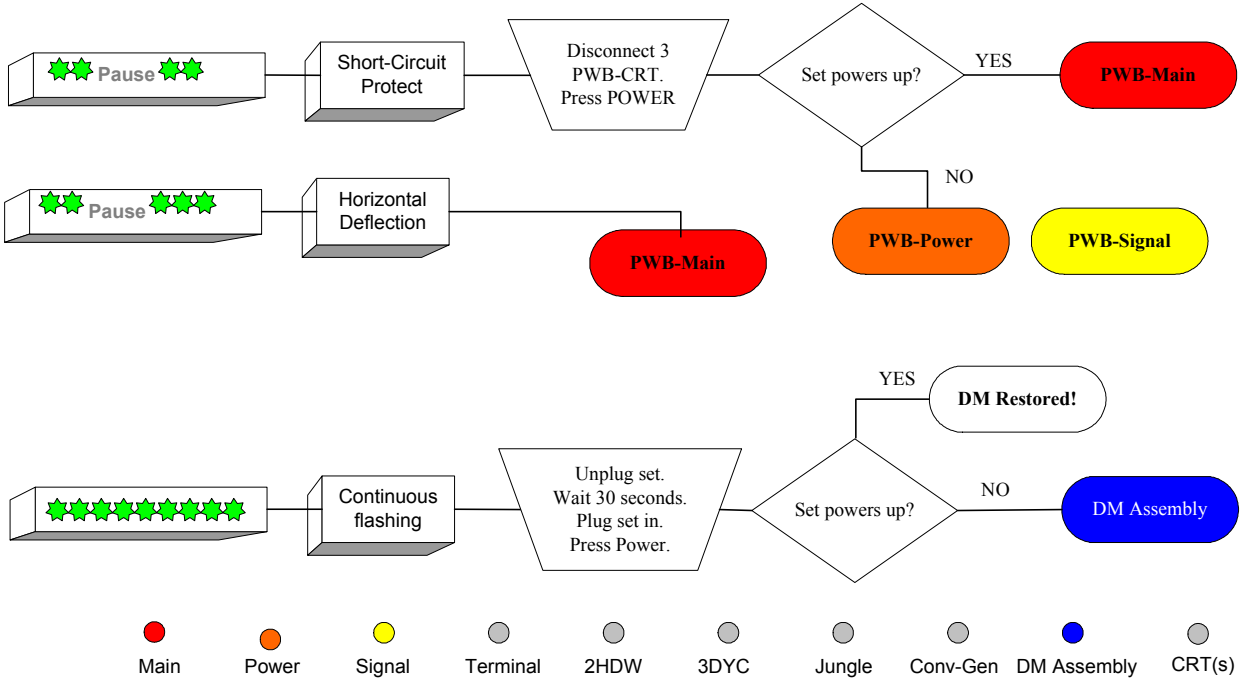
With the set OFF, Press and hold the Front Panel "Device" and "Menu" buttons for five seconds
Observe the flashing pattern of the front panel L.E.D.



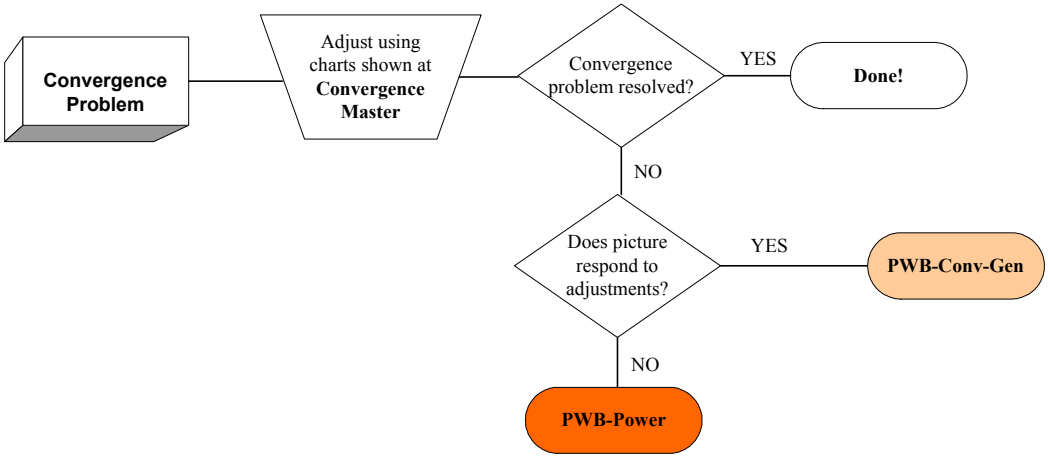
V21 Chassis - Shut-Down Problem

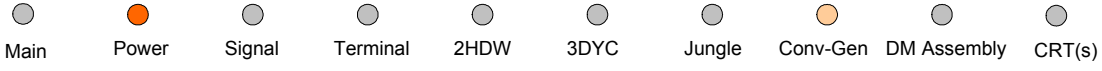
Shut-Down Problem - 2

With the set OFF, Press and hold the Front Panel "Device" and "Menu" buttons for five seconds
Observe the flashing pattern of the front panel L.E.D.



V21 Chassis - Convergence Problem





V21 Chassis - Convergence Master

CONV MISC (MENU-2-1-5-9-6)

Item Number	Abbrev. Name	Data SD	Data HD	Notes
1	HVOL	160		HV Adj.
2	VCNT	29	29	Preset
3	VSTR	0	0	"
4	VOFS	25	0	"
5	STLN	45	34	"
6	FPHS	288	288	"
7	CPHS	15	15	"
8	HOFS	22	22	"
9	DPHS	0	0	"
10	DOFS	51	51	"
11	TPHS	34	36	"
12	TPVD	25	39	"
13	ODEV	200	125	"
14	HRTC	1	1	"
15	DRTC	1	1	"
16	DAC	1	1	"
17	EPWP	0	0	"
18	SCRL	25	25	"
19	SDEL	600	600	"
20	FDEL	3	3	"

* Do not change "1 HVOL" if it has been previously set.

CONV GREEN Items (MENU-2-1-5-9-5)

No.	Abbrev. Name	Description	48" Data SD	48" Data HD	55" Data SD	55" Data HD	65" Data SD	65" Data HD	73" Data SD	73" Data HD
1	HSTA*	Horizontal Position	0	0	0	0	0	0	0	0
2	VSTA*	Vertical Position	-15	0	-15	0	-15	0	-20	0
3	SKEW	Skew (Y axis rotation)	0	0	0	0	0	0	0	0
4	TILT	Tilt (X axis rotation)	0	0	0	0	0	0	0	0
5	HWID	Horisontal Width	30	30	30	30	30	30	20	20
6	HLIN	Horizontal Linearity	0	0	-15	-10	-10	-20	-10	-10
7	SPCC	Side Pin Cushion Correction	0	0	0	0	0	0	0	0
8	HKEY	Horizontal Keystone	0	0	0	0	0	0	0	0
9	TBPC	Top/Bottom PC Correction	-150	-150	-200	-190	-200	-170	-220	-180
10	VKEY	Vertical Keystone	15	10	15	10	0	0	10	10
11	VWID	Vertical Height	0	0	0	0	0	0	0	0
12	VLIN	Vertical Linearity.	0	0	0	0	0	0	0	0

***HSTA and VSTA must not exceed ±200**

CONV RED Items (MENU-2-1-5-9-5)

No.	Abbrev. Name	Description	48" Data SD	48" Data HD	55" Data SD	55" Data HD	65" Data SD	65" Data HD	73" Data SD	73" Data HD
1	HSTA	Horizontal Position	50	50	50	50	50	50	50	50
2	VSTA	Vertical Position	0	0	0	0	0	0	0	0
3	SKEW	Skew (Y axis rotation)	0	0	0	0	0	0	0	0
4	TILT	Tilt (X axix rotation)	0	0	0	0	0	0	0	0
5	HLIN	Horixontal Linearity	-190	-190	-180	-170	-150	-150	-220	-190
6	HWID	Horizontal Width	0	-10	0	0	10	10	10	10
7	VKEY	Vertical Keystone Correction	-120	-110	-100	-95	-90	-70	-100	-110
8	VWID	Vertical Height	0	0	0	0	0	0	0	0
9	VLIN	Vertical Linearity	0	0	0	0	0	0	0	0
10	TPPC	Top/Bottom PC Correction	20	20	20	20	20	20	20	20
11	SDBW	Horizontal Side Bow	30	30	30	30	30	30	50	30

***HSTA and VSTA must not exceed ±200**

CONV BLUE Items (MENU-2-1-5-9-5)

No.	Abbrev. Name	Description	48" Data SD	48" Data HD	55" Data SD	55" Data HD	65" Data SD	65" Data HD	73" Data SD	73" Data HD
1	HSTA	Horizontal Position	-50	-50	-50	-50	-50	-50	-50	-50
2	VSTA	Vertical Position	0	0	0	0	0	0	0	0
3	SKEW	Skew (Y axis rotation)	0	0	0	0	0	0	0	0
4	TILT	Tilt (X axix rotation)	0	0	0	0	0	0	0	0
5	HLIN	Horixontal Linearity	200	190	175	170	160	150	230	200
6	HWID	Horizontal Width	0	-30	0	-10	0	-10	-20	-20
7	VKEY	Vertical Keystone Correction	130	80	90	65	70	75	80	90
8	VWID	Vertical Height	0	0	0	0	0	0	0	0
9	VLIN	Vertical Linearity	0	0	0	0	0	0	0	0
10	TPPC	Top/Bottom PC Correction	0	-20	0	0	0	-20	-20	0
11	HSBW	Horizontal Side Bow	-30	-30	-30	-30	-30	-30	-30	-30

***HSTA and VSTA must not exceed ±200**

V21 - Parts List

[#] Model Legend:
(1) WS-B55, (2) WS-48511, (3) WS-55511, (4) WS-55711, (5) WS-65511, (6) WS-65611, (7) WS-65711, (8) WS-65712, (9) WS-73711

Part #	Part Name & Description	[#]
	TUBES	
251C219040	ASSY-CRT-RED	3
251C219050	ASSY-CRT-GREEN	3
251C219060	ASSY-CRT-BLUE	3
251C219070	ASSY-CRT-RED	4
251C219080	ASSY-CRT-GREEN	4
251C219090	ASSY-CRT-BLUE	4
251C220010	ASSY-CRT-RED	5
251C220020	ASSY-CRT-GREEN	5
251C220030	ASSY-CRT-BLUE	5
251C220040	ASSY-CRT-RED	6
251C220050	ASSY-CRT-GREEN	6
251C220060	ASSY-CRT-BLUE	6
251C220070	ASSY-CRT-RED	7
251C220080	ASSY-CRT-GREEN	7
251C220090	ASSY-CRT-BLUE	7
251C221010	ASSY-CRT-RED	8
251C221020	ASSY-CRT-GREEN	8
251C221030	ASSY-CRT-BLUE	8
251C221040	ASSY-CRT-RED	9
251C221050	ASSY-CRT-GREEN	9
251C221060	ASSY-CRT-BLUE	9
251C221070	ASSY-CRT-RED	1
251C221080	ASSY-CRT-GREEN	1
251C221090	ASSY-CRT-BLUE	1
251C222010	ASSY-CRT-RED	2
251C222020	ASSY-CRT-GREEN	2
251C222030	ASSY-CRT-BLUE	2

Part #	Part Name & Description	[#]
	PRINTED CIRCUIT BOARDS	
930B866012	ASSY-PWB-MAIN	8746513
930B866013	ASSY-PWB-MAIN	9
930B866014	ASSY-PWB-MAIN	2
930B879002	ASSY-PWB-POWER	
930B880003	ASSY-PWB-SIGNAL	12356
930B880004	ASSY-PWB-SIGNAL	4789
955C230002	ASSY-DM	
935C965003	ASSY-PWB-CRT	
935C966002	ASSY-PWB-2HDW	
935C967001	ASSY-PWB-TERMINAL	12356
935C967002	ASSY-PWB-TERMINAL	4789
935D521006	ASSY-PWB-DBF	
935D581002	ASSY-PWB-PREAMP	
935D583001	ASSY-PWB-JUNGLE	1
935D583002	ASSY-PWB-JUNGLE	
935D584002	ASSY-PWB-SVM	
935D585001	ASSY-PWB-CONV-GEN	
935D586001	ASSY-PWB-3DYC/MD	
935D587002	ASSY-PWB-CONTROL 2	
935D588003	ASSY-PWB-FRONT	12356
935D588004	ASSY-PWB-FRONT	4789
935D605002	ASSY-PWB-CROSS OVER	4789