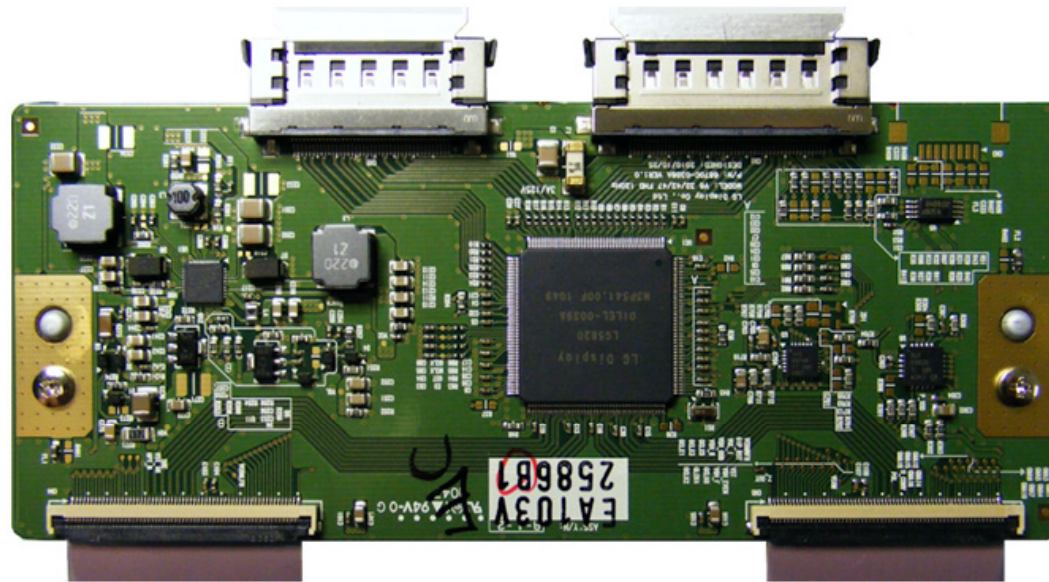


2012 UNDERSTANDING LCD T-CON TRAINING PRESENTATION



LG
Life's Good

*Published March 1st, 2012
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Table Of Contents

- 1) **The T-CON Heat Sink Shield. [Pg 3]**
- 2) **What is a T-CON, (TFT Controller)? [Pg 6]**
- 3) **What Voltage source does the T-CON use? [Pg 8]**
- 4) **What Voltages does the T-CON generate? [Pg 10]**
- 5) **What is an LVDS Cable (Low Voltage Differential Signal)? [Pg 12]**
- 6) **What is the Difference between a T-CON and a 3D FRC T-CON? [Pg 17]**
- 7) **How to Troubleshoot a T-CON board. [Pg 20]**
- 8) **Some T-CONs Route the P-DIM (Dimming Signals) to the Inverter. [Pg 31]**
- 9) **What is the purpose of the Blue LED on some T-CONs? [Pg 36]**



1) T-CON COVERED BY A HEAT SINK SHIELD

- 1) The T-CON Heat Sink Shield. [Pg 3]**
- 2) What is a T-CON, (TFT Controller)? [Pg 6]
- 3) What Voltage source does the T-CON use? [Pg 8]
- 4) What Voltages does the T-CON generate? [Pg 10]
- 5) What is an LVDS Cable (Low Voltage Differential Signal)? [Pg 12]
- 6) What is the Difference between a T-CON and a 3D FRC T-CON? [Pg 17]
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- 8) Some T-CONs Route the P-DIM (Dimming Signals) to the Inverter. [Pg 31]
- 9) What is the purpose of the Blue LED on some T-CONs? [Pg 36]



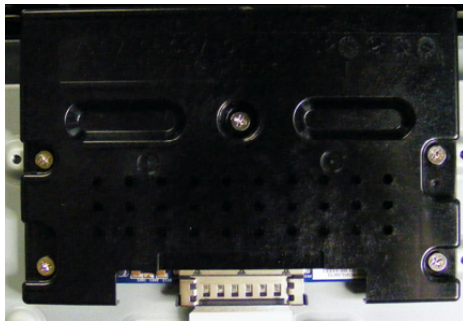
The T-CON Shield Examples

The T-CON is covered by a Heat Sink Shield which is responsible for relieving the heat build up on the T-CON's DC to DC Converters and to prevent high frequency noise from exiting the T-CON as well as prevent ingress (External Radiation) from outside sources.

In the examples below take note about how many LVDS cables attach to the T-CON board. This will indicate weather it's a 60Hz or at least a 120Hz T-CON. The LVDS cable will be explained later.

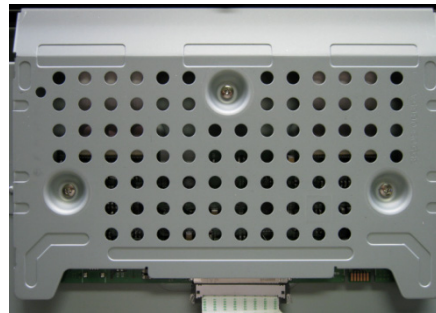
Some models do not have a T-CON, it's built into the Main board. 42LE5500, 42LH40.

Example 37LK450 (60Hz)



LVDS

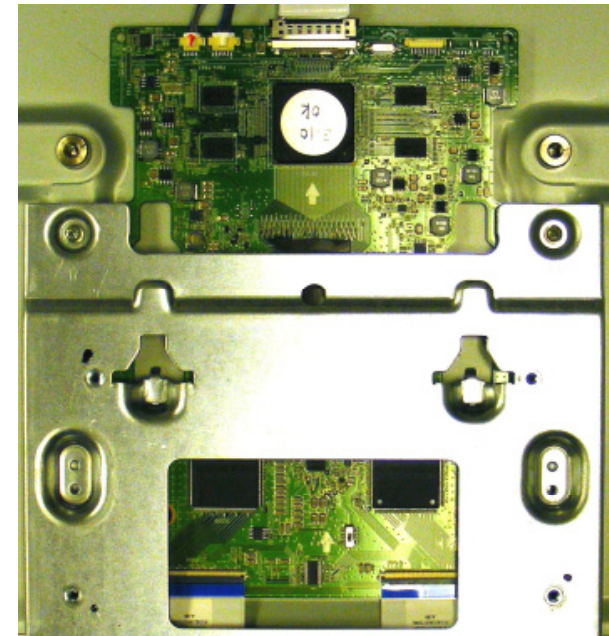
Example 42LH20 (60Hz)



LVDS

Example 55LX6500 (240Hz)

LVDS



3D (2010)

Example 42LG70 (120Hz)



LVDS LVDS

Example 37LH55 (120Hz)



P-DIM LVDS LVDS



T-CON Shield Purpose and Key Points

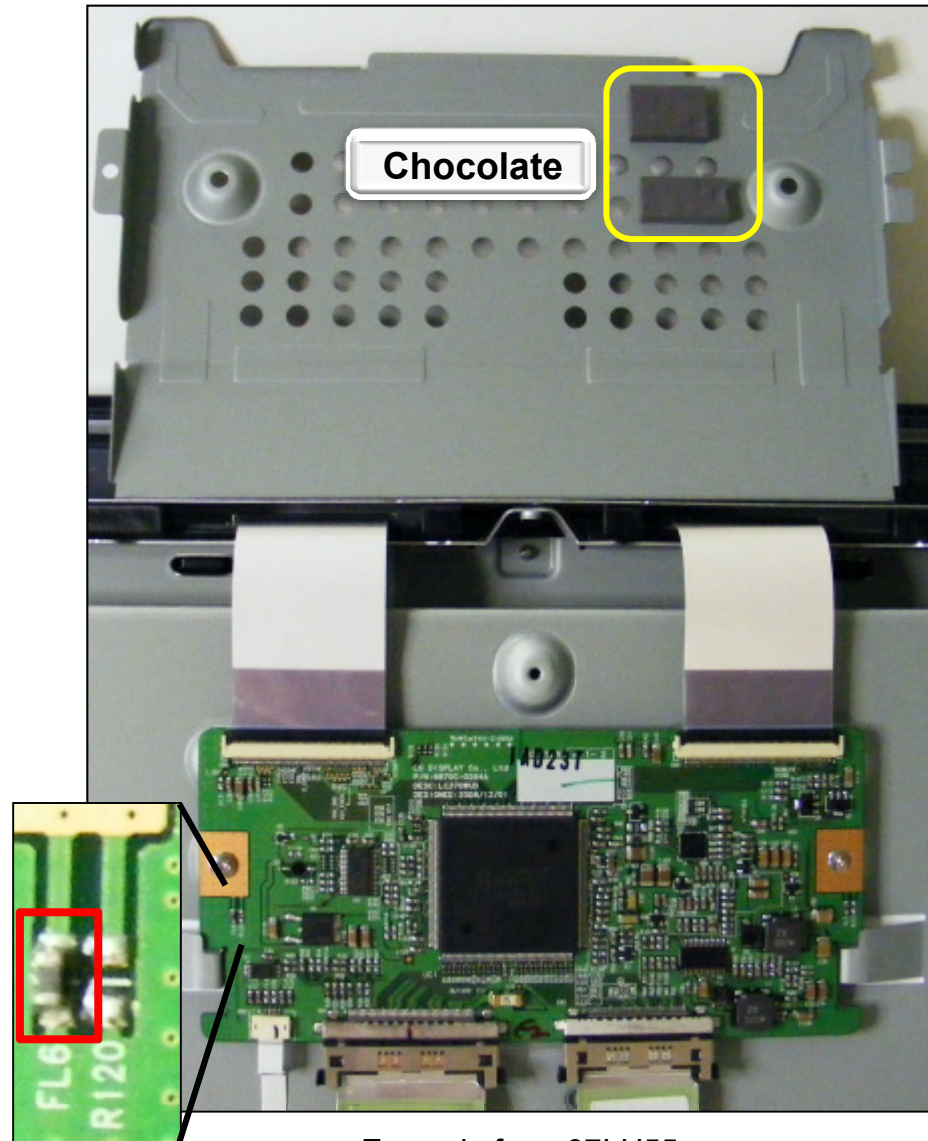
The T-CON shield may serve two functions.

- 1) They prevent RF radiation, either in or out.
- 2) They work as a heat dissipation shield.

Here are some key points to remember when removing the shield;

- Many of the shields have a piece of material that is used to transfer heat from a component on the board to the shield. This material is called “Chocolate”. Look for it when removing the shield. Make sure to return it to the correct location when replacing the shield. In the example on the right, the two pieces of chocolate are protecting the DC-to-DC converter coils in the lower right hand corner.
- Always remember to put the screws back into place on the T-CON board when the shield is removed. This will protect the small devices called EMI filters protecting ground return on the two ground pads beneath the screws. (See example of FL6 on the right).
- There is another EMI filter FL7 on the the right Grounding screw pad.

FL6
EMI
Filter



Example from 37LH55



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2) *WHAT IS A T-CON?*

- 1) The T-CON Heat Sink Shield. [Pg 3]
- 2) **What is a T-CON, (TFT Controller)?** [Pg 6]
- 3) What Voltage source does the T-CON use? [Pg 8]
- 4) What Voltages does the T-CON generate? [Pg 10]
- 5) What is an LVDS Cable (Low Voltage Differential Signal)? [Pg 12]
- 6) What is the Difference between a T-CON and a 3D FRC T-CON? [Pg 17]
- 7) How to Troubleshoot a T-CON board. [Pg 20]
- 8) Some T-CONs Route the P-DIM (Dimming Signals) to the Inverter. [Pg 31]
- 9) What is the purpose of the Blue LED on some T-CONs? [Pg 36]



What is the T-CON Function?

The T-CON (TFT Controller) is responsible for;

1. Driving the TFT panel. This is usually accomplished by two LVDS type cables between the T-CON and the Panel. The panel cell structure is broken into Vertical columns and Horizontal rows.
 - **Horizontal Resolution:** On a panel with a resolution of 1920 X 1080 we must have 1920 X 3 columns, because a pixel is comprised on a Red, Green and Blue cell. So there will be 5760 individual cells in rows across the screen. To turn these cells on and off, the panel will use vertical address lines or electrodes driven by a small board located inside the panel. In this way we can turn the colors on and off accordingly to recreate the correct colors required to recreate the image.
 - **Vertical Resolution:** On a panel with a resolution of 1920 X 1080 there will be 1080 horizontal rows of cells running across the panel. These rows are being driven by a small board inside the panel. By addressing a particular cell via the vertical columns and turning on a row of cells, only the cells being address by the vertical electrodes will be activated. The number of horizontal rows determine the panels Vertical resolution.
2. **TFT:** Each cell has is driven by a thin film transistor called (TFT) and a capacitor. When that cells is addressed (turned on) the capacitor will charge and will remain charged until the next refresh cycle. Generally speaking, when the cell has no power applied, it blocks the light from passing through, when it turns on, dependant upon how long it is on, allows more or less light to pass. In this way we can control the brightness level being output by that cell.

Panel Voltages: The T-CON is responsible for developing panel voltages. These voltage will vary dependant upon the type of panel utilized. We generally state there will be 4 voltages that are always being delivered to the panel, -5V, 3.3V, 16V and 26V. However, there may be more according to the type of panel being used.

Backlights: Since the Liquid crystal panel does not generate any light of its own, there must be a light source behind the panel. This light source is called the “Backlights” called B\L here after. The B\L can be either florescent (EEFL or CCFL) or they can be LED. The T-CON is not responsible for turning on the B\L.



3) WHAT VOLTAGE SOURCE DOES THE T-CON USE?

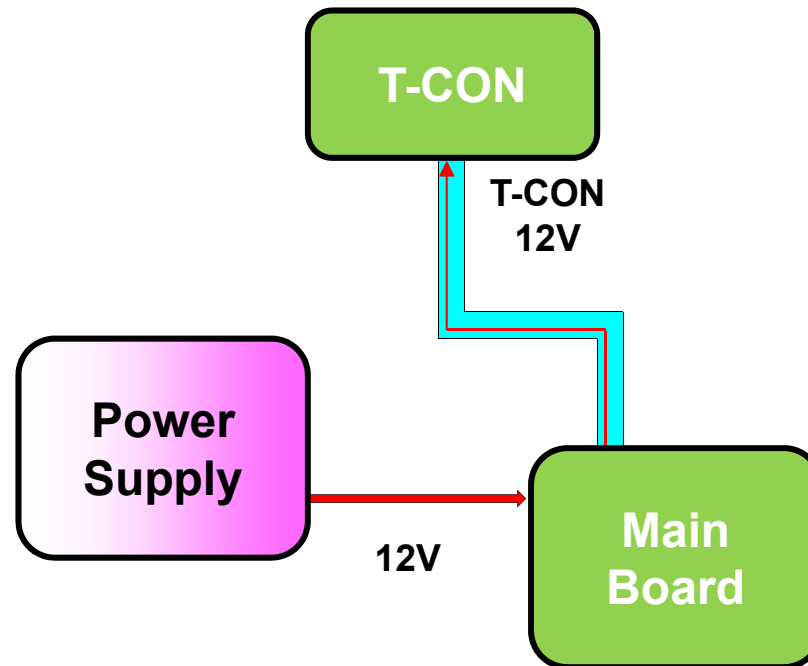
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- 4) What Voltages does the T-CON generate? [Pg 10]
- 5) What is an LVDS Cable (Low Voltage Differential Signal)? [Pg 12]
- 6) What is the Difference between a T-CON and a 3D FRC T-CON? [Pg 17]
- 7) How to Troubleshoot a T-CON board. [Pg 20]
- 8) Some T-CONs Route the P-DIM (Dimming Signals) to the Inverter. [Pg 31]
- 9) What is the purpose of the Blue LED on some T-CONs? [Pg 36]



Understanding the Voltage Source for the T-CON.

The T-CON Voltage Source will always be provided from the Main board. However, the Main board does not actually generate the T-CON source voltage. All the Main board does is switch on and off the voltage coming from the Power Supply.

The Power Supply generates a 12V supply that is sent to the Main board. When it is time to turn on the T-CON, the Microprocessor will send out a command that turns on the T-CON 12V and this voltage is routed out the LVDS cable to the T-CON. (See the Troubleshooting section for more details about the T-CON 12V turn on circuit).



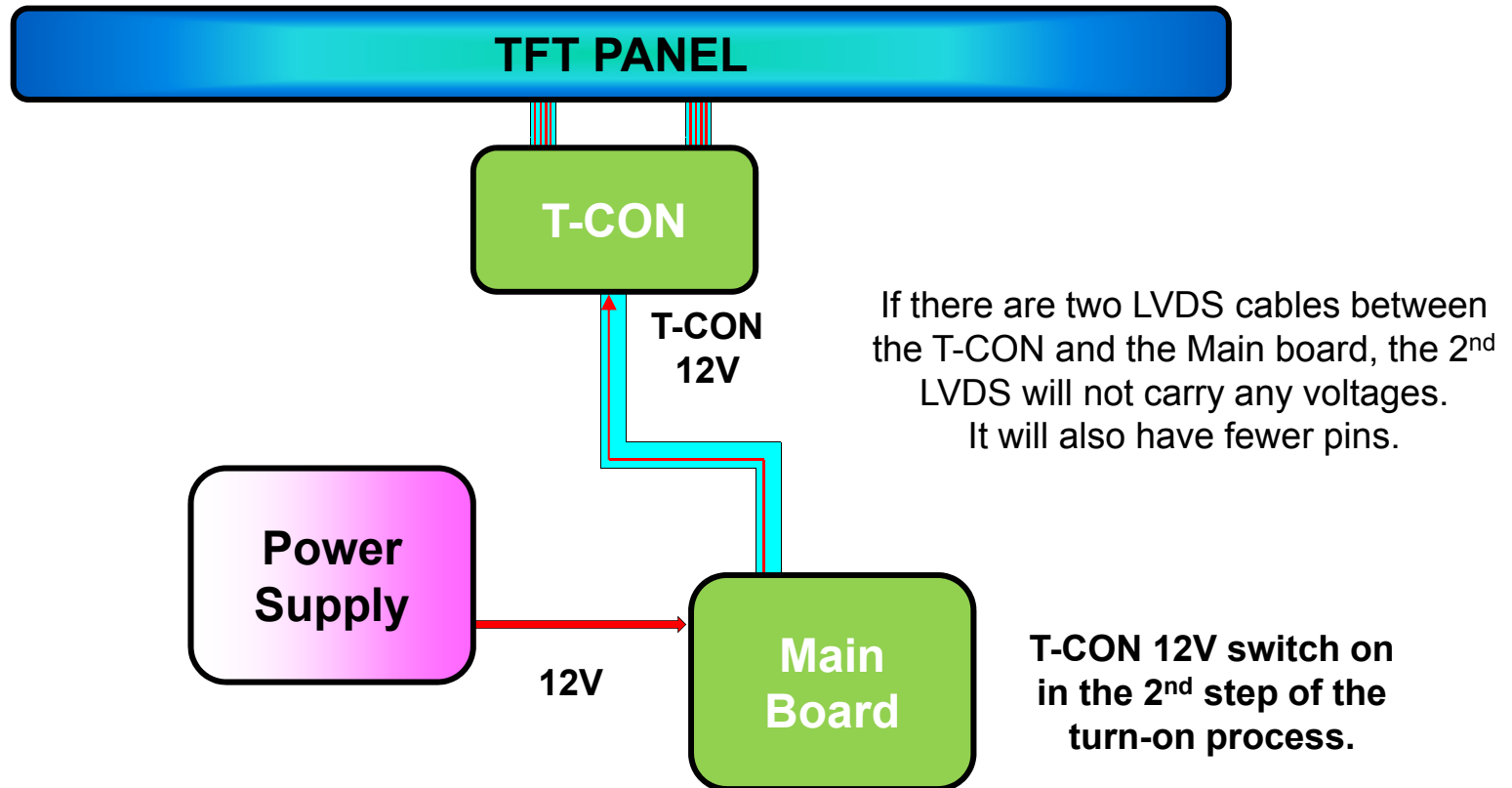
4) WHAT VOLTAGE DOES THE T-CON GENERATE?

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- 5) What is an LVDS Cable (Low Voltage Differential Signal)? [Pg 12]
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Understanding the Voltages that the T-CON Generates.

When the T-CON receives the 12V from the Main board, it turns on DC-to-DC converters on the T-CON board to generate several voltages. Some are used on the T-CON board itself (3.3V and 1.0V) and some are sent out to the panel for the panel's internal horizontal and vertical driving boards. Generally speaking, there are 4 primary voltages sent to the panel. They are -5V, 3.3V, 16V and 26V. It is important to always check for these voltages if you having problems with the T-CON board. But always remember there may be more voltages generated and sent to the panel on different types of panels.



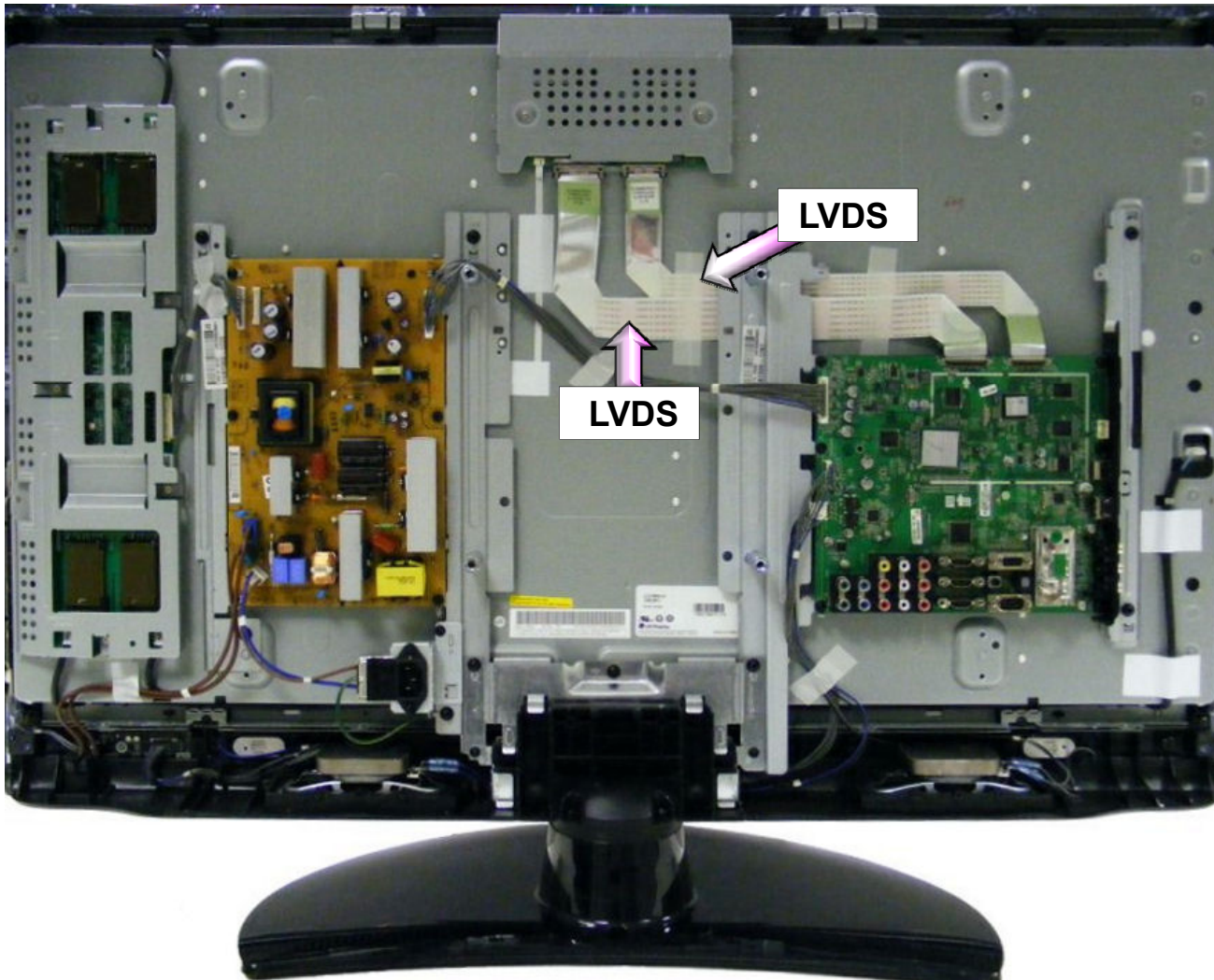
5) *WHAT IS AN LVDS CABLE?*

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Understanding the LVDS Cable.

The picture below shows the LVDS cables being routed from the Main board to the T-CON.



Example: 37LH55



Understanding the LVDS Cable.

The LVDS (Low Voltage Differential Signal) Cable in a LCD TV is responsible for two primary jobs.

- 1. VIDEO and TIMING SIGNALS:** To deliver video signals that have been processed into a positive and a negative going pair of signals. These pair of signals are sent in groups which equal the resolution characteristics of the panel. As an example if the panel is a HD panel, the differential pair will be 10 lines carrying positive and negative going video data. And there will be two lines carrying positive and negative going clock signals. If the panel is a full HD panel, it will have double the amount of lines.

The positive going signals will be designated on the schematic with the suffix of (P or +) and the negative going lines will be designated as (N or -). If you take one pair of video signals and look at them on a scope, they will be an exact mirror of each other. One going positive and one going negative. By using a differential pair, the circuitry can isolate and remove the noise on the line by addition and it can extract the actual signal by subtraction which will double the signal level.

- 2. T-CON VOLTAGE:** The T-CON board needs voltage to operate, the LVDS cable will deliver the T-CON's operational voltage.

If the LVDS cable is suspected of having a problem, most often it can be seen visually. Look for the cable being bent which causes the internal paths to be broken. The cable can be cut, or cracked or physically damaged in some way. The other problem that the LVDS cable can have is the continuity contacts that are on the side that goes into the connector can separate from the cable itself. This can only be seen by unlocking the cable connector and removing the cable. Then flipping the cable over so the contact points can be seen. See if they are separated from the cable. They could be curled up or even bent over and pressed onto another line causing a short. One other thing to look for is the cable being incorrectly inserted into the connector, (improperly seated).

When the LVDS cable is causing a problem, the symptom can be many. Lines in the picture, portions blocked out, every other line missing, noise patterns on the screen, missing 12V to the T-CON causing a black or no picture symptom, etc... It can even shut the TV down if the 12V is shorted.

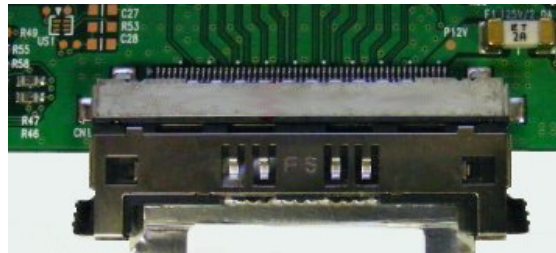


Types of LVDS Cable Connectors

The LVDS cable can use different types of connections to the Main board and to the T-CON. Below shows some of the types of LVDS cable connections being used in LG LCD TVs.



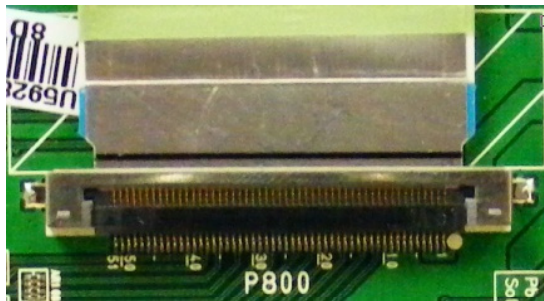
To unlock, press in on the two sides



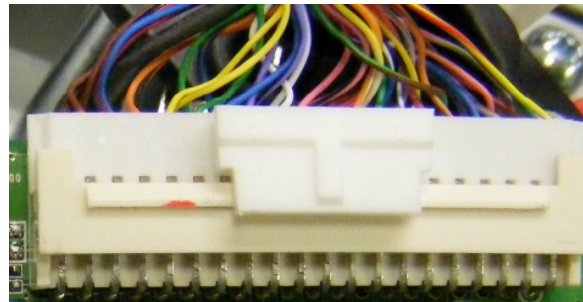
To unlock, press in on the two sides



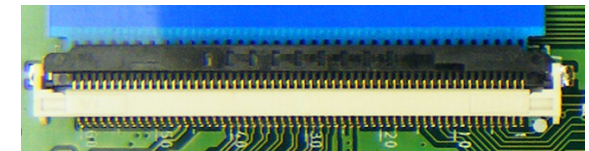
To unlock, press in on the two sides



To unlock, flip up the black locking tab

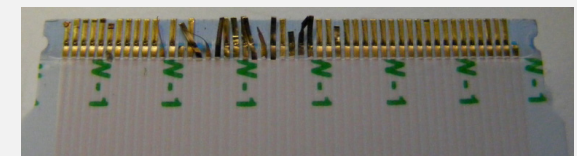


To unlock, press down to release the locking tab
This is a wire type LVDS and not a ribbon cable type.



To unlock, flip down the black locking tab

DEFECTIVE LVDS CABLE



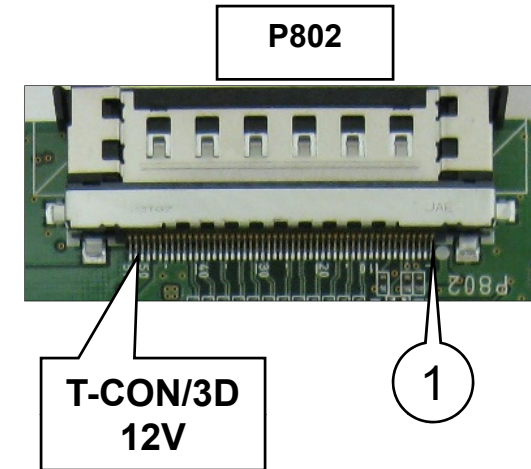
Example of LVDS Connector Contents

P802 LVDS Connector "T-CON/3D Board" to P7800 "Main"

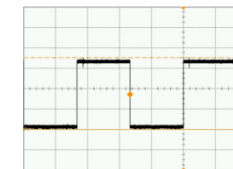
Pin	Label	Run	Diode Check
1	Gnd	Gnd	Gnd
2	3D_Sync_Out	0.03V	2.34V
3	*V_SYNC	3.33V	1V
4	SDA3_3.3V	3.34V	1.73V
5	SCL3_3.3V	3.34V	1.73V
6	FRC_RESET	3.32V	Open
7	n/c	n/c	n/c
8	3DTV	0V	Open
9	3D_DIM	0V	Open
10	3D_DIM_2	0.05V	Open
11	n/c	n/c	n/c
12	RRXA0-	1.17V	1.67V
13	RRXA0+	1.19V	1.67V
14	RRXA1-	1.19V	1.67V
15	RRXA1+	1.17V	1.67V
16	RRXA2-	1.22V	1.67V
17	RRXA2+	1.14V	1.67V
18	Gnd	Gnd	Gnd
19	RRXACK-	1.16V	1.67V
20	RRXACK+	1.20V	1.67V
21	Gnd	Gnd	Gnd
22	RRXA3-	1.20V	1.67V
23	RRXA3+	1.14V	1.67V

Pin	Label	Run	Diode Check
24	RRXA4-	1.26V	1.67V
25	RRXA4+	1.08V	1.67V
26	Gnd	Gnd	Gnd
27	n/c	n/c	n/c
28	RRXB0-	1.19V	1.67V
29	RRXB0+	1.19V	1.67V
30	RRXB1-	1.19V	1.67V
31	RRXB1+	1.16V	1.67V
32	RRXB2-	1.2V	1.67V
33	RRXB2+	1.14V	1.67V
34	Gnd	Gnd	Gnd
35	RRXBCK-	1.16V	1.67V
36	RRXBCK+	1.2V	1.67V
37	Gnd	Gnd	Gnd
38	RRXB3-	1.22V	1.67V
39	RRXB3+	1.14V	1.67V
40	RRXB4-	1.26V	1.67V
41	RRXB4+	1.09V	1.67V
42-46	Gnd	Gnd	Gnd
47	n/c	n/c	n/c
48-51	PANEL_VCC	11.59V	Open

Example from LX9500



Text in Blue are LVDS video signals.



*Pin 2
3.5V p/p 60 Hz
3D-Sync

*Pin 2 Only active when a 3D source is played. (1.63V)

T-CON/3D B+

Diode Check taken with meter in Diode Mode with all Connectors Removed



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March 2012 LCD T-CON Troubleshooting

6) *DIFFERENCE BETWEEN A T-CON AND A 3D T-CON?*

- 1) The T-CON Heat Sink Shield. [Pg 3]
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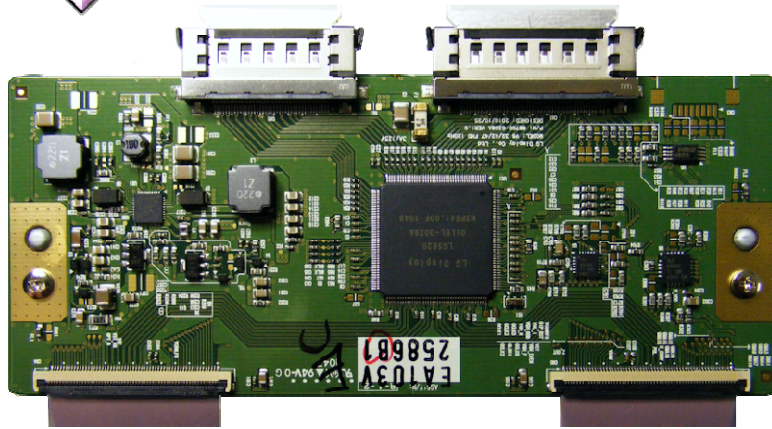


Differences between a T-CON and a 3D FRC T-CON

The typical T-CON's basic responsibilities are to drive the TFT panel and to generate panel voltages. The video input through the LVDS cables is already formatted for usage by the T-CON board.



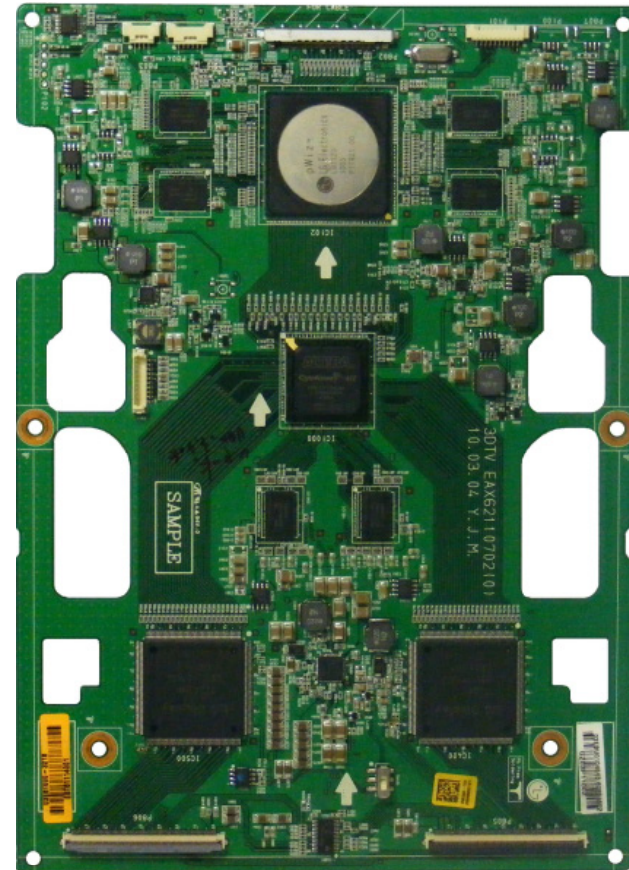
Typical T-CON



The 3D FRC T-CON basic responsibilities are to; generate panel voltages. When not in 3D it generates the Tru-Motion motion estimated motion compensated (MEMC) frames. When in 3D it unpacks 3D frame content. It generates 3D sync which is used by the 3D Shutter glasses. It formats the video for usage by the panel driver circuit and it drives the panel. The video input through the LVDS cables is 24 bit LVDS video.



3D FRC T-CON

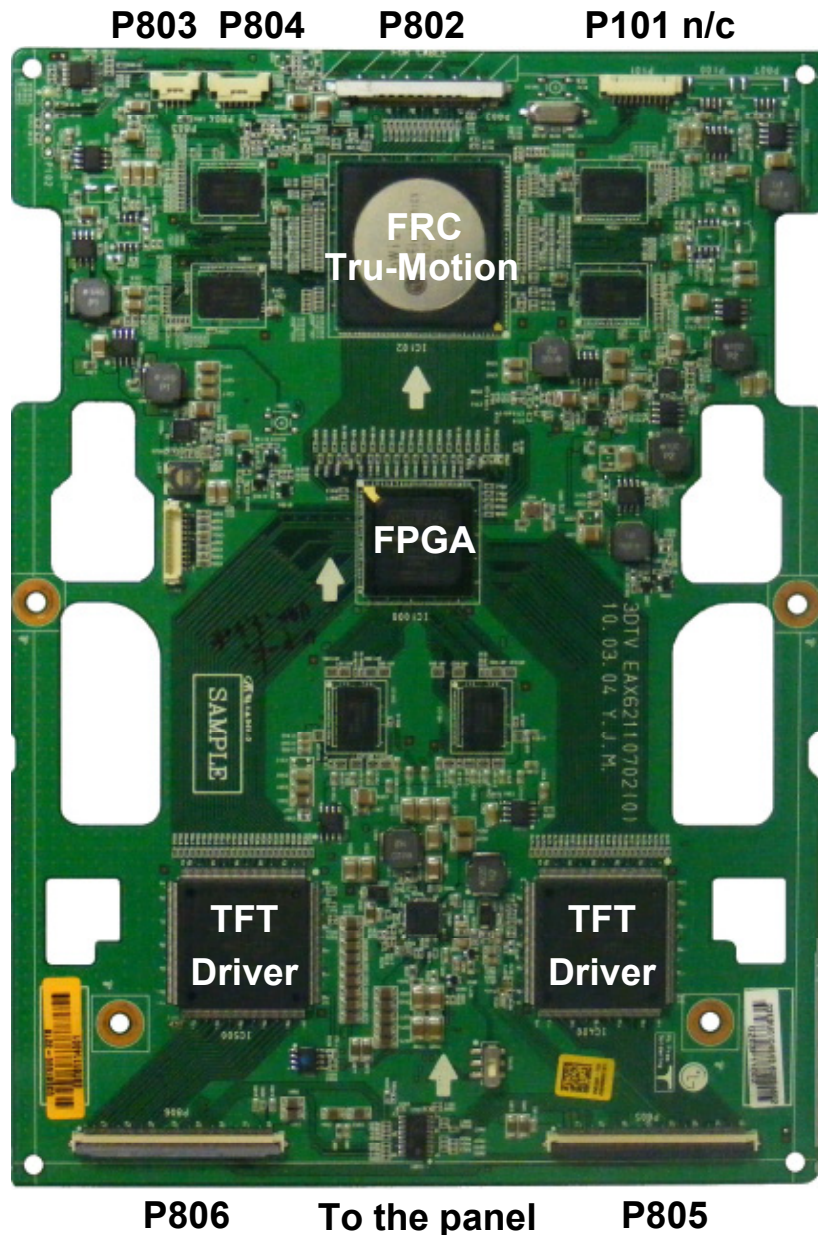


Since the 3D FRC T-CON does so much more work than a standard T-CON, it has an additional 12V input via a two wire connector. The voltage is from the same source as a typical T-CON. It comes from the power supply and switched on/off by the Main board.



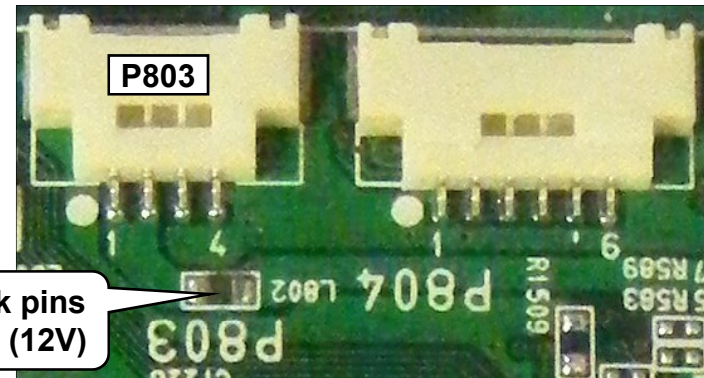
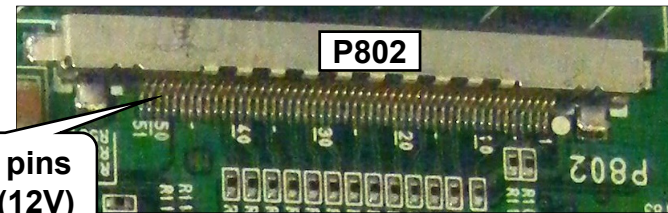
Differences between a T-CON and a 3D FRC T-CON

Example from LX6500, LX9500 series



This shows the location of the additional circuitry on the 3D FRC T-CON.

The 12V is sent to the T-CON by two separate connections. P802 and P803.



Troubleshooting is the same for this type of T-CON. See troubleshooting section.

FRC: Frame Rate Converter

FPGA: Field-programmable gate array

March 2012 LCD T-CON Troubleshooting



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7) HOW TO TROUBLESHOOT A T-CON ?

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Troubleshooting a No Picture problem.

When dealing with a suspected T-CON problem, the very first thing you should approach is “Does the T-CON board have it’s operational voltage”? **TV TURN ON PROCESS:** When the TV turns on, it is a 3 step process.

Step 1) RL-ON called (Relay On) or **PWR_ON** called (Power On). This turns on the power supply which turns on all the voltages that the Main board needs to operate. It also turns on the backlight B+ even though the backlights will not be on at this time.

The Main board needs several different voltages to operate. It needs the Stand-By voltage which is always present even if the set is not turned on. It needs what is called Video Processing voltage which is 12V. And it needs Audio amplification voltage which can vary dependant upon the wattage output of the audio amplifier. This voltage will be either 17V or 24V. This voltage can also be used to generate Tuner voltage.

Step 2) Panel_CTL called (Panel Control). This will be the command that actually turns on the T-CON operational voltage by activating a switch that takes the 12V from the Power Supply and routes it to the T-CON board through the LVDS cable. On a side note, the 2010 3D model T-CONs also have a secondary 12V supply (which comes from the same switch) and sends it to the T-CON through a two pin connector for additional current demands of the 3D T-CON. It is not the fact that the T-CON 12V current is too much for the 12V supply, it is that the current demand of the 3D FRC T-CON is too much for the thin wire in the LVDS cable.

Step 3) INV_ON called (Inverter On) or **DRV_ON** called (Drive On). This command will turn on the backlights. This output from the Main is sent back to the Power Supply to activate the backlight driver IC. If the backlights have an external Ballast (Inverter), the INV_ON line will be routed through the Power Supply to the Inverter. The same thing holds true for LED backlights which may have an internal or external Inverter.

So the area of concern when dealing with a No Picture symptom is to first make sure there are backlights. If the backlights do not come on, you still may be able to see if the panel is working by using a flashlight and looking (at close proximity) to the panel. Hold the flashlight close to the panel and look carefully for any movement within the panel. You may also be able to shine the flash light through any hole in the metal shield covering the back of the panel. If you see movement, this would indicate there is activity in the LCD panel and that you need to investigate the problem from the backlight perspective. Remember the backlights (Florescent or LED) need a power supply (24V) and the turn on command called DRV_ON or INV_ON.

Continued on the next page.



Troubleshooting a No Picture problem, checking Power Supply voltages.

If you have backlights but you have no picture, the first step is to check the connector from the Power Supply to the Main board. Confirm the 3 voltages, STBY voltage, 12V and 17V/24V. You can also listen for audio which would confirm that the Main board is processing audio and it has the Audio B+.

Here is an example of the connector (from a 55LW5600) coming from the Power Supply to the Main board.

P502 "MAIN Board" Connector To P201 "SMPS Board"

	Pin	Label	STBY	Run	Diode Check	
	1	PWR-ON	0V	3.4V	2.79V	← PWR_ON Step 1: Turns on the Power Supply. (1)
24V	2-4	24V	0V	25V	OL	
	5-8	Gnd	Gnd	Gnd	Gnd	
Stand-By 3.5V	9-12	3.5V_ST	3.56V	3.51V	1.15V	Steps 1 and 3 of the three step Turn On Process go to the Power Supply
	13-15	Gnd	Gnd	Gnd	Gnd	
	16	GND/VSYNC	n/c	n/c	OL	
12V	17	12V	0V	12.01V	2.09V	
	18	DRV-ON	0V	3.24V	1.54V	← DRV_ON Step 3: Turns on the Backlights. (3)
	19	12V	0V	12.01V	2.09V	
	20	A-DIM	n/c	n/c	OL	
	21	12V	0V	12.01V	2.09V	
	22	PDIM-1	0V	0.2V~3.3V	2.4V	
	23	n/c	n/c	n/c	OL	
	24	Err OUT	n/c	n/c	OL	

Note: We will discuss the 2nd step of the turn on sequence next.



No Picture problem, Checking the T-CON's Voltage from the Main board 1 of 2

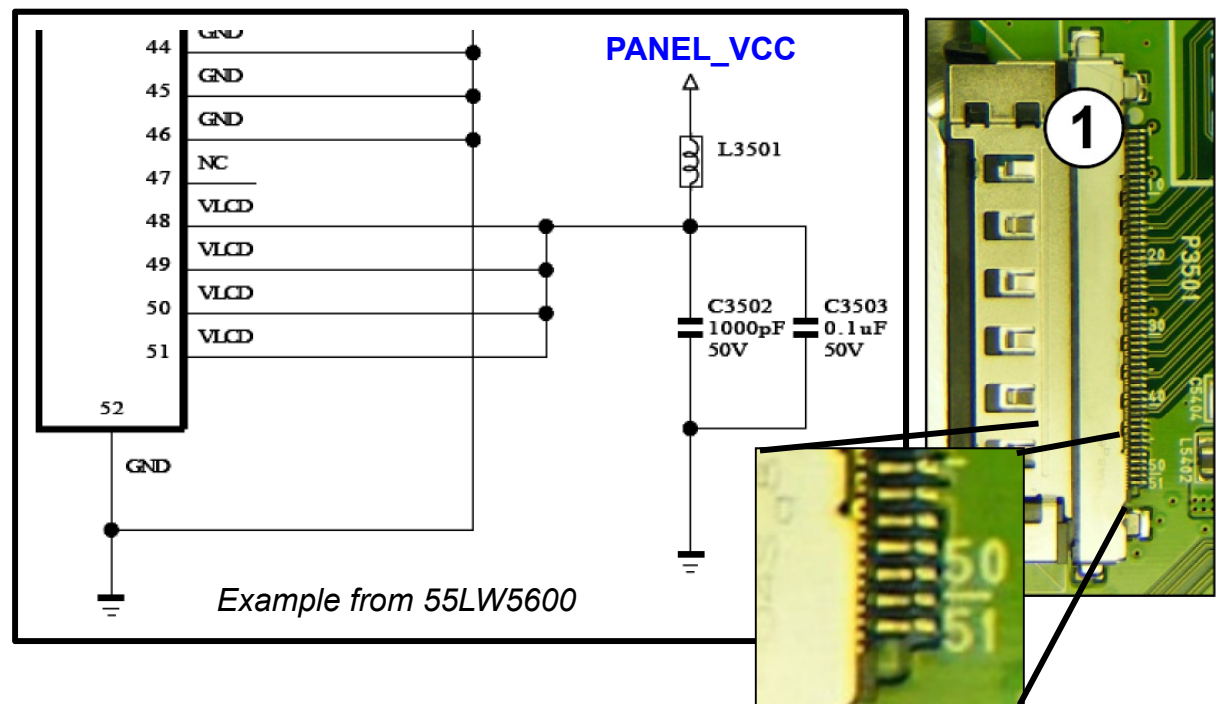
During **Step 2** of the Turn On sequence, Panel_CTL turns on the 12V to the T-CON. Once you have confirmed that the Main board is receiving the correct voltages, you need to confirm that the T-CON is receiving its operational voltage. The best way to check is to begin with the LVDS cable from the Main to the T-CON. It will have a test point for the 12V to the T-CON. Look on the left or right side for 4 pins tied together, this will be the 12V test point. In some cases when the set has two LVDS cables, look on the LVDS cable with the most pins (usually 51). Then look on the left or right side for 4 pins tied together. This will be the 12V test point. (The LVDS cable with the fewer pins will not be carrying any DC voltage).

Tip: Some models use the first and last pin as ground. This is easy to verify with a DVM in ohms.

Tip: Some models use a plug in type of connector instead of a ribbon cable. In this case you can not tell if the 4 pins are tied together, so with the set turned on, just measure pin 2 and/or the next to the last pin for 12V on the LVDS connector with the most pins if there is more than one LVDS connection.

12V TO THE T-CON:

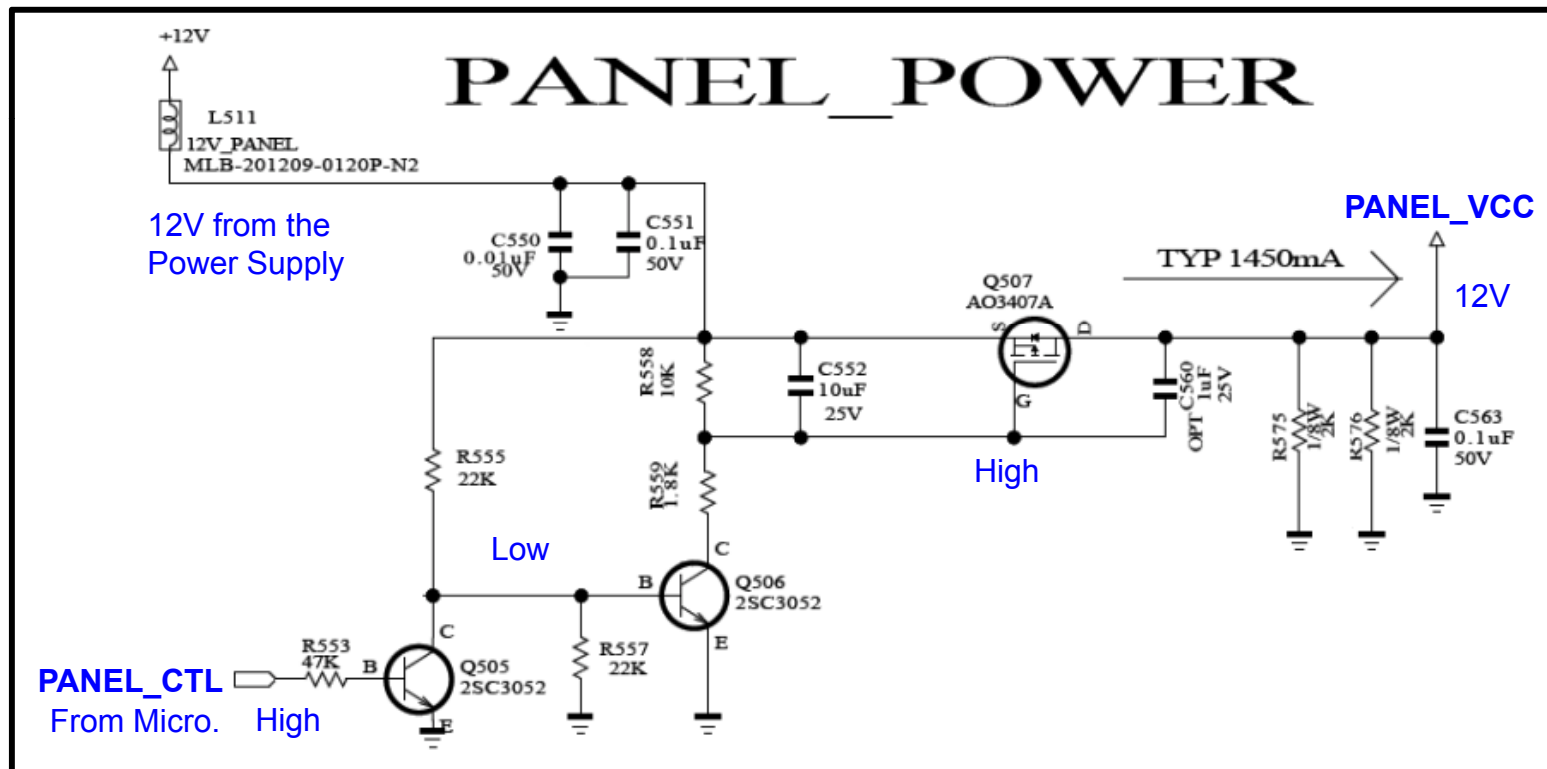
Here is an example of how the T-CON 12V is routed to the LVDS connector. You will note that pins 48 through 51 are carrying the 12V to the T-CON. In this case it is not possible visually to determine that the last 4 pins are tied together. This is where you would measure the 2nd and the next to the last pin for 12V.



No Picture problem, Checking the T-CON's Voltage from the Main board 2 of 2

During Step 2 of the Turn On sequence, **Panel_CTL** turns on the 12V to the T-CON. For an internal look at the circuitry involved in generating the 12V for the T-CON, look at the circuit shown in the example below. Here is an example of how the T-CON 12V is switched on/off on the Main board. When the Microprocessor outputs **Panel_CTL** it is routed to Q505 which turns on. The Collector current goes high and the collector voltage goes low. This drops the base of Q506 low and Q506 turns off. This allows the 12V from the Power Supply routed through L511 to pull up the Gate of Q507 via R558. Q507 has the 12V on its Source. When Q507 switches on it outputs the 12V to the T-CON through the LVDS connector which was explained on the previous page.

Example from 55LW5600

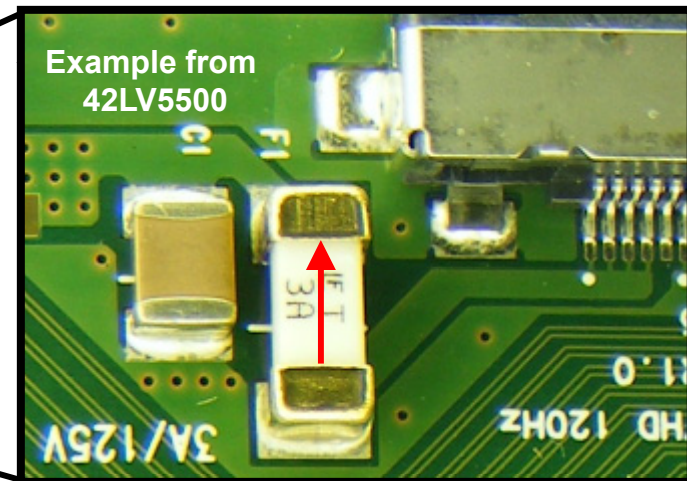
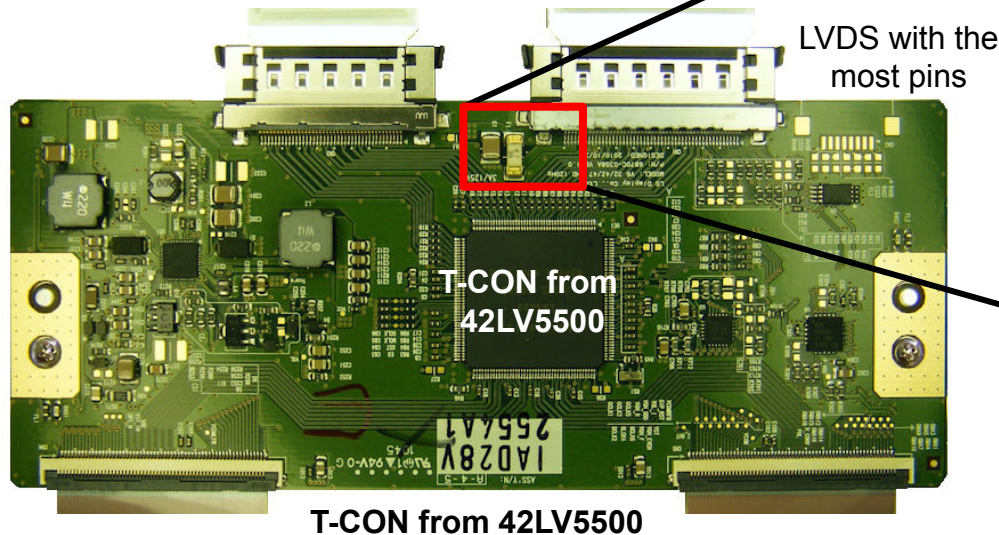


No Picture problem, Checking the T-CON's Voltage

Once you have confirmed that there is 12V on the Main board side of the LVDS connector, it is time to get to the T-CON itself. Since the T-CON is generally covered by a shield, you may or may not be able to get to the 12V TP without removing the shield.

(Note: Review Section 1 which details different types of T-CON Shields).

There will always be a 12V fuse protection the 12V line. It will always be the first component the 12V passes once it enters the T-CON. So this is an easy test point to check for the 12V input to the T-CON. If it is here, you can continue. If it is missing, check the LVDS cable for an open from the Main to the T-CON. Be sure (with the power turned off) to remove the LVDS cable from the connectors on both ends to investigate for frayed contacts. This most often happens on the LVDS cables that are slipped into the connector and the Connector has a flip locking mechanism.



12V Fuse
F1

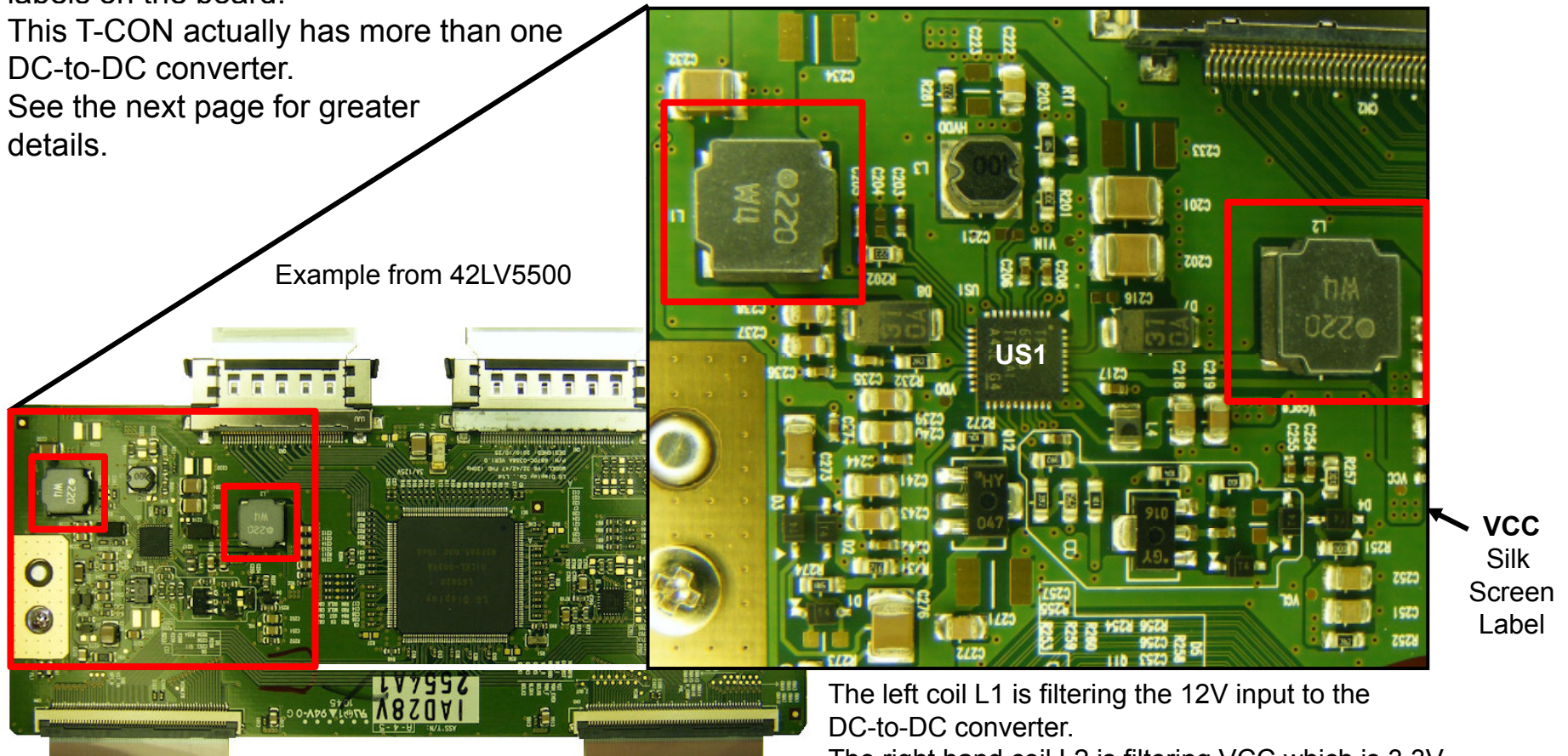


No Picture problem, Checking the T-CON's DC to DC Converter

All T-CONs have a DC-to-DC converter which develops voltages for the T-CON board itself and for the panel. Some have more than one. It is important to check these voltages once the 12V input has been confirmed. To locate the main DC-to-DC converter, look for the larger coils on the board. In the example below, the two larger coils can easily be seen on the upper left hand side. The flat pack IC **US1** is the main DC-to-DC converter driver IC. If you do not have any training material you can still pick out some key voltage source TPs from the DC-to-DC converter. Look for "VCC, VDD, HVDD, VGL or VGH" silk screened labels on the board.

This T-CON actually has more than one DC-to-DC converter.
See the next page for greater details.

Example from 42LV5500



The left coil L1 is filtering the 12V input to the DC-to-DC converter.

The right hand coil L2 is filtering VCC which is 3.3V

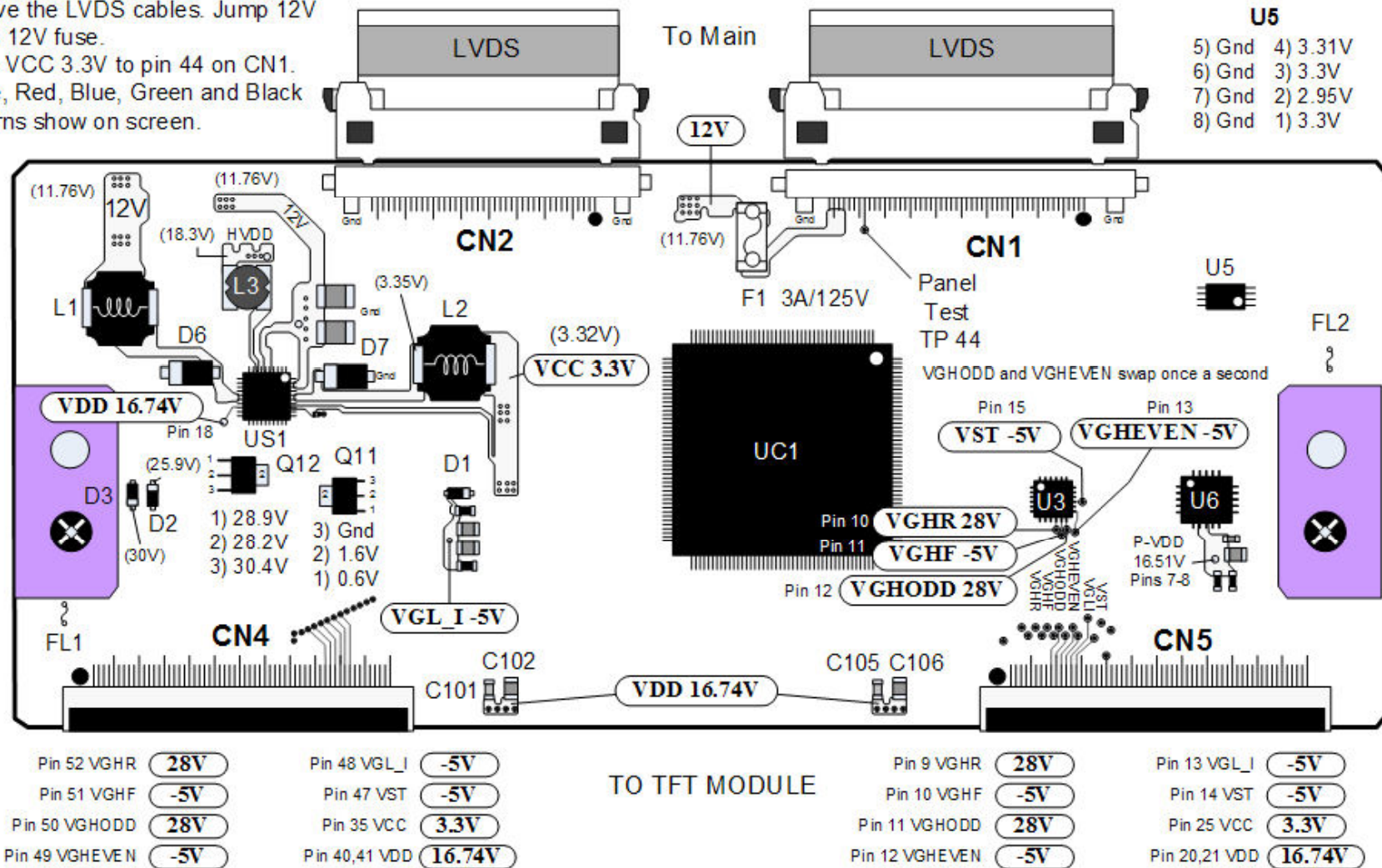


No Picture problem, Checking the T-CON's DC to DC Converter

PANEL TEST

To run the T-CON "Panel Test", remove the LVDS cables. Jump 12V to the 12V fuse. Jump VCC 3.3V to pin 44 on CN1. White, Red, Blue, Green and Black patterns show on screen.

Example from 42LV5500



- U5**
- 5) Gnd
 - 6) Gnd
 - 7) Gnd
 - 8) Gnd
 - 4) 3.31V
 - 3) 3.3V
 - 2) 2.95V
 - 1) 3.3V

VGHODD and VGHEVEN swap once a second

Warning:

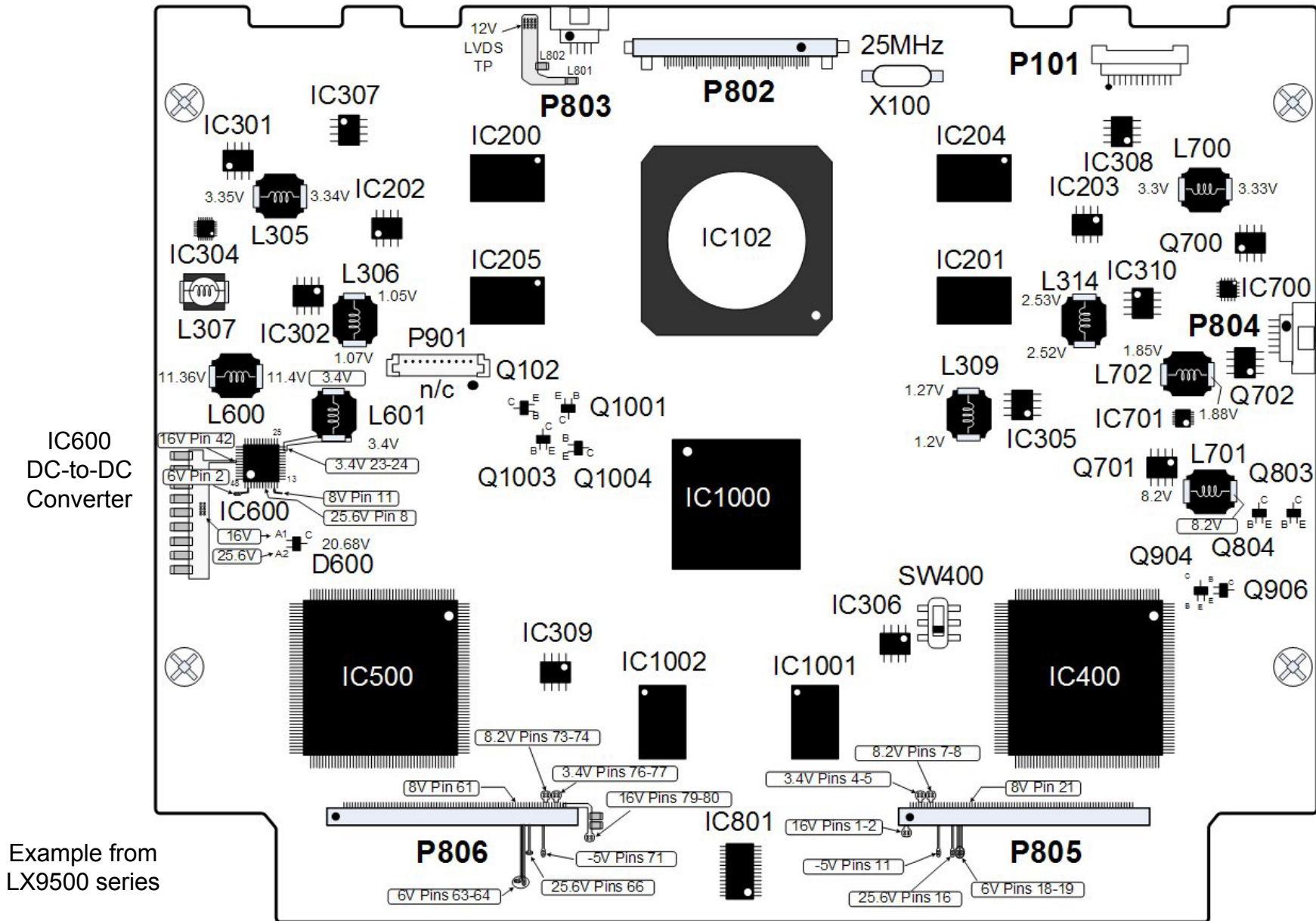
VGHODD and VGHEVEN swap once a second

T-Con Board under shield. Be sure to reinsert screws before operating set with shield removed.



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Checking a 3D FRC T-CON's DC to DC Converter



IC600
DC-to-DC
Converter

Example from
LX9500 series



No Picture problem, Running the Panel Test 1 of 2

When there is a video problem it can be difficult to determine if the problem is related to the Main board, the T-CON board or the Panel. Most of the typical T-CON boards (not the 3D FRC T-CONs) have a built in test pattern that can be run to isolate the problem.

The next page gives the details about how to set up the T-CON board so that it can run the Panel Test.

Also remember that to run the Panel Test;

- The Power Supply must be working normally.
- The Backlights must be running normally.

This test can also be used when there is video but the video has a problem.

If there is a Video Problem and the Panel Test works normally, before condemning the Main board be sure to investigate the LVDS cable.

Sum Up the Panel Test:

The LVDS cables must be removed before running the test.

12V must be jumped to the T-CON.

3.3V must be jumped to pin 41 of the LVDS cable on the 51 pins LVDS.

The Power Supply must be OK.

The Backlights must be OK.

Side note: If the Power Supply is not working, you can still run the Backlights and the Panel Test by substituting;

24V and DRV_ON (usually 3.5V~5V) to the Inverter (Ballast).

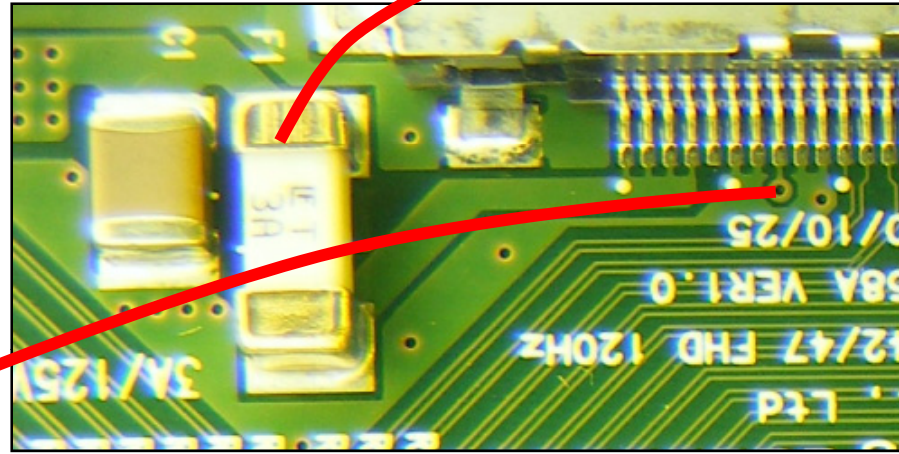
12V and 3.3V to the T-CON as described above.



T-CON (TFT Drive) Board Panel Test 2 of 2

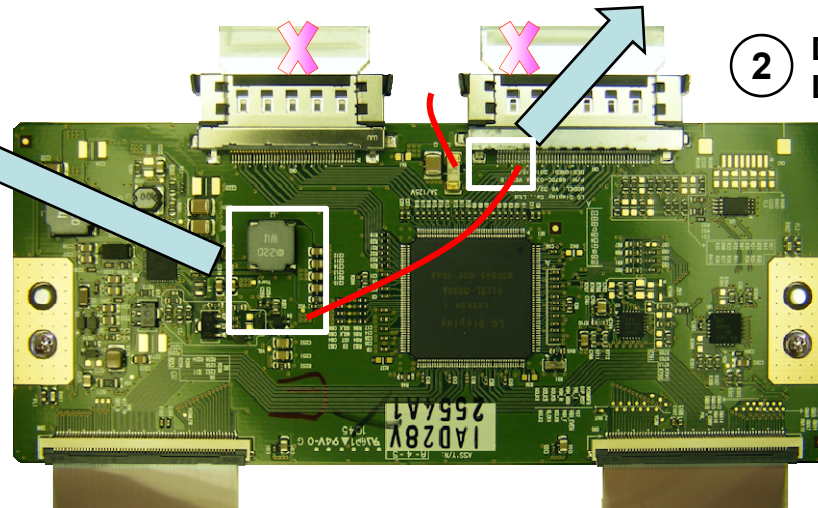
① Set up the Power Supply so that it can run without the Main board if the Main board will not turn on the Power Supply. Do not apply AC at this time.

③ Jump 12V from the SMPS to the T-CON Fuse



② Disconnect both LVDS Cables

④ Jump 3.3V from the VCC TP to pin 44 of CN1



⑤ Apply AC to the Power Supply and Toggling patterns of White, Red, Blue, Green should appear on the screen



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March 2012 LCD T-CON Troubleshooting

8) P-DIM ROUTED THROUGH THE T-CON

- 1) The T-CON Heat Sink Shield. [Pg 3]
- 2) What is a T-CON, (TFT Controller)? [Pg 6]
- 3) What Voltage source does the T-CON use? [Pg 8]
- 4) What Voltages does the T-CON generate? [Pg 10]
- 5) What is an LVDS Cable (Low Voltage Differential Signal)? [Pg 12]
- 6) What is the Difference between a T-CON and a 3D FRC T-CON? [Pg 17]
- 7) How to Troubleshoot a T-CON board. [Pg 20]
- 8) Some T-CONs Route the P-DIM (Dimming Signals) to the Inverter. [Pg 31]**
- 9) What is the purpose of the Blue LED on some T-CONs? [Pg 36]



Some T-CONs Deliver P-DIM (Dimming Signals) to the Inverter

P-DIM (Called PWM-DIM which stands for Pulse Width Modulation Dimming) is a signal from the Main board that is generated by monitoring the Video content's average brightness level. It is then sent to the Backlight driver IC to control the brightness of the backlights accordingly. The maximum brightness level is established by the customer through the Customer's Menu in the Video selection under Backlights. This setting has a bar graph that can be set from 100% down to 0%.

The P-DIM signal will follow the percentile setting proportionately. The range of P-DIM is 3.3V to 0V. So when the bar graph is set for 100% the P-DIM line will be 3.3V and the backlight brightness will be maximum.

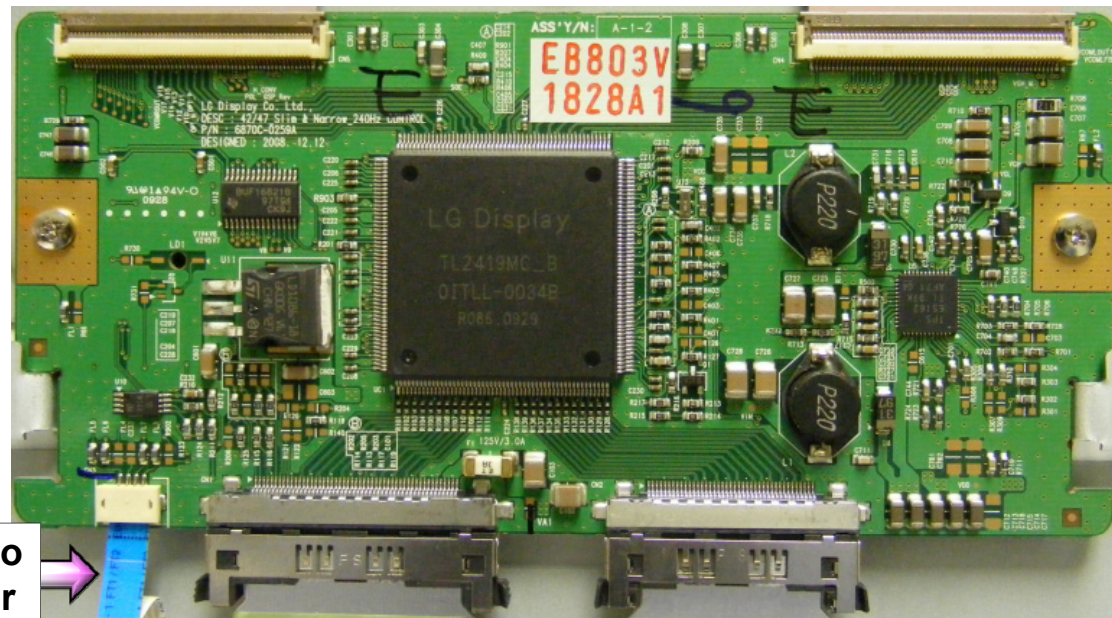
Most often the P-DIM line is routed directly from the Main board to the Power Supply, it is routed through the Power Supply directly to the Inverter and then to the Backlight driver IC.

(If the Power Supply has an on-board Inverter, the Driver IC is on the Power Supply itself).

However, on some sets, the P-DIM line is routed to the T-CON board. The T-CON then generates a control signal that is then routed to the Inverter and then to the Driver IC.

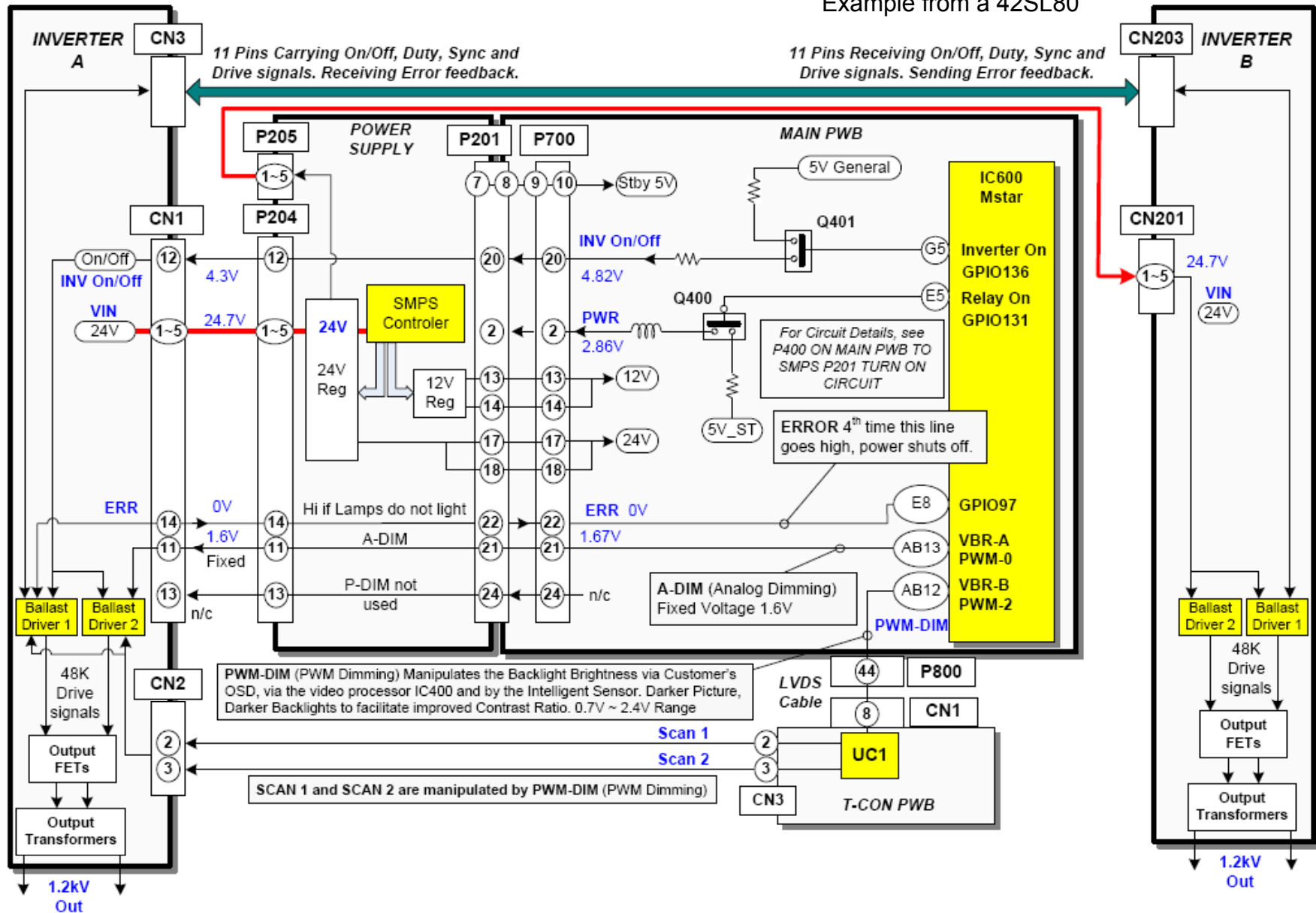
Here is the T-CON from a 42SL80. The connector in the bottom left goes to the Inverter and carries the P-DIM Control Signals. The P-DIM signal from the Main board is brought in on pin 8 of the left LVDS and is then routed to the large MCM IC. Then it is output through the 8 pin IC on the bottom left to the connector.

The next page shows the P-DIM routing for this model.



Example of P-DIM Routed Through the T-CON

Example from a 42SL80



Troubleshooting the P-DIM Line when Routed Through the T-CON

When troubleshooting this type of P-DIM routing, you will still use the same procedure. Enter the Customer's Menu and go to Video, then select Backlights. Place a DC voltage meter on the output from the T-CON CN3 or the input to the Inverter CN2. You can check either of the two pins.

While adjusting the Backlights from 100% down to 0% the P-DIM lines (now called Scan1 and Scan2) will vary accordingly from 2.4V at 100% down to 0.67V at 0%.

CN3 "T-CON" to CN2 "Inverter A"

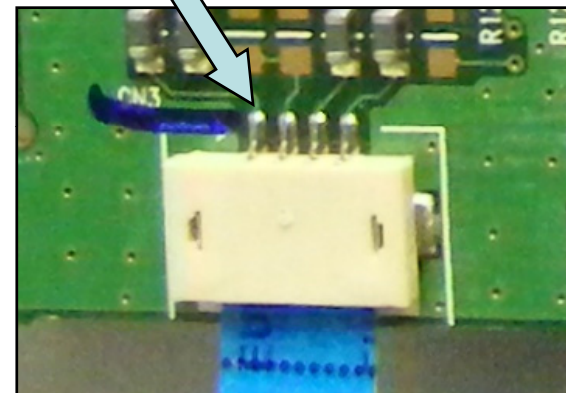
Pin	Label	Run	Diode Test
1	n/c	n/c	n/c
2	SCAN 1	0.67V~2.4V	Open
3	SCAN 2	0.67V~2.4V	Open
4	Gnd	Gnd	Gnd

Pins 2 SCAN 1 and 3 SCAN 2 (Digital Dimming)
Can vary according to the brightness level of the
video signal and the OSD Backlight setting.

0.67V 0% to 2.4V 100%.

P-DIM Output from the Video Processing chip
IC100 (Mstar) and input on CN1 pin 8 T-CON.

See arrow on the
T-CON board CN3
indicating pin 1



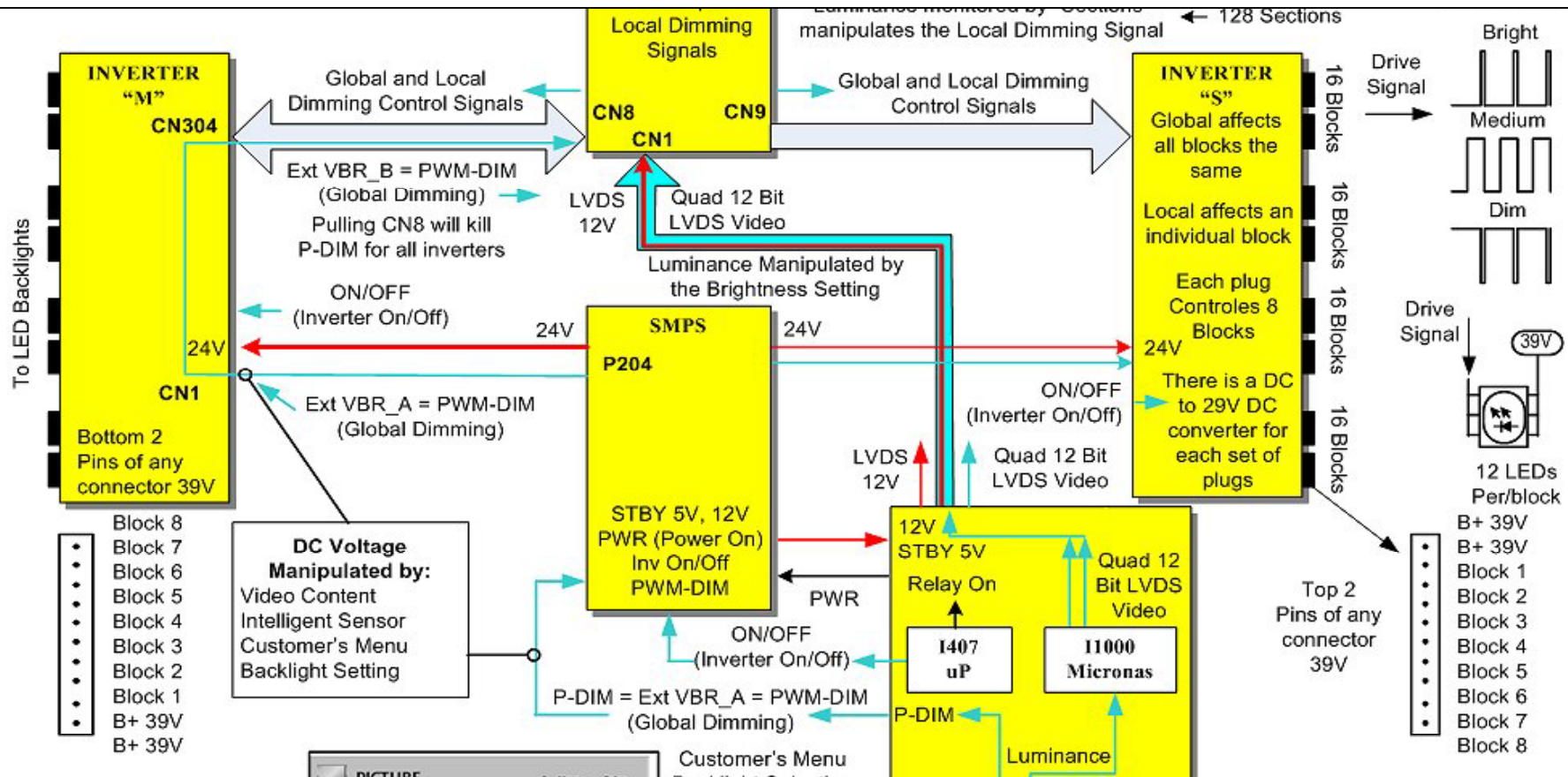
CN3

Tip: When dealing with a dim picture, another trick you can use for troubleshooting this type of P-DIM routing is to turn the power off and disconnect the small cable between the T-CON to the Inverter and then turn the set back on. This will defeat the P-DIM control signal and the backlights should now go to maximum brightness.



47LG90 Backlight Dimming Control Through T-CON

In the 47LG90 (LED Backlights) the P-DIM line is also routed through the T-CON, but it goes through the Main Inverter first after the Power Supply.



Tip: When dealing with a dim picture, a trick you can use for troubleshooting this type of P-DIM routing is to turn the power off and disconnect CN8 and CN9 on the T-CON and then turn the set back on. This will defeat the P-DIM and Local Dimming control signals and the backlights should now go to maximum brightness.



9) THE PURPOSE OF THE BRIGHT BLUE LED ON SOME T-CONs

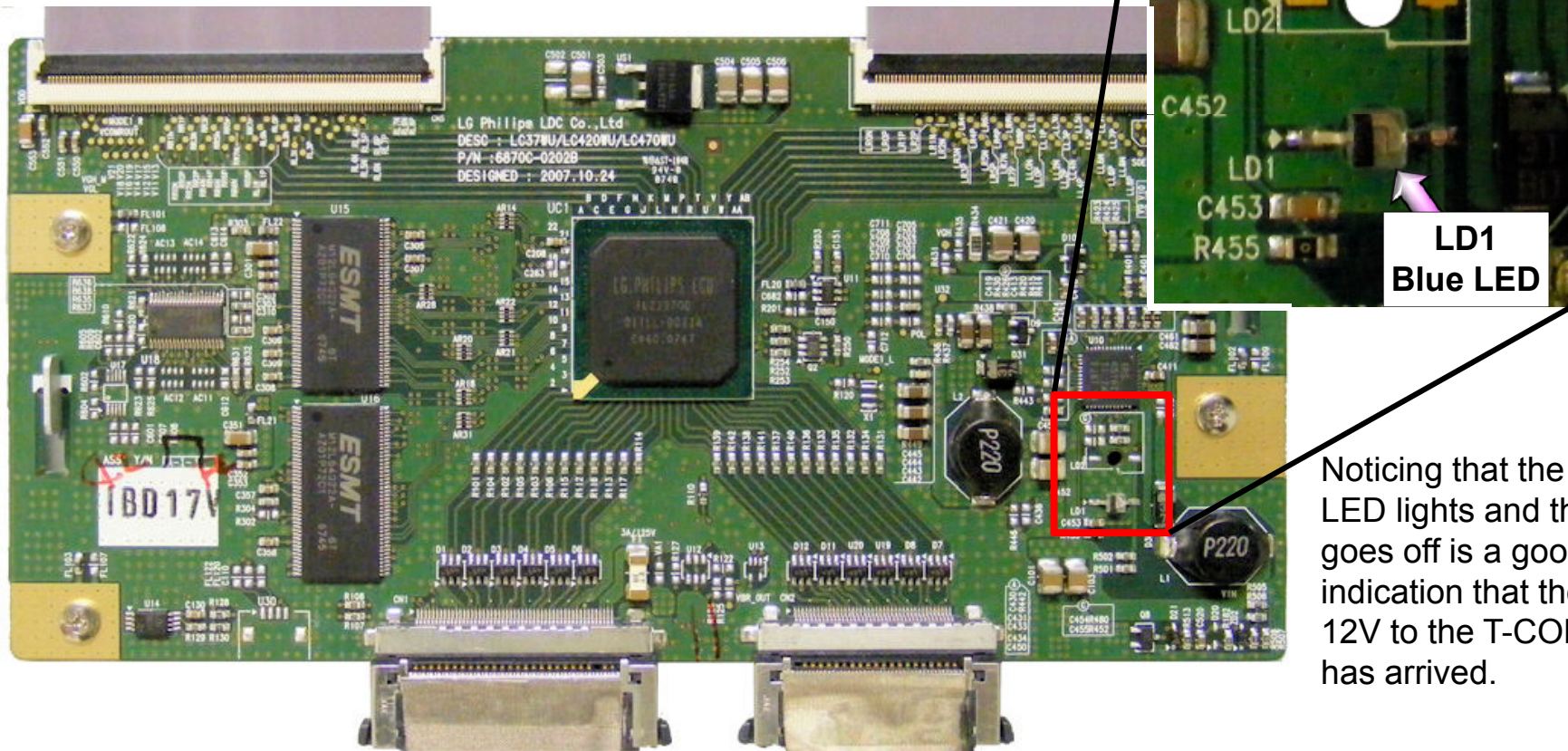
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The Function of the Blue LED on Some T-CON Boards.

On some of the LCD T-CONs there is a bright Blue LED that turns on for a brief moment during turn on and then it shuts off. These are only used in set with Florescent Bulbs as the Backlights. As in the example below (from 42LG60), it shows the Blue LED is on the lower right hand side.

The purpose of LD1 is to help excite the Selenium gas in one of the backlight bulbs. This helps the bulb to light when there's little room light by pre-exciting the gas. With little room light, the gas in the florescent Bulbs tends to lie dormant, (Little movement). This LED help to get the Electrons moving just before the point of firing, (turning on). You may note the hole in the board just above LD1. There is A small hole under LD1 too. This is how the light goes through the board to get to the Bulbs. (There is a hole in the back metal cover of the panel as well).

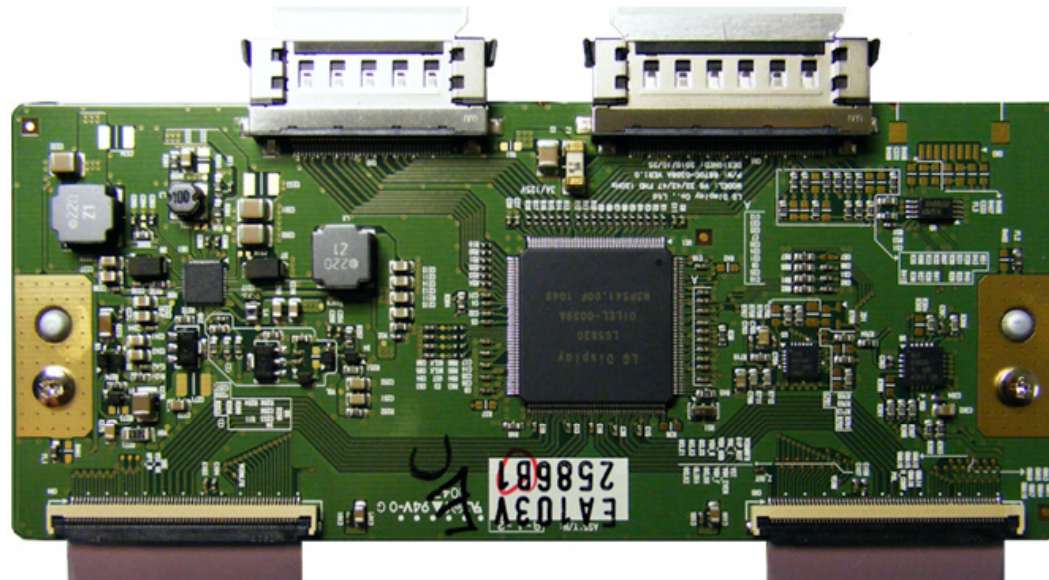


End of the T-CON Troubleshooting Presentation



LG
Life's Good

This concludes the Presentation



Thank You.



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