JVC

JVC Television
Power Supply Training

JVC

INTRODUCTION

After this course, you will learn:

- The operation of Switching supplies
- Details about the regulator IC
- Operation of the Power Supply Modes
- The operation of the Power Factor Circuit
- Troubleshooting procedures useful in diagnosing defective components
- Some failures and their symptoms

JVC

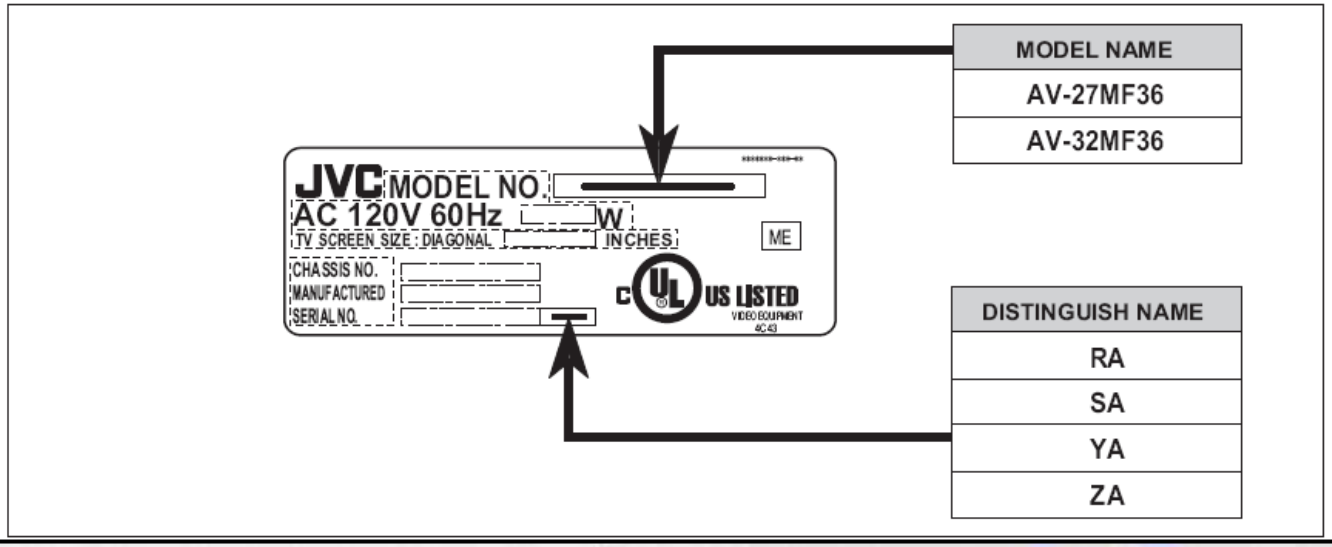
AGENDA

- Model Identification
- Service Manual Supplements
- Switching Power Supply
- Power Supply Components
- Basic Switching
- Switching Device
- Switching Operation
- Switching Review
- Power Factor circuit
- Troubleshooting techniques

MODEL IDENTIFICATION

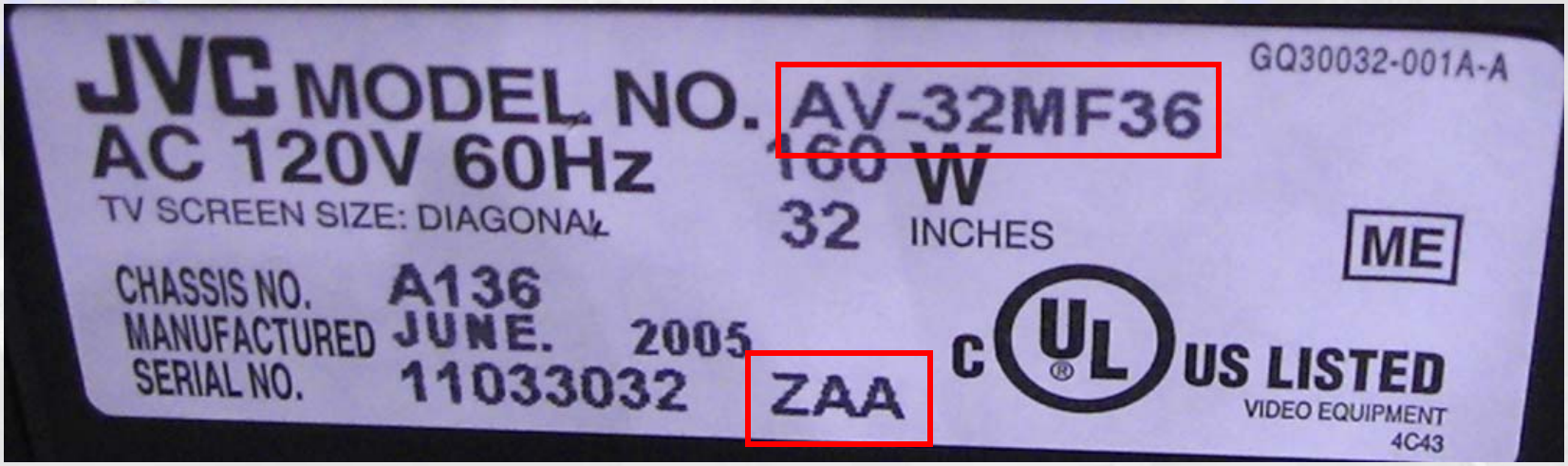
2.3 HOW TO IDENTIFY MODELS

How to recognize from the appearance of the model concerned is written below. Please distinguish from several contents currently printed on the rating label



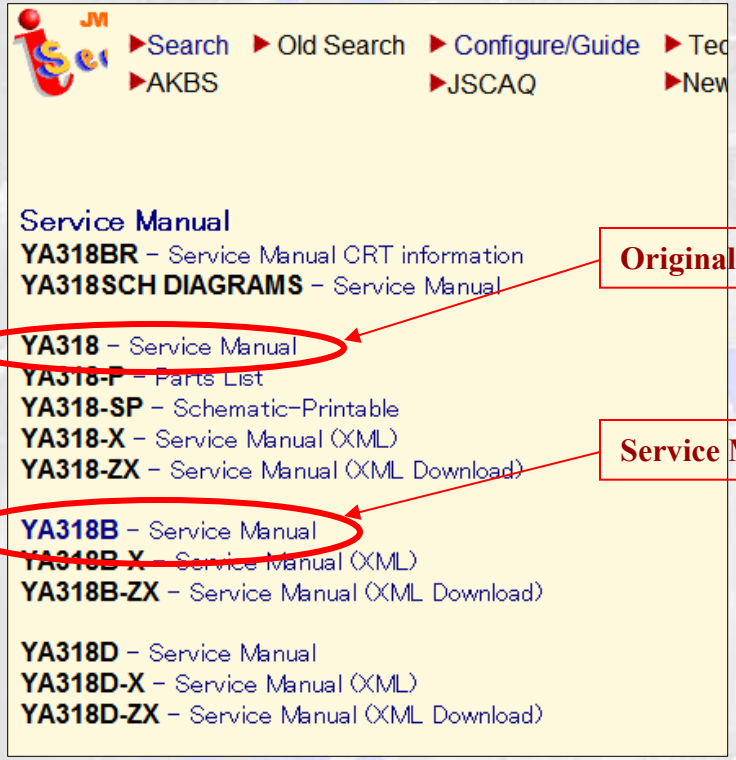
MODEL NAME
AV-27MF36
AV-32MF36

DISTINGUISH NAME
RA
SA
YA
ZA



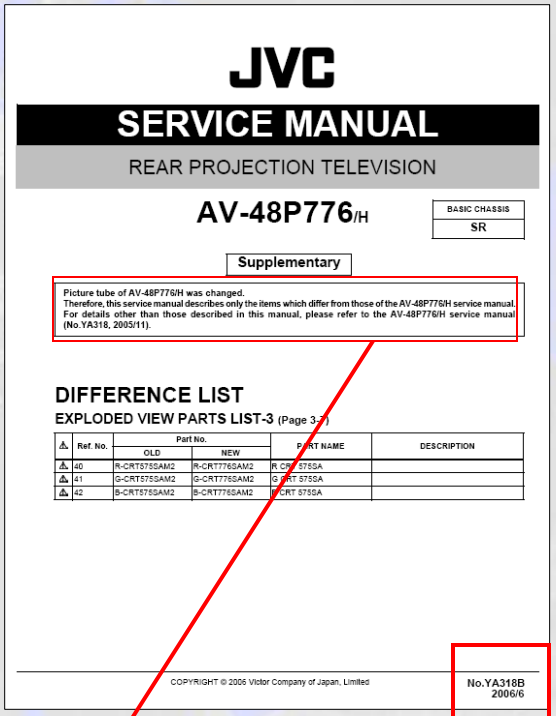
- Prior to service, it is always wise to verify the Model and Version to ensure that the correct Service manuals and Schematics are being used.
- In some cases, the Version may indicate PWB or CRT differences
- This information is listed in the Main Difference List of the Service Manual, or the Service Manual Supplements. For example YA319 is the service manual, but YA319B would be a revision.
- The Example shows that the AV-32MF36 has (4) versions. The example shows the “Z” Version of this model.
- The Model Number listed at the top of the model label will always be the same for all versions.
- The TV Model Version is usually shown to the right of the Serial Number on the Model Label

SERVICE MANUAL SUPPLEMENTS



Original Service Manual

Service Manual Supplement


JVC

SERVICE MANUAL

REAR PROJECTION TELEVISION

AV-48P776/H

BASIC CHASSIS
SR

Supplementary

Picture tube of AV-48P776/H was changed.
Therefore, this service manual describes only the items which differ from those of the AV-48P776/H service manual.
For details other than those described in this manual, please refer to the AV-48P776/H service manual (No.YA318, 2005/11).

DIFFERENCE LIST

EXPLODED VIEW PARTS LIST-3 (Page 3-7)

Ref. No.	Part No. OLD	Part No. NEW	PART NAME	DESCRIPTION
40	R-CRT575SAM2	R-CRT776SAM2	R CRT 575SA	
41	G-CRT575SAM2	G-CRT776SAM2	G CRT 575SA	
42	B-CRT575SAM2	B-CRT776SAM2	B CRT 575SA	

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No.YA318B
2006/6

Supplements show Corrections, Additions and Differences that may have occurred during the production of a TV Model.

No. YA318B

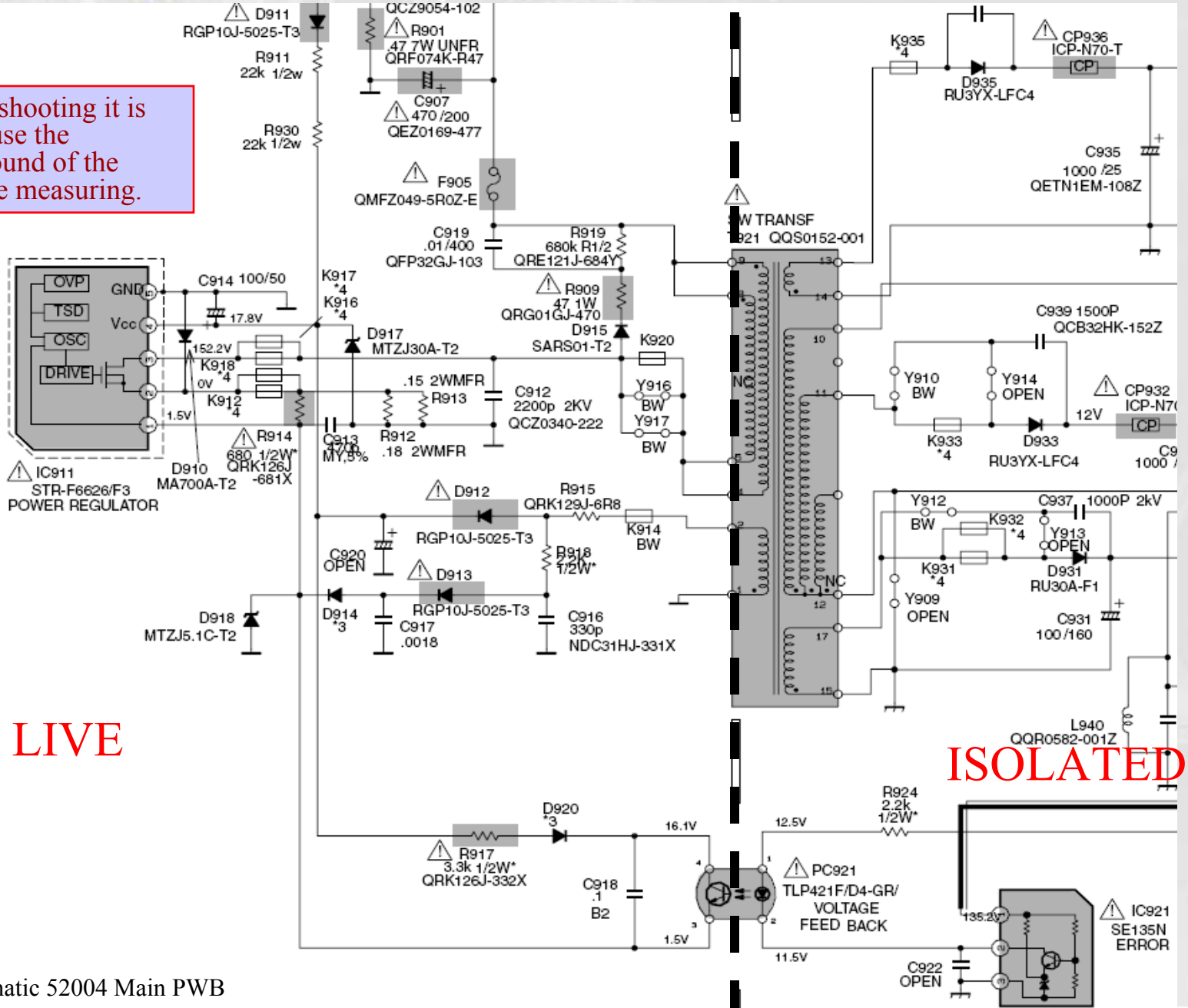
2006/6

Picture tube of AV-48P776/H was changed.
Therefore, this service manual describes only the items which differ from those of the AV-48P776/H service manual.
For details other than those described in this manual, please refer to the AV-48P776/H service manual (No.YA318, 2005/11).

- Some Service Manual have Supplements
- Supplements show Corrections, Additions and Differences that may have occurred during the production of a TV Model.
- It is necessary to ensure you have all Service Documents for a model prior to servicing.
- The Original Manual will only show the original Service Information for a model, but Service Manual Supplements may list information that is important to the service of a model.
- Ensure that you use the Model and Model Version when looking for documents on ISee to ensure you are getting the correct information.

SWITCHING POWER SUPPLY

When troubleshooting it is necessary to use the respective ground of the device you are measuring.



Taken from Schematic 52004 Main PWB

- This is the Power Section from the AV-32F703 taken from the 52004 Schematic of the Main PWB.

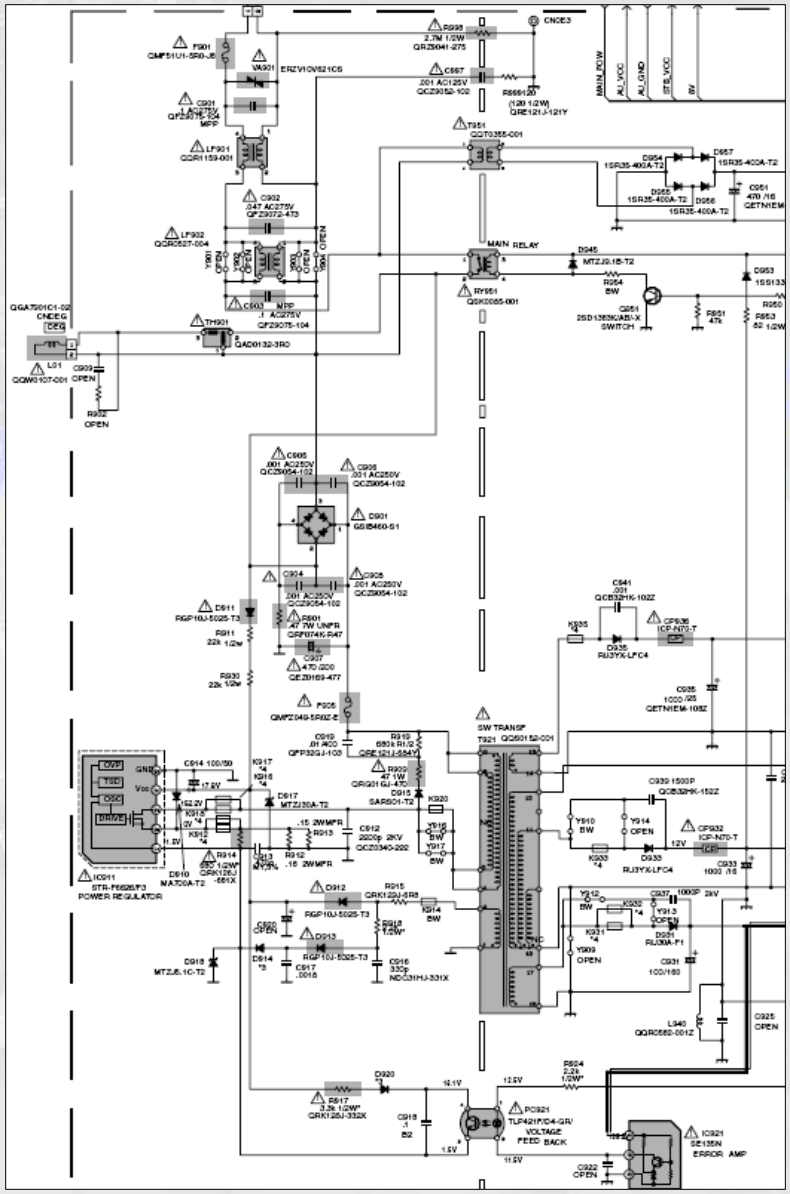
- On the schematic, there a **BLACK** line that separates the LIVE and ISOLATED sides of the PWB. Components on the left side are live. Those on the right side are isolated

- When troubleshooting it is NECESSARY to use the respective ground, **Live or Isolated,** of the device you are measuring.

- Additional components, located along the dotted line, ensure circuit isolation while passing all Power or Control signals. These components are the Relay, Switching Transformer, Photocoupler and the Capacitors that are used to connect the Live and Isolated grounds.

POWER SUPPLY COMPONENTS

1. F901 and VA901	Surge Protection
2. T951, D954-57 and C951	Standby Power
3. C901, C902 and C903	Line Filter:
4. D901 and C907	Main rectifier
5. IC911	Switching Regulator
6. D911, R911,R930 and C914	Startup
7. T921	Switching Transformer
8. R912, R913 and R914	Current Feedback
9. R915 and D912	Run DC
10. D917 and D914	Refresh
11. D945 ~ RY951	Main Relay
12. Q951	Main Relay Drive
13. IC921	Error Amp



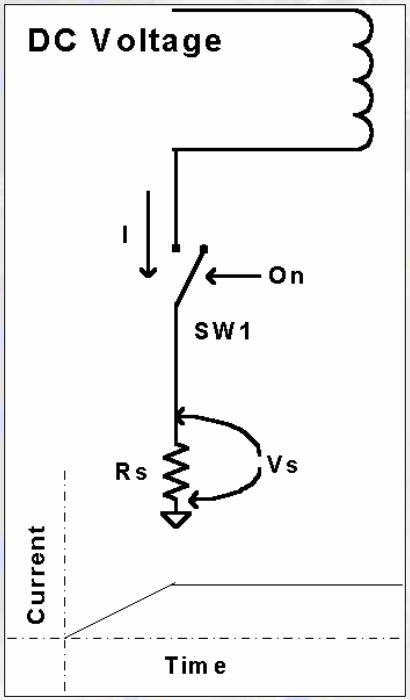
Schematic 52004 Main PWB

- Reference Schematic 52004 Main PWB for Schematic Details.
- This is a brief explanation of the components that make up the Power Supply and there functions.
- This is the basic circuit configuration and use for all JVC Power Supplies. **While some Power Supplies may omit or add circuits, the general function of all JVC Power Supplies are the same**.

1.	F901 and VA901	**Surge Protection:** Stops circuit function if High Current (short) is detected.
2.	T951, D954-57 and C951	**Standby Power:** Supplies Standby DC voltage to Micon
3.	C901, C902 and C903	**Line Filter:** Filtering of AC line noise
4.	D901 and C907	**Main rectifier:** Provides rectified DC to Switching Regulator and Switching Transformer.
5.	IC911	**Switching Regulator:** Regulates Switching Voltages out of Transformer
6.	D911, R911,R930 and C914	**Startup:** Provides Startup DC for Switching Regulator until Transformer conduction begins
7.	T921	**Switching Transformer:** Provides voltages to all circuits
8.	R912, R913 and R914	**Current Feedback:** Provides current feedback to Switching IC to stop conduction.
9.	R915 and D912	**Run DC:** Provides additional DC to Switching IC
10.	D917 and D914	**Refresh:** Provide Refresh voltage to Restart IC Regulation
11.	D945 ~ RY951	**Main Relay:** Allows Power flow to Switching IC and SW Reg. Also functions as relay for Degauss
12.	Q951	**Main Relay Drive:** Controls function of Main Relay
13.	IC921	**Error Amp:** Monitors B1 Line Voltage

BASIC SWITCHING

INDUCTOR CHARGING

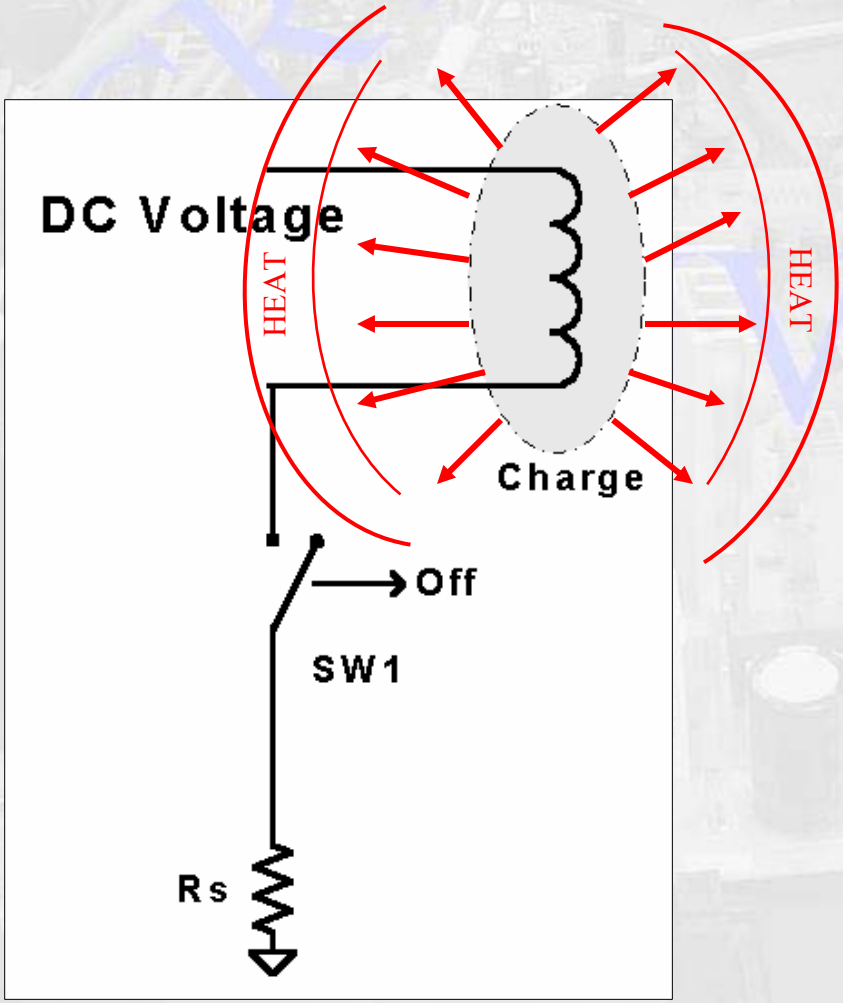


1. Switch SW1 off
2. Apply a DC to the inductor as shown
3. Turn SW1 on and the Current rises slowly
4. The Inductor charges to its maximum
5. After charging is complete, the current stays constant

- One of the important part in SMPS is the Transformer. Transformer functions like a basic inductor.
- With a DC applied to an inductor and connected to ground through a resistor, if the switch is turned on, the current will rise slowly through the inductor and the resistor.
- The current ramps up and Reaches maximum and stays constant.
- When the current does not change any more, the inductor is fully charged.
- Capacitors and inductors behave similarly but opposite. Capacitors can hold the charge, but inductors can not. It has to be discharged. If there is no path to discharge, it will make eddy current through the coil and produce heat.
- The basic of Switching power supply is the effective and controlled use of using the discharged energy.

BASIC SWITCHING

INDUCTOR DISCHARGING



Once the Inductor is finished charging, turn SW1 off.

1. What happens to the charge in the inductor? It will be lost as heat.

2. Can we use this energy? If so, how?

3. Can we control this charging? If so, how?

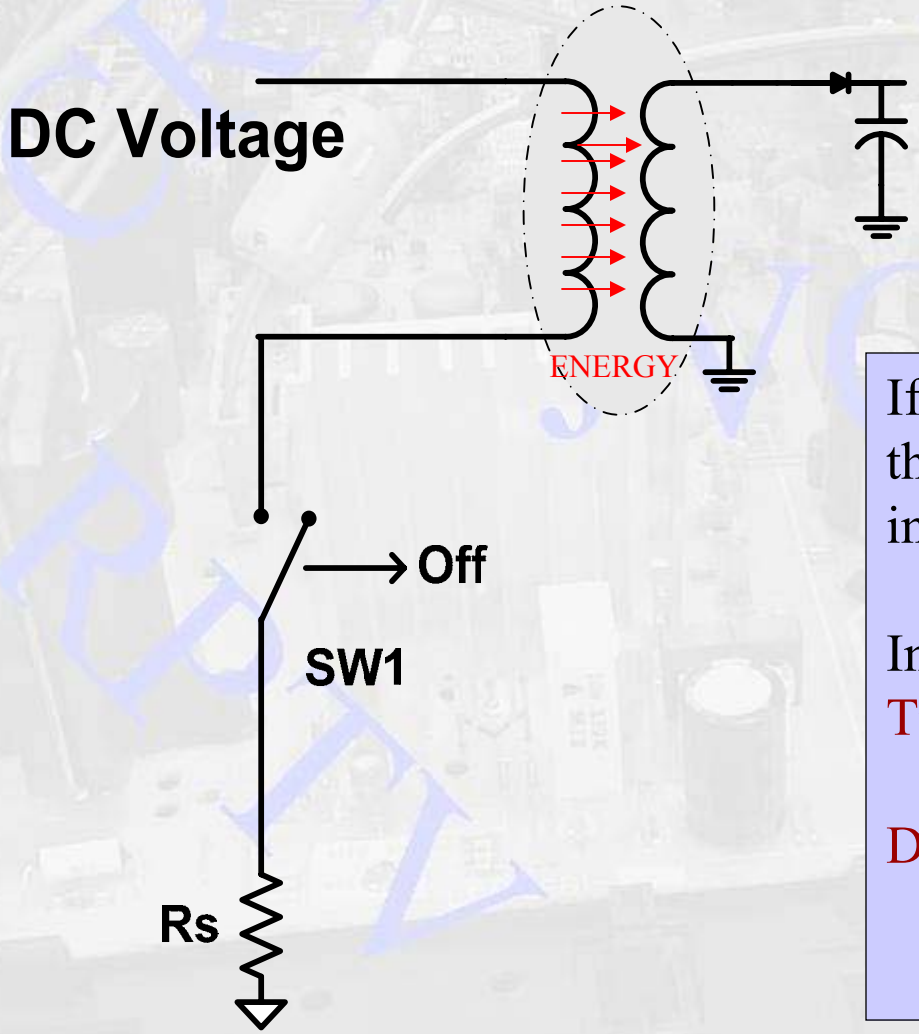
<u>This can be applied in the Switching Power supply.</u>

- When the current flow to the Fully Charged Inductor is interrupted by closing SW1, the stored energy is released as Heat.

- This stored energy is utilized in the Switching Power Supply.

BASIC SWITCHING

TRANSFORMER OPERATION



If there is a secondary winding during the off time, energy will be transferred into the secondary.

In other words:
Transformer charges during ON-time.

Discharges during OFF-time

If the coil has a secondary winding and a load is attached, it is called a transformer because it transforms the energy into electrical energy and delivers it to a load.

In other words, the transformer discharges its stored energy into the secondary.

Repeating these actions again.

1. When the Switch is turned on the primary charges.

2. When the Switch is turned off, the charged core of the inductor discharges into the secondary.

3. Since we are interested in DC output, the addition of the Diode and Capacitor at the secondary will allow for the energy to be stored in the Capacitor. This stored energy is our Secondary DC voltage.

4. If the switch is turned off prior to fully charging the inductor, the transferred energy will be less. This shows that by controlling the Switch's on/off time we can obtain necessary secondary voltage.

The Transformer, Switch or any Switching Device and a Control Circuit (to control on/off switching) make up a Switching Supply.

BASIC SWITCHING

SUMMARY

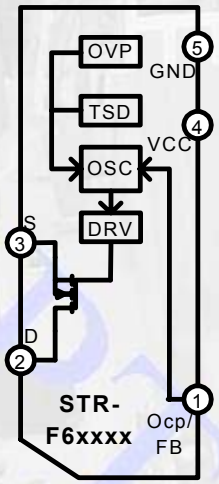
1. Apply an unregulated DC Voltage to the Transformer's Primary.

2. Switching the Primary ON and OFF will result in Secondary Voltage.

3. Controlling the ON/OFF timing of the Switching Device will result in a Regulated Secondary Voltage

Switching power supply regulation is achieved by controlling the switching device's ON/OFF timing .

SWITCHING DEVICE



- STR-Fxxxx IC
- Very reliable construction
- All in one package
- Protection circuits
- Minimum pins (5 pins)

- This is one of the various types of Switching Devices used in JVC Power Supplies.

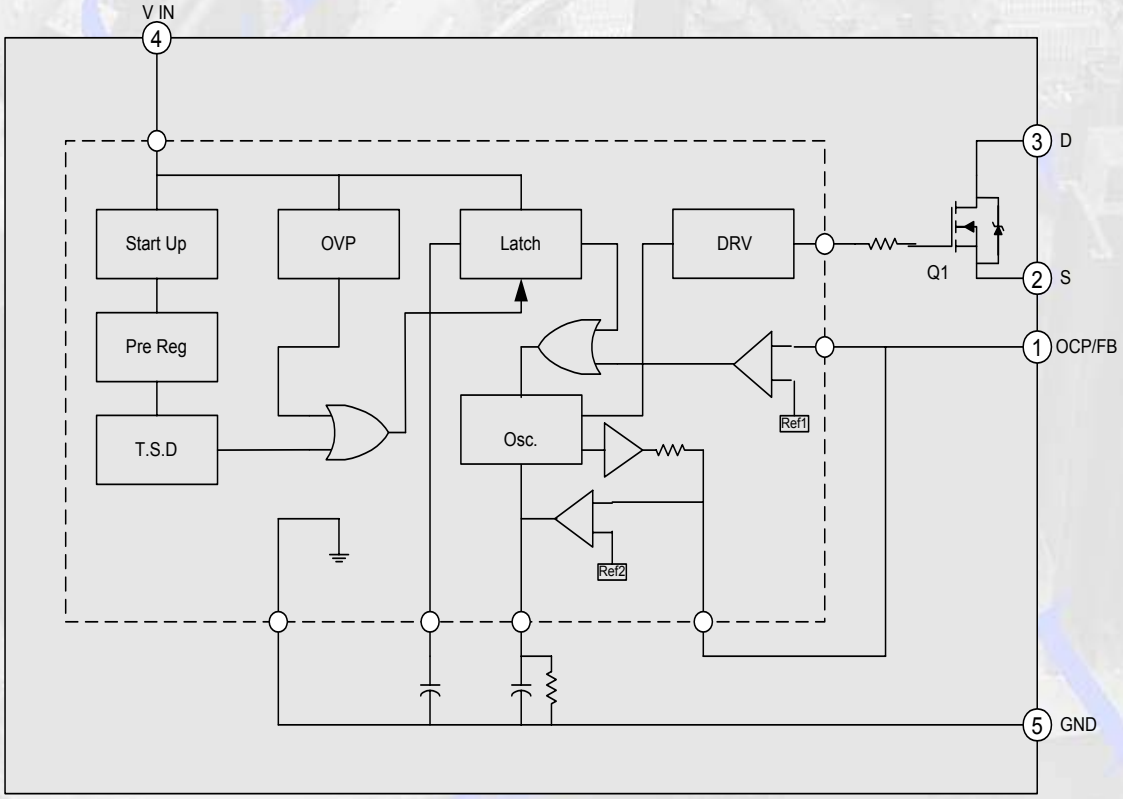
- In the previous explanations we called it SW1. On the Schematics previously outlined it is the Regulator

- It has the actual ON/OFF switch (a Power FET), control circuits, and protection circuits.

The Internal Circuits of the other Switching Devices used by JVC may vary, but the operation of the Device is the basically the same for them all.

SWITCHING DEVICE

Properties



- 0.7V Applied to Pin 1 will turn OFF the FET
- FET will turn on after pre-determined time
- Applying a 2.0V pulse to Pin 1 refreshes the IC prior to pre-determined time

- When a Start up DC is applied to the other circuits inside the IC, it turns the FET ON.

- When the FET is ON there will be a short between pin2 and pin3 of the IC.

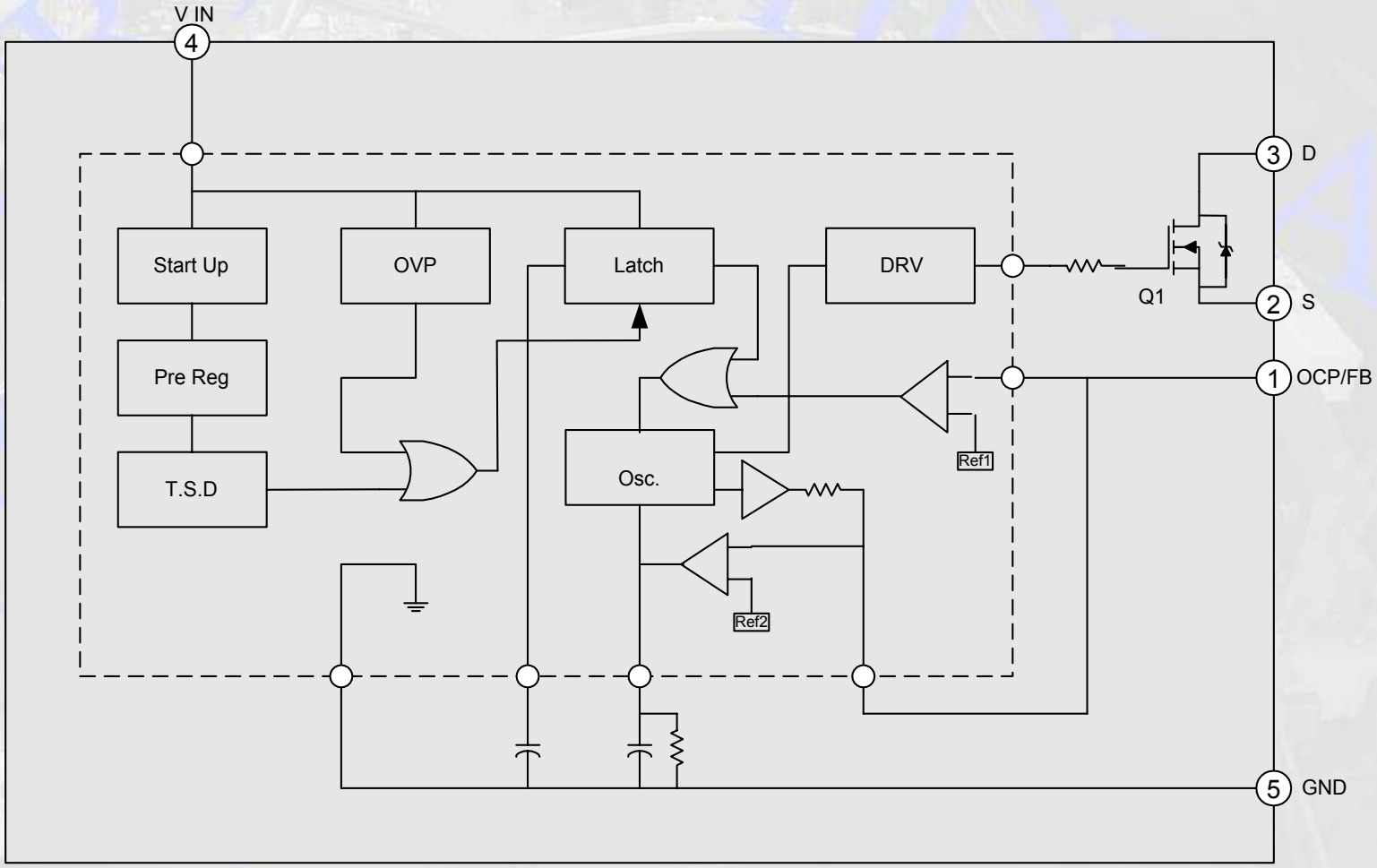
- If 0.7V is applied at pin 1, the FET turns OFF. Due to the internal timing circuit, the FET will start again after a pre-determined time.

- If we wants to turn ON the IC prior to the internally decided time, we can apply a 2VDC to pin1.

- This means, we can turn ON the FET and turn OFF the FET at any time we want.

SWITCHING DEVICE

Internal



Startup: When we apply approximately 12V to pin4, the IC's internal circuit functions and turns ON the FET

Drive: When the internal circuit is turned on, the driver circuit turns ON the power FET

Power FET: This is what we previously called the Switch. We use this to allow current to flow through the transformer.

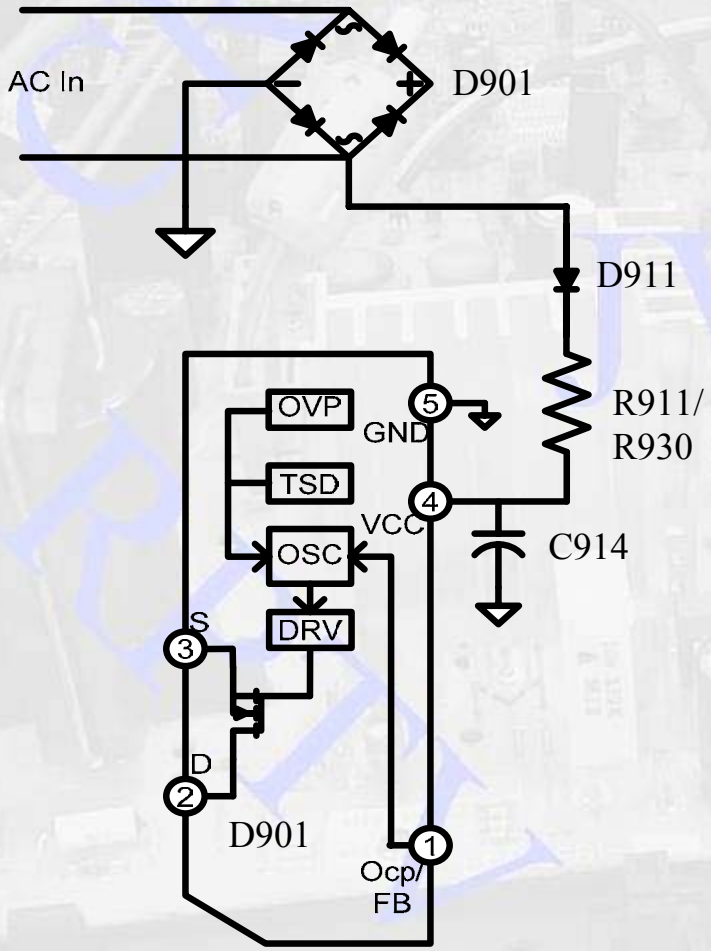
Oscillator: The IC has an Oscillator for timing control. This oscillator decides its natural on/off time. This means, after applying the startup DC, after a pre-determined time it will come on.

OCP/FB: This is the control input to override the oscillator's timing. By applying a 0.7V to this input, we can turn OFF the internal circuit and FET. By applying a 2.0V pulse, we can turn it back ON.

TSD: Thermal Shut Down: This is for the thermal protection. When the IC overheats, this circuit turns off the IC and latches it. We have to unplug the power to restart.

OVP: The OVP circuit monitors the startup DC. If the voltage exceeds the specified level, it turns off the IC and latches it. We need to unplug the power to restart.
Latch: This is the latch circuit that latches and holds the shut down circuit outputs.

SWITCHING DEVICE
Turn ON



- Apply power to the IC
- When the tank Capacitor charges up to the Start-up voltage, IC starts conduction
- The Switching FET turns ON
- Now it can switch the RAW-DC through the Transistor, if it is connected

Reference Schematic 52004 Main PWB for Schematic Details.

- This is start up circuit. This circuit composes R911, R930, D911 and C914.

•This circuit Provides the Start-up Voltage for the Switching IC911

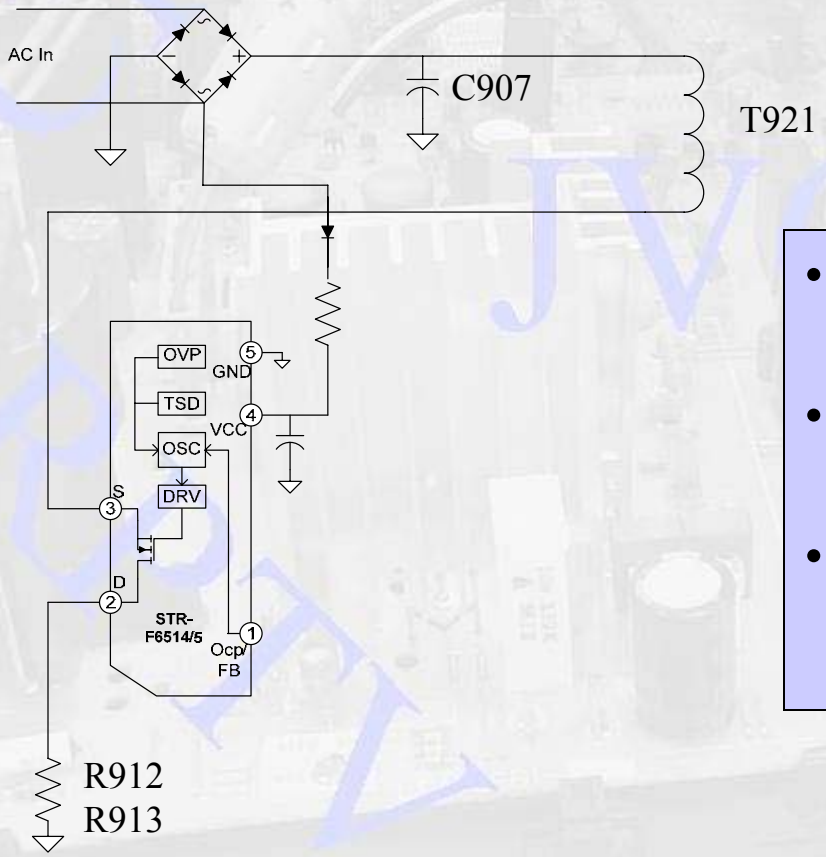
•The DC voltage supplied by this circuit turns the IC and FET ON.

•If the IC was open and AC current was allowed to flow, no current would flow through the IC. This would cause C914 to overcharge and explode. **For this reason, If you find a defective Switching Regulator IC, replace the Capacitor. Similarly, if you find exploded Capacitor, replace the IC.**

Reference Schematic 52004 Main PWB for Schematic Details.

SWITCHING DEVICE

TRANSFORMER CHARGING



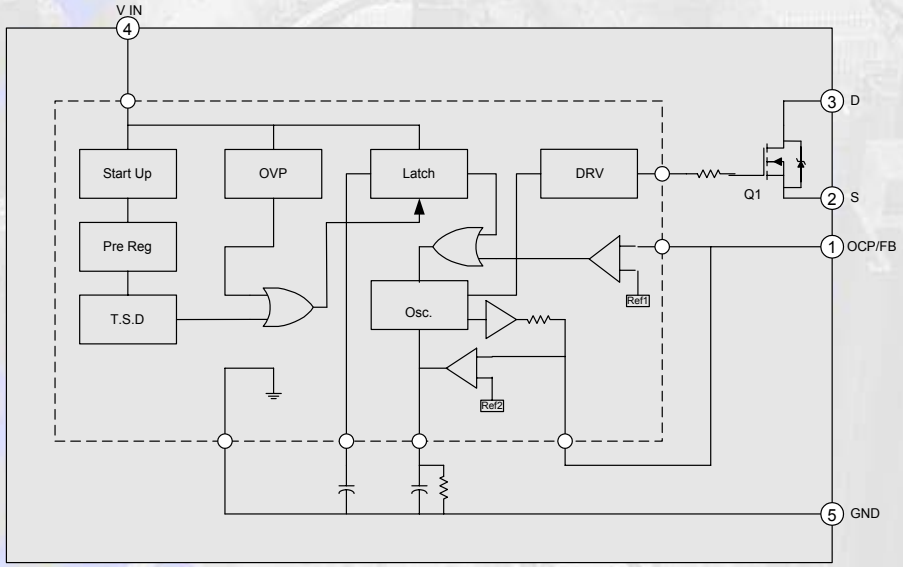
- Current flows through the transformer and charges it
- A proportional voltage develops at the source resistor
- Turning the FET off will cause the switching action

Reference Schematic 52004 Main PWB for Schematic Details.

- Once the startup DC is applied, the FET can turn ON
- The Transformer is allowed to charge.
- Raw DC is passed through the primary of a transformer to the IC pin 3
- The Voltage passed through the FET connects to a source resistor on pin2 to ground.
- As the Transformer charges, a proportional voltage will build on the Source Resistor R914.

SWITCHING DEVICE

Turn Off 1/2



- Applying 0.7V to Pin 1 will turn OFF the FET
- FET will turn on after pre-determined time

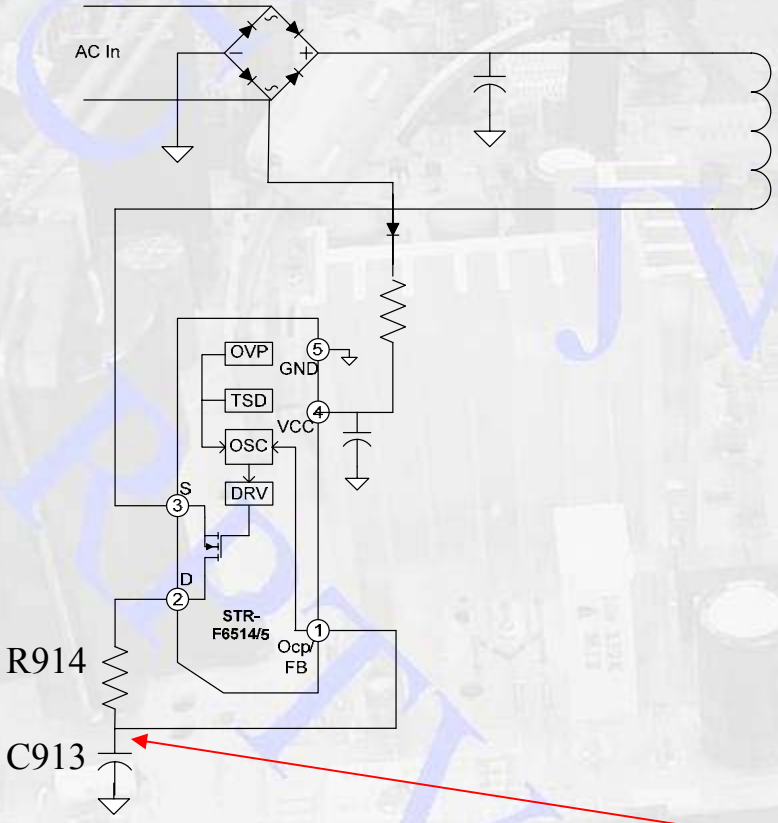
Do you remember this?

If 0.7V is applied at pin 1, the FET turns OFF.

Due to the internal timing circuit, the FET will start again after a pre-determined time.

SWITCHING DEVICE

Turn Off 2/2



- When the FET conducts, a ramp voltage is generated at pin 2.
- We use this ramp to turn FET off and hence create a switching action

Ramping Voltage builds here and is feed back to pin1.

If this feedback Resistor/Capacitor opens up, the IC will never be turned off. The transformer and the IC will overheat and shutdown occurs.

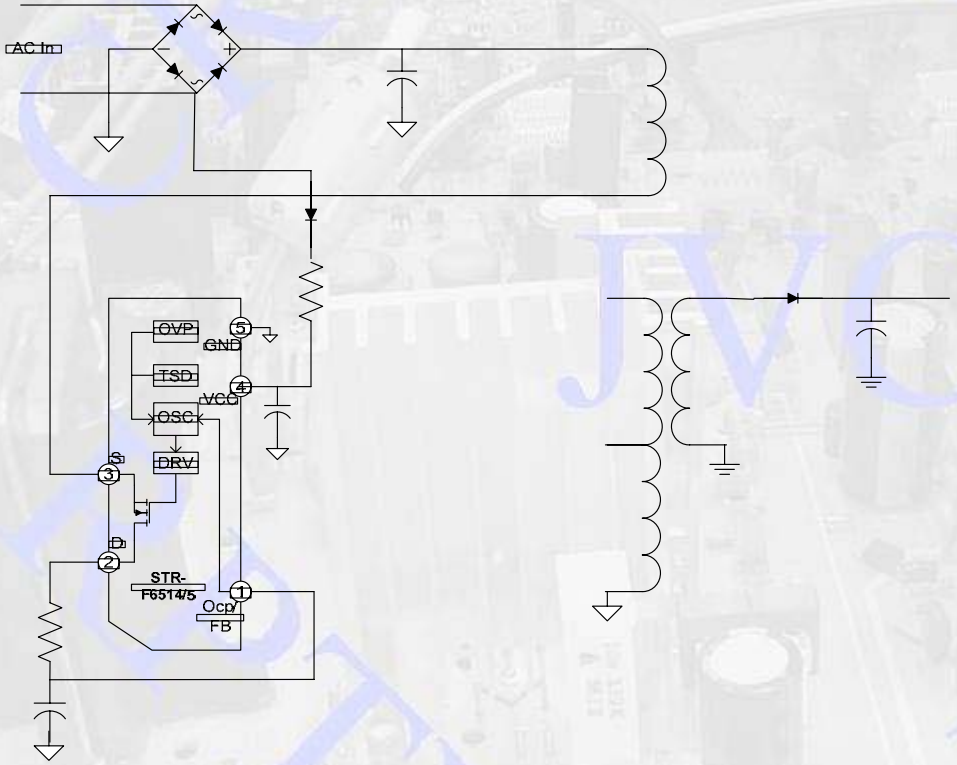
Reference Schematic 52004 Main PWB for Schematic Details.

- We already discussed that the IC is designed such that if we apply 0.7V at pin1, it will turn off the IC temporarily.
- The circuit is designed in such a way that when the transformer is charged, 0.7V builds at the Capacitor C913.
- We use this ramping voltage at pin2 to turn off the IC.
- When the inductor (primary) charges, Current increase through the source resistors. It causes a ramp voltage at pin2 and is applied to pin.

If this feedback Resistor/Capacitor opens up, the IC will never be turned off. The transformer and the IC will overheat and shutdown occurs.

SWITCHING DEVICE

SECONDARY VOLTAGES



- Repeating ON/OFF switching generates Secondary Voltages
- IC function drains the ICs Power Supply and it becomes too low

The IC could Shut OFF due to insufficient Supply Voltage

Reference Schematic 52004 Main PWB for Schematic Details.

- When DC is applied to pin3, current will flow through the transformer and charges it. The current will generate .7 V on pin2. This is applied to pin1 to turn it off.

- When the Inductor shuts off, the Inductor discharges the energy to the secondary.

- Repeating the ON and OFF process causes a switching action. This action causes the transformer to charge and discharge generating generates Secondary Voltages.

- The IC's startup voltage is through a high value resistor.

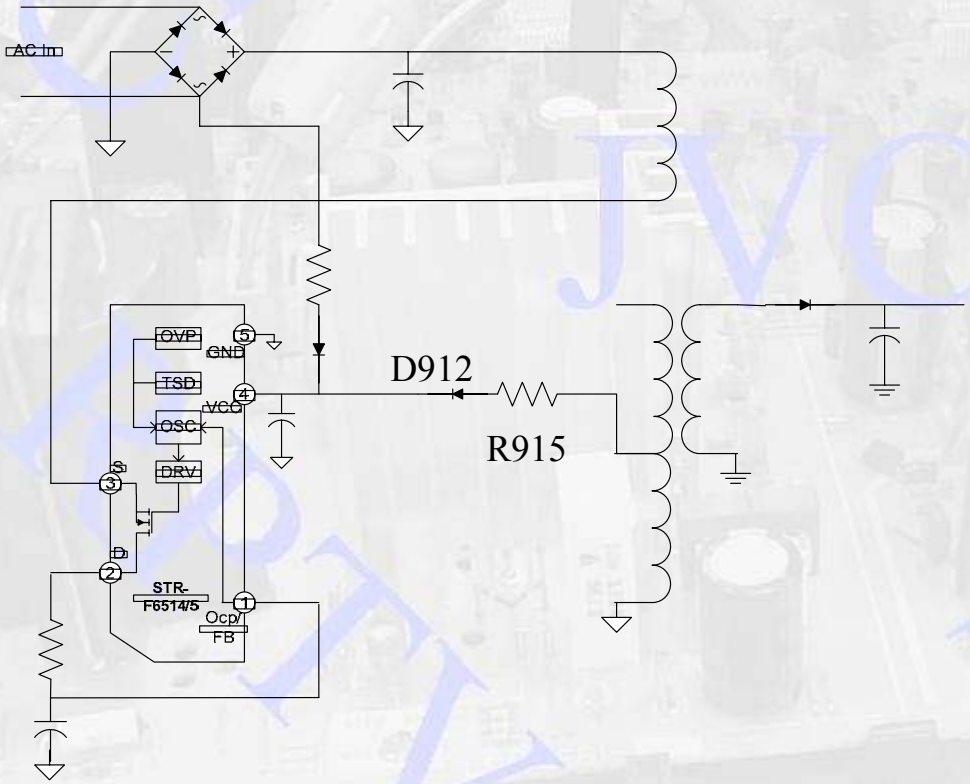
- When the IC functions, it drains current through pin4 and the supply is insufficient and cannot continue to supply voltage to the IC.

The IC could Shut OFF due to insufficient Supply Voltage

- We want the IC to be permanently on and turn ON/OFF the FET. But if the IC goes off, the control is not possible. Total reset occurs causing a pulsating supply

SWITCHING DEVICE

SUPPLEMENT POWER (RUN-DC)



- Supplement the start-up DC with Run-DC
- IC Power Supply becomes stable
- Transformer fully Charges/Discharges

Reference Schematic 52004 Main PWB for Schematic Details.

From the generated secondary voltage, an additional DC is supplemented using a Resistor and Diode.

This is known as Run-DC circuit

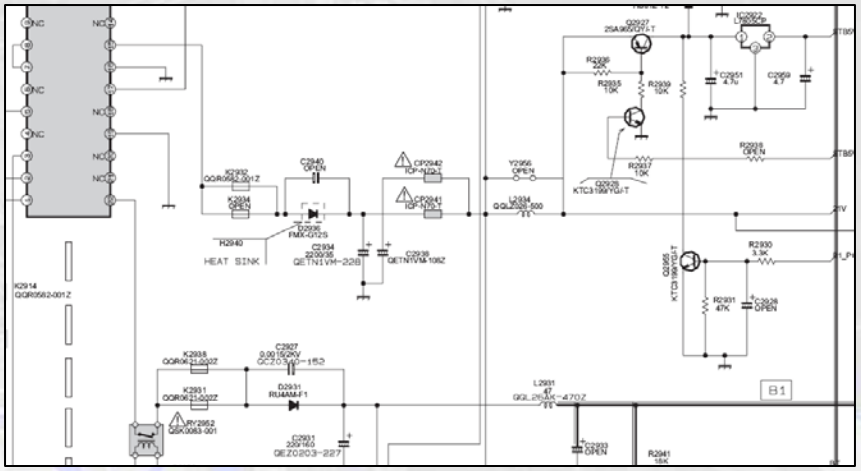
Now that the supply is steady and running, We have secondary voltages. The Transformer charges fully and discharges into secondary

SWITCHING OPERATION

POWER SUPPLY TYPES

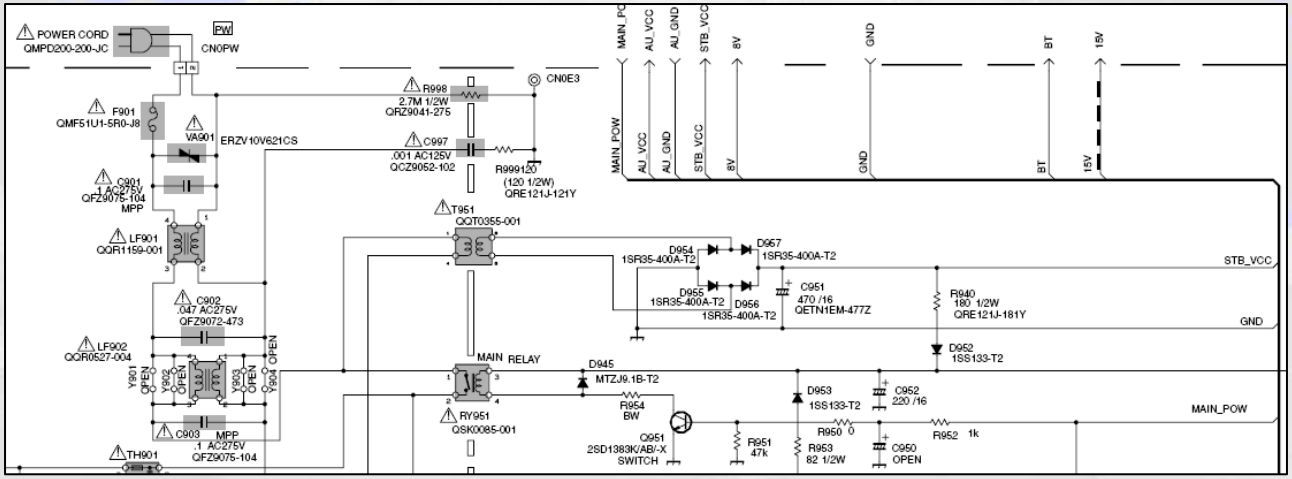
TYPE 1 - ALWAYS ON

- Standby Voltage for Micon is supplied by Switching Circuits.
- Standby Mode used when TV Off.



Reference Schematic YA321 Power and Def PWB for Schematic Details

There are 2 general types of circuit configurations used in JVC Power Supplies.



Reference Schematic 52004 Main PWB for Schematic Details

TYPE 2 - POWER ON

- Switching Circuits <u>ONLY supply Power after</u> TV Power is ON.
- Standby Voltage for Micon is supplied from DC Voltage tapped directly from incoming AC line.

There are 2 general types of circuit configurations used in JVC Power Supplies.

TYPE 1 - ALWAYS ON

•Utilizes a Standby Mode when TV Power is OFF.

•Standby Voltage for Micon is supplied by Switching Circuits.

•Example shown that T2921 supplies voltage to the DC Regulator (IC2922).

•The Micon will turn ON RY2952 to allow B1 Voltage flow when the TV is turned ON.

•Reference Schematic YA321 Power and Def PWB for Schematic Details.

TYPE 2 - POWER ON

•Switching circuits supply Power after TV Power is ON.

•Standby Voltage for Micon is supplied from DC Voltage tapped directly from incoming AC line.

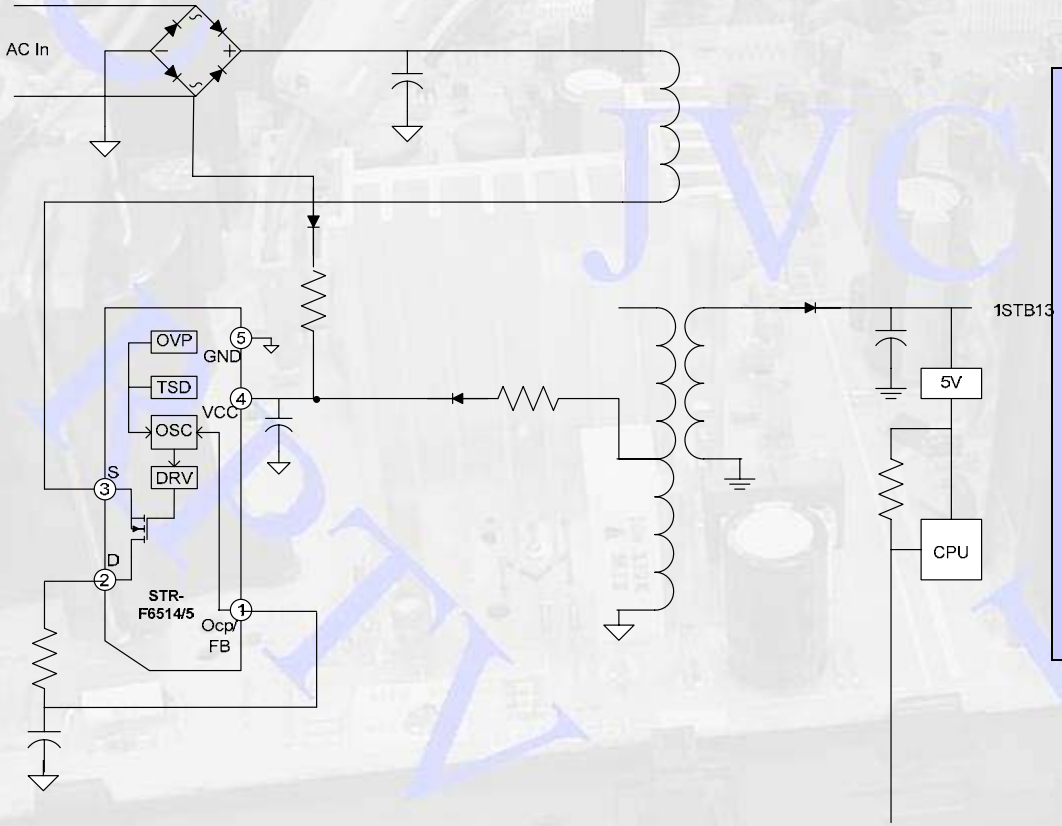
•In the example shown, the Standby VCC is supplied by T951, D954-D957 and C951.

•The Micon turns ON RY951, this allows AC Voltage to flow to the Switching Circuits when the TV is turned ON.

•Reference Schematic 52004 Main PWB for Schematic Details

SWITCHING OPERATION

STANDYBY MODE



- In Standby Mode, very few devices are functional
- They need only very little charge
- We must reduce energy transfer

• Some units utilize a Standby Mode.

•In Standby Mode, very few devices such as CPU, memory, etc. are functional.

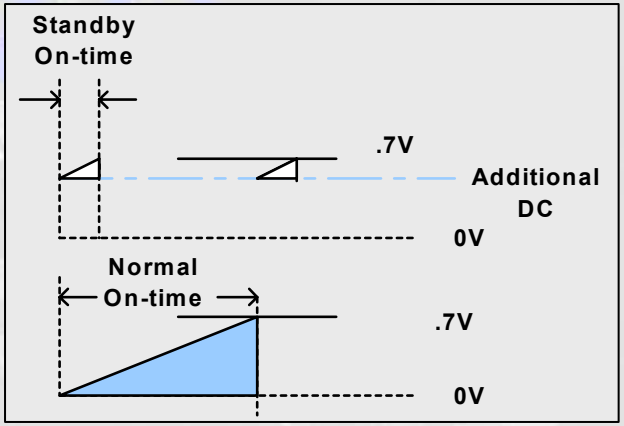
• Since CPU power is also provided from the transformer's output, we can not turn off the regulator.

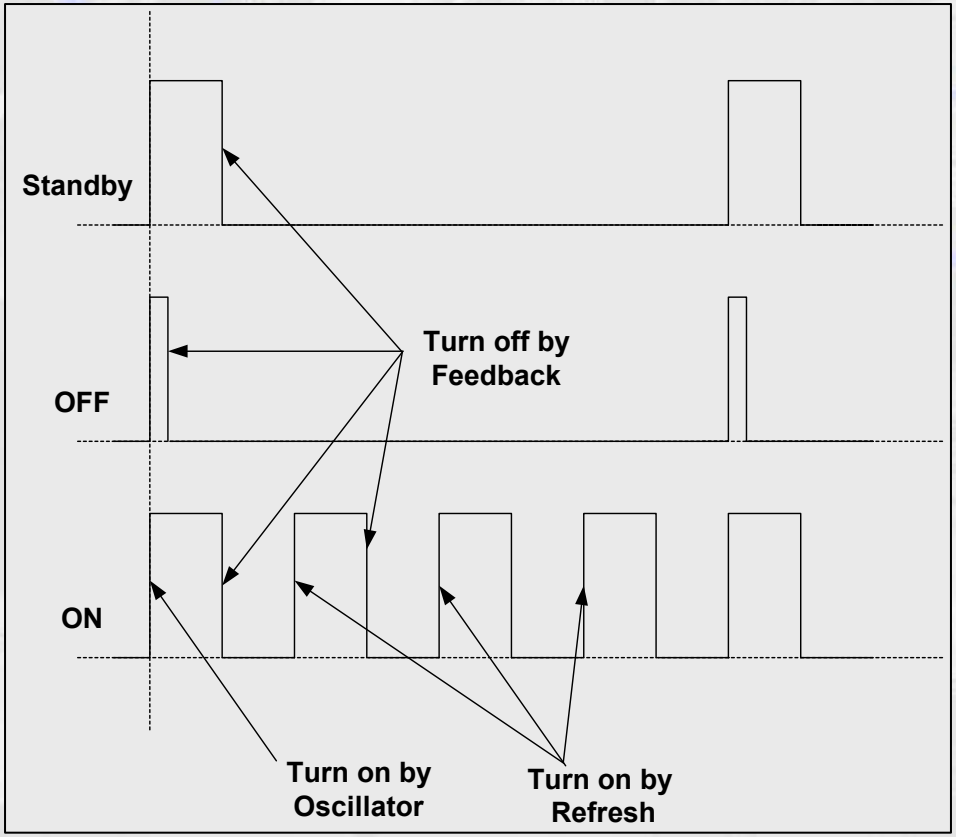
• In order to minimize the Power consumption, we control the energy transfer by reducing the charging and discharging time.

• Refer to the schematic and follow the standby supply for the CPU. It is generated from the STB13V.

SWITCHING OPERATION

STANDBY MODE GRAPHIC





- In normal mode, the on-time is the transformer's charging time
- In standby mode, additional DC added to the ramp
- This reduces ramping time

• In normal operating mode, the ramp size depends on how long it takes the current to generate the 0.7V Ramp.

• By this time, the transformer would normally be fully charged.

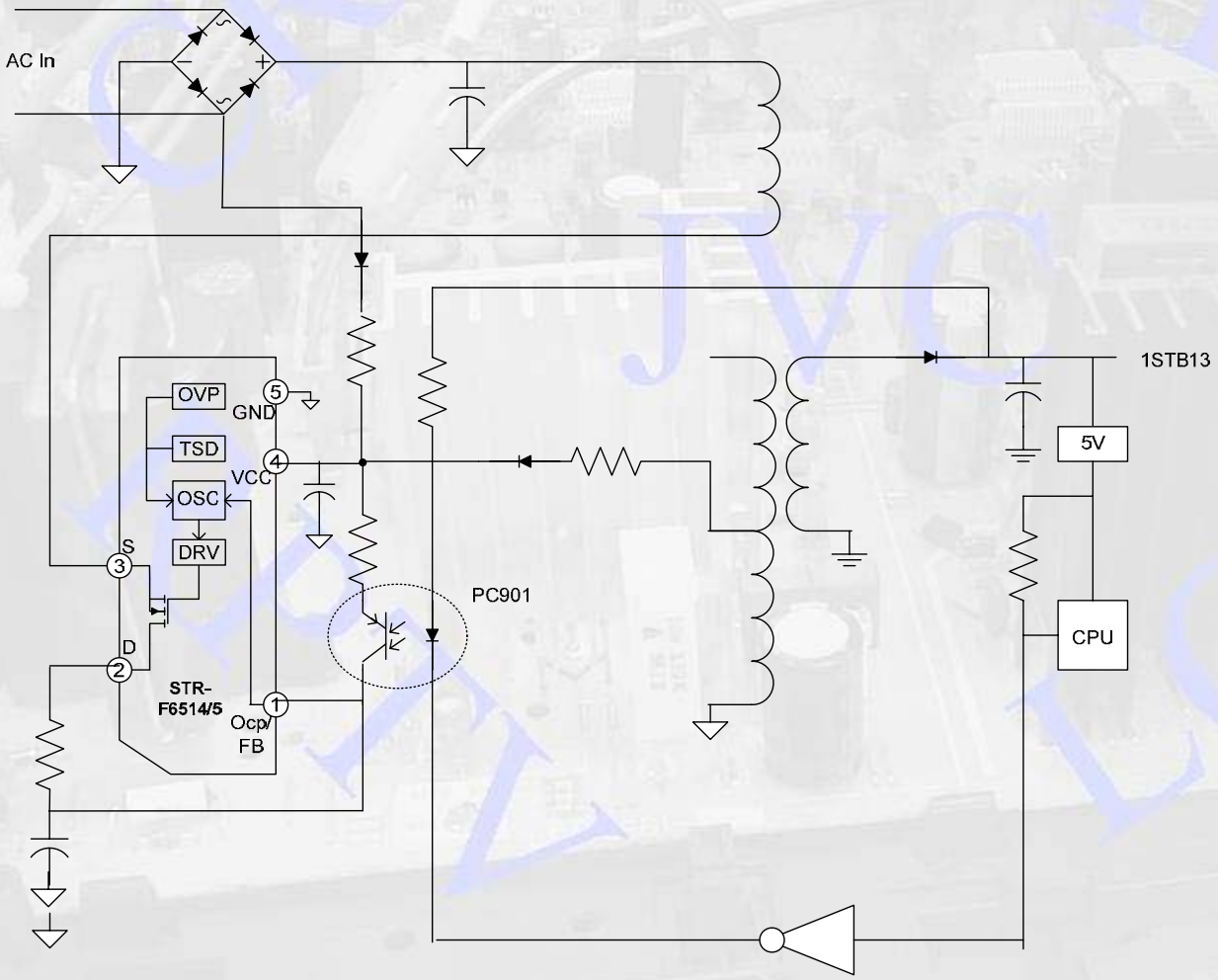
• In standby, we don't need the transformer to charge fully, this means reducing the ICs on-time.

• This is done by raising the Ramp's base or adding DC to it

• The new ON-Time will be the time it takes to ramp up to 0.7V from the additional DC.

SWITCHING OPERATION

ADDITIONAL DC USING PHOTO COUPLER



- Additional DC is applied from IC's supply using a Photo Coupler.
- The Photo Coupler must be turned On in Standby Mode and turned Off in Normal Mode

In the Standby Mode, additional DC is provided from the ICs Supply Voltage using the Photo Coupler.

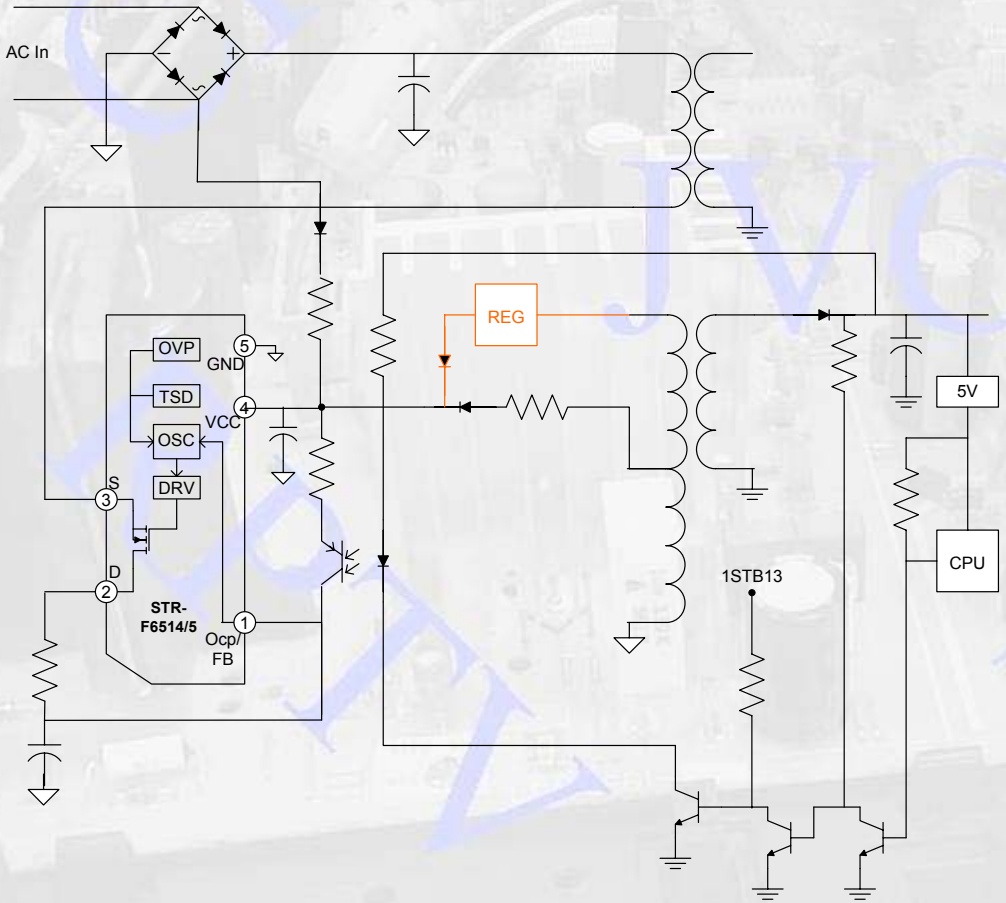
The CPU's outputs a High turning the Photo Coupler on.

The Photo Coupler supplies additional FeedBack DC to pin1.

As we already saw in the chart, this must be added in standby and must be removed in normal mode.

SWITCHING OPERATION

SUPPLEMENT POWER (RUN-DC)



- During Standby Mode, the Run DC may be insufficient to keep Switching IC ON
- IC Power is supplemented by Regulated Voltage

• When power is turned on, the Run-DC is sufficient to keep the IC functioning.

• During Standby Mode the Output Voltages from the Transformer is reduced.

• When this happens, the IC could turn off due to the insufficient Run-DC Voltage that is being supplied.

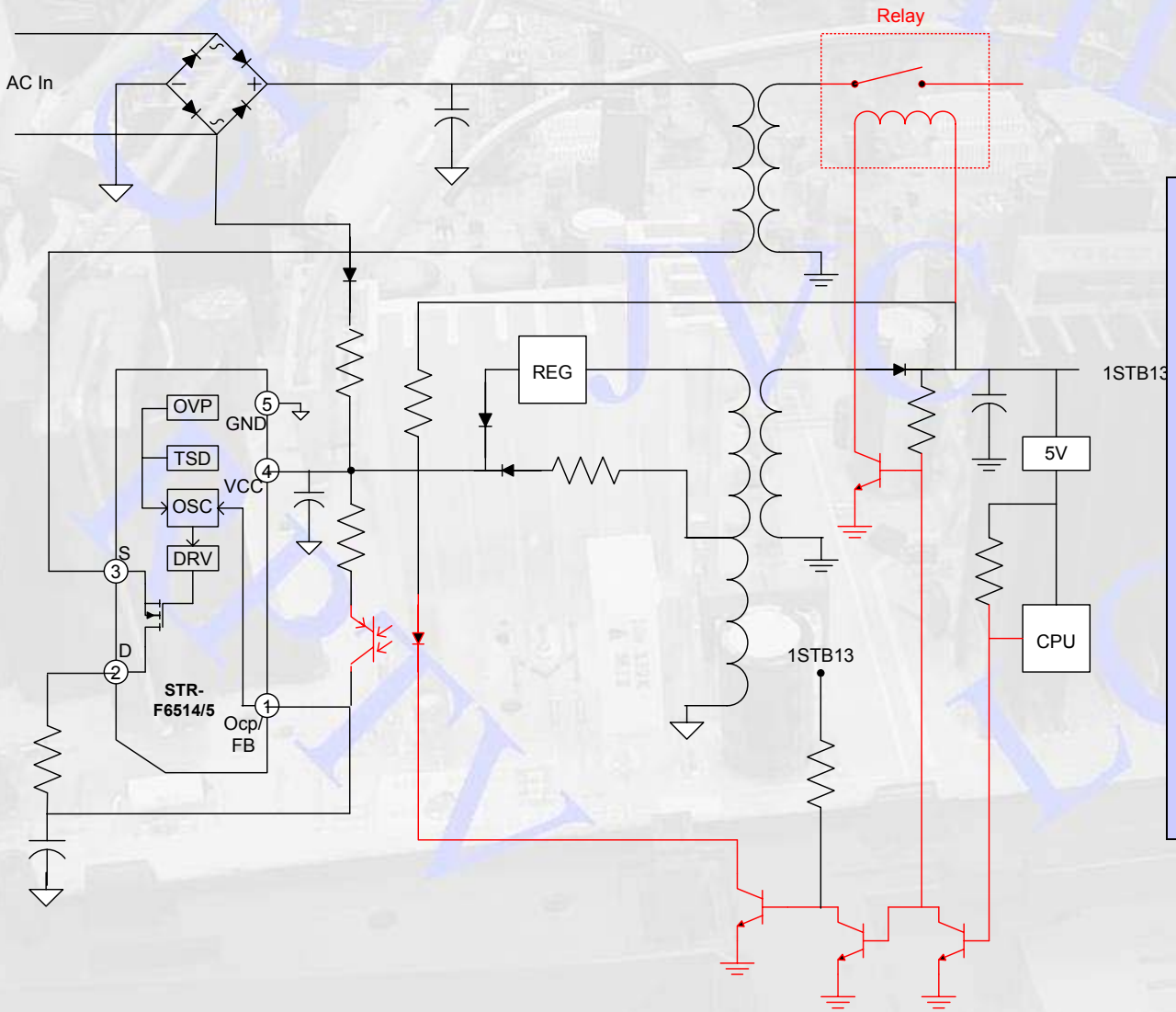
• For this reason, a regulated DC voltage from a higher tap is used to supplement the RUN DC.

•This voltage must be regulated otherwise in normal operation the voltage will be too high and will destroy the IC

<u>This circuit is not used in all models</u>

SWITCHING OPERATION

PHOTO COUPLER DURING POWER ON



- At Power On Micon outputs LOW
- Photo coupler is inactive
- On-Time is normal
- B1 relay is turned On

- At Power-on, Micon's power control output goes low.

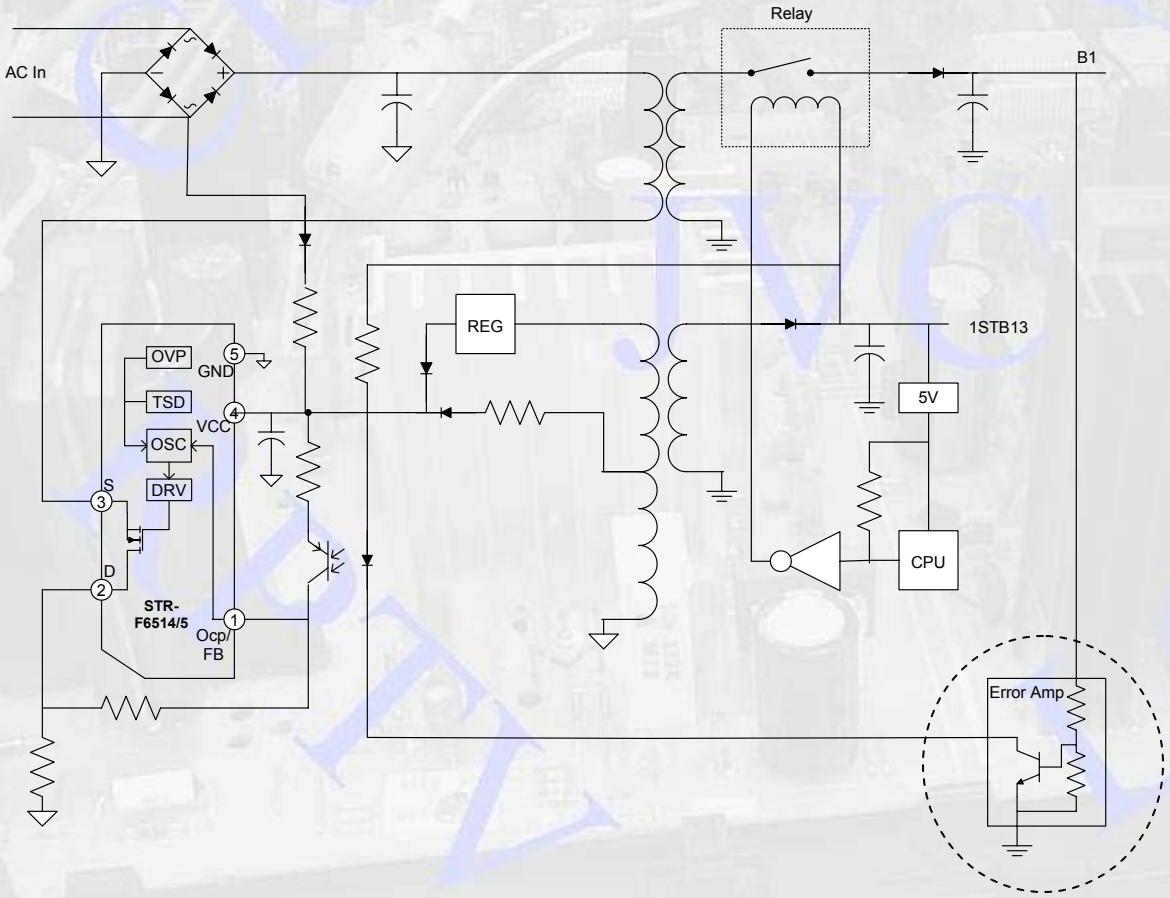
- This signal (through some inverters) turns on the relay and supplies power to Main Power output.

- At the same time, the Micon turns off the Photo Coupler.

The control circuits for the Photo Coupler and their operation may vary slightly in some models

SWITCHING OPERATION

ERROR AMP



- Error amp monitors B1
- Controls Photo Coupler to Reduce on-time if B1 exceeds spec

• When the on-time is normal sufficient energy is transferred and the B1 supply; High voltage, etc.. is active.

• If the B1 Supply is more than required, it must be reduced.

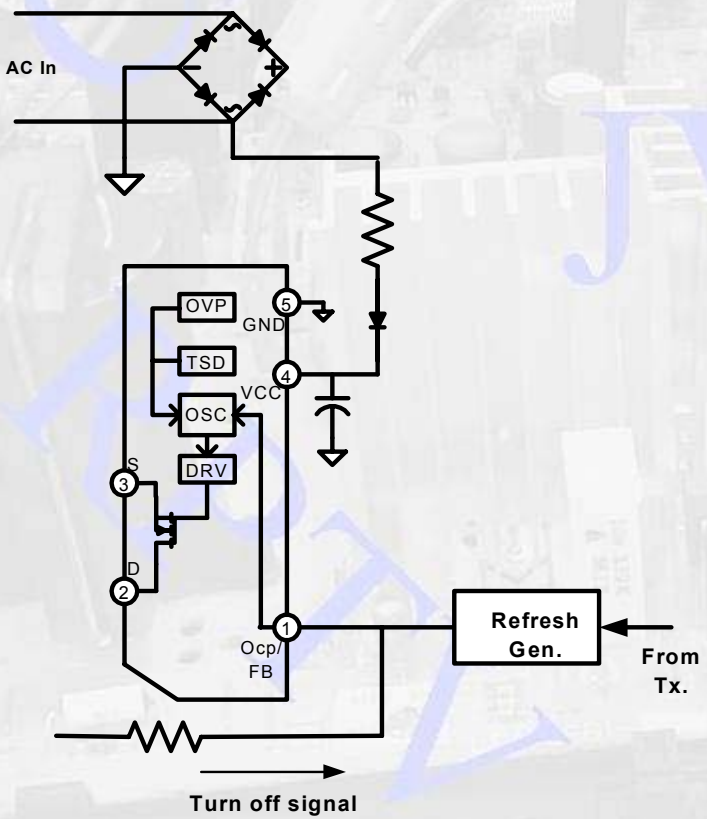
• By controlling the ON/OFF timing of the supply, the B1 Supply voltage can be controlled.

• This is done with the use of an Error Amp.

• The Error Amp monitors the B1 Supply and Activates the Photo Coupler feedback as needed to reduce the ON time of the Switching Supply.

SWITCHING OPERATION

REFRESH



- In practical use, we need to restart the IC earlier than the pre-determined time
- Apply 2.0V pulse to pin1
- During the negative edge, the IC will refresh (reset) and turns on again.

•When the transistor is off the ramp voltage will disappear because of the internal oscillator.

•After a pre-determined time, the FET will turn on again.

•In case of additional power requirements by the TV circuits, instead of waiting for the internal Timing generator to turn on the IC, we can refresh the IC.

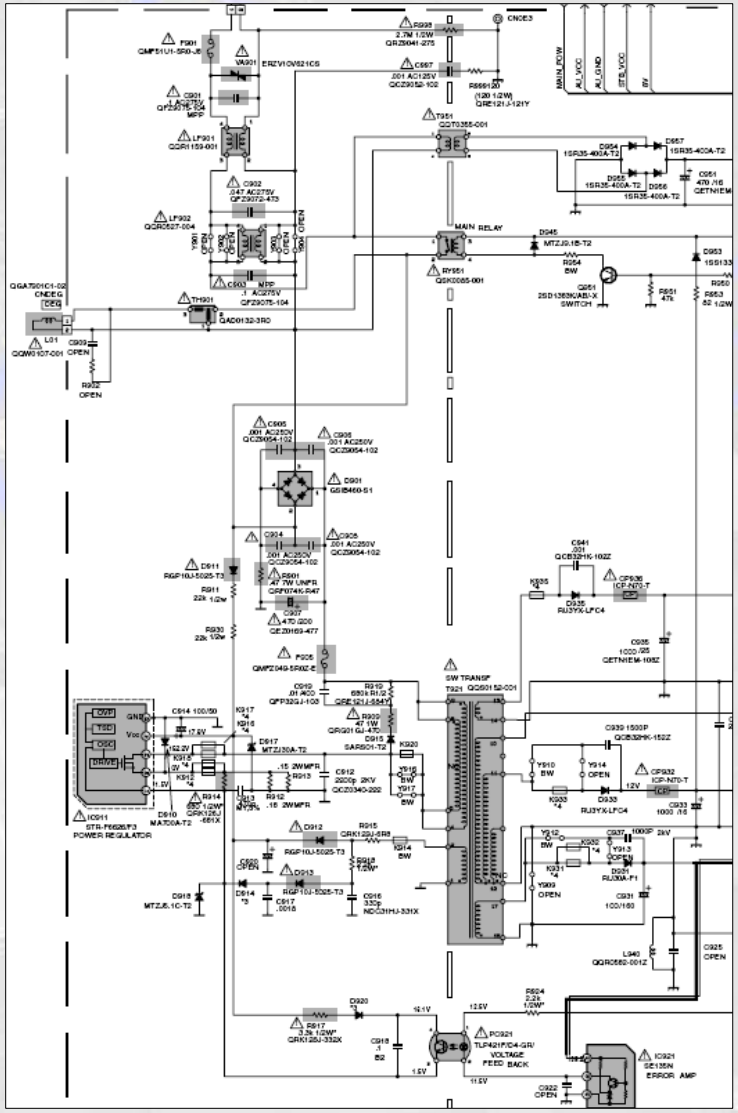
•By raising pin1 above 2.0V and dropping it back to zero, on the negative edge, the IC resets again and starts conduction.

•This is known as the Refresh Circuit

SWITCH CIRCUIT REVIEW

POWER SUPPLY COMPONENTS

1. F901 and VA901	Surge Protection
2. T951, D954-57 and C951	Standby Power
3. C901, C902 and C903	Line Filter:
4. D901 and C907	Main rectifier
5. IC911	Switching Regulator
6. D911, R911,R930 and C914	Startup
7. T921	Switching Transformer
8. R912, R913 and R914	Current Feedback
9. R915 and D912	Run DC
10. D917 and D914	Refresh
11. D945 ~ RY951	Main Relay
12. Q951	Main Relay Drive
13. IC921	Error Amp



Schematic 52004 Main PWB

- Reference Schematic 52004 Main PWB for Schematic Details.

- For Review, look over the Schematic and identify these components and their functions.

1.	F901 and VA901	**Surge Protection:** Stops circuit function if High Current (short) is detected.
2.	T951, D954-57 and C951	**Standby Power:** Supplies Standby DC voltage to Micon
3.	C901, C902 and C903	**Line Filter:** Filtering of AC line noise
4.	D901 and C907	**Main rectifier:** Provides rectified DC to Switching Regulator and Switching Transformer.
5.	IC911	**Switching Regulator:** Regulates Switching Voltages out of Transformer
6.	D911, R911,R930 and C914	**Startup:** Provides Startup DC for Switching Regulator until Transformer conduction begins
7.	T921	**Switching Transformer:** Provides voltages to all circuits
8.	R912, R913 and R914	**Current Feedback:** Provides current feedback to Switching IC to stop conduction.
9.	R915 and D912	**Run DC:** Provides additional DC to Switching IC
10.	D917 and D914	**Refresh:** Provide Refresh voltage to Restart IC Regulation
11.	D945 ~ RY951	**Main Relay:** Allows Power flow to SW IC and SW Reg. Also functions as relay for Degauss
12.	Q951	**Main Relay Drive:** Controls function of Main Relay
13.	IC921	**Error Amp:** Monitors B1 Line Voltage

This is the basic circuit configuration and use for all JVC Power Supplies. **While some Power Supplies may omit or add circuits, the general function of all JVC Power Supplies are the same**.

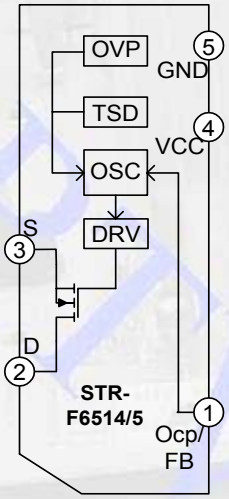
JVC

SWITCH CIRCUIT REVIEW

We will quickly go through the operation of a Switching Supply

SWITCH CIRCUIT REVIEW

BRIDGE RECTIFIER



The AC line Voltage is converted to DC by the Bridge and Capacitor.

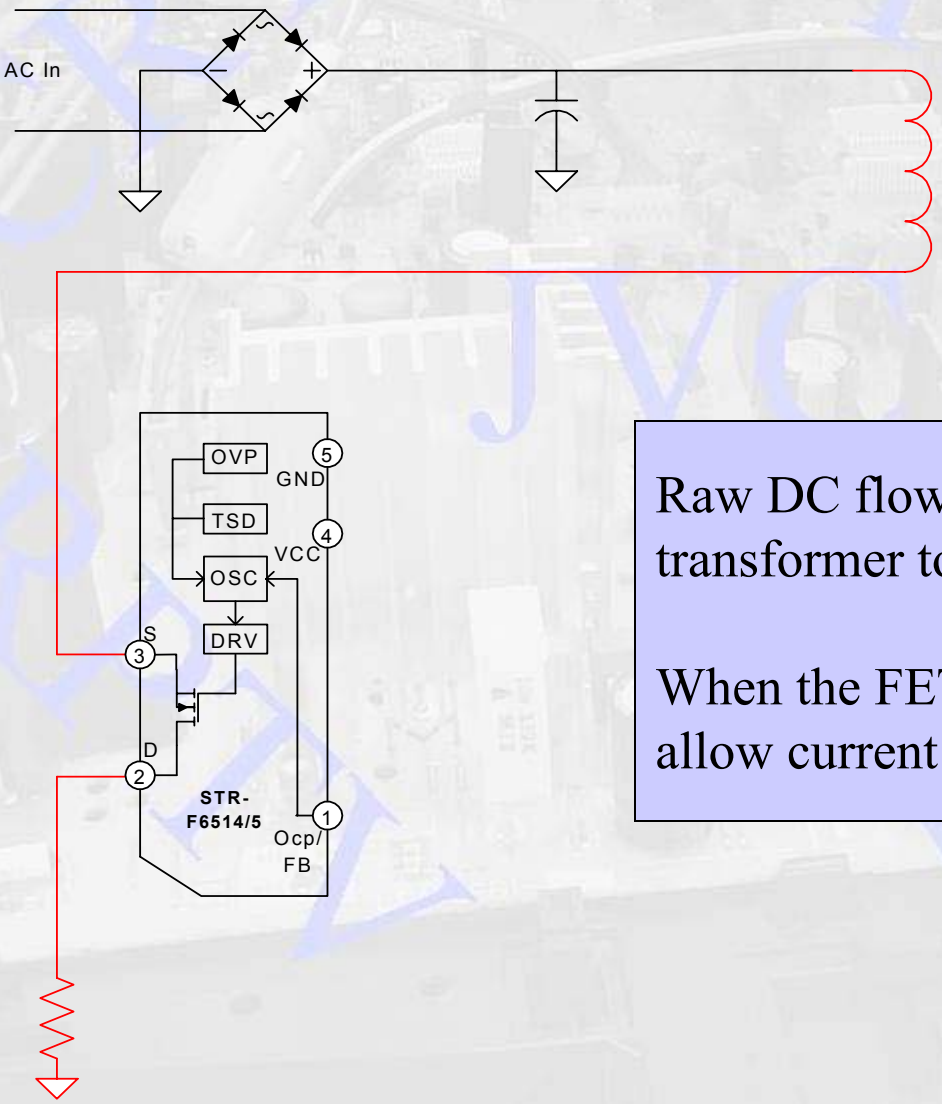
- The circuit begins with the AC Input, Line Filters (not shown), Bridge Rectifier and the Filter Capacitor.

- The Bridge Rectifier converts the AC input into a DC output.

- The DC output is stored by the Capacitor.

SWITCH CIRCUIT REVIEW

APPLIED DC



Raw DC flows through the transformer to the Switching Device.

When the FET is turned On, it will allow current flow to ground.

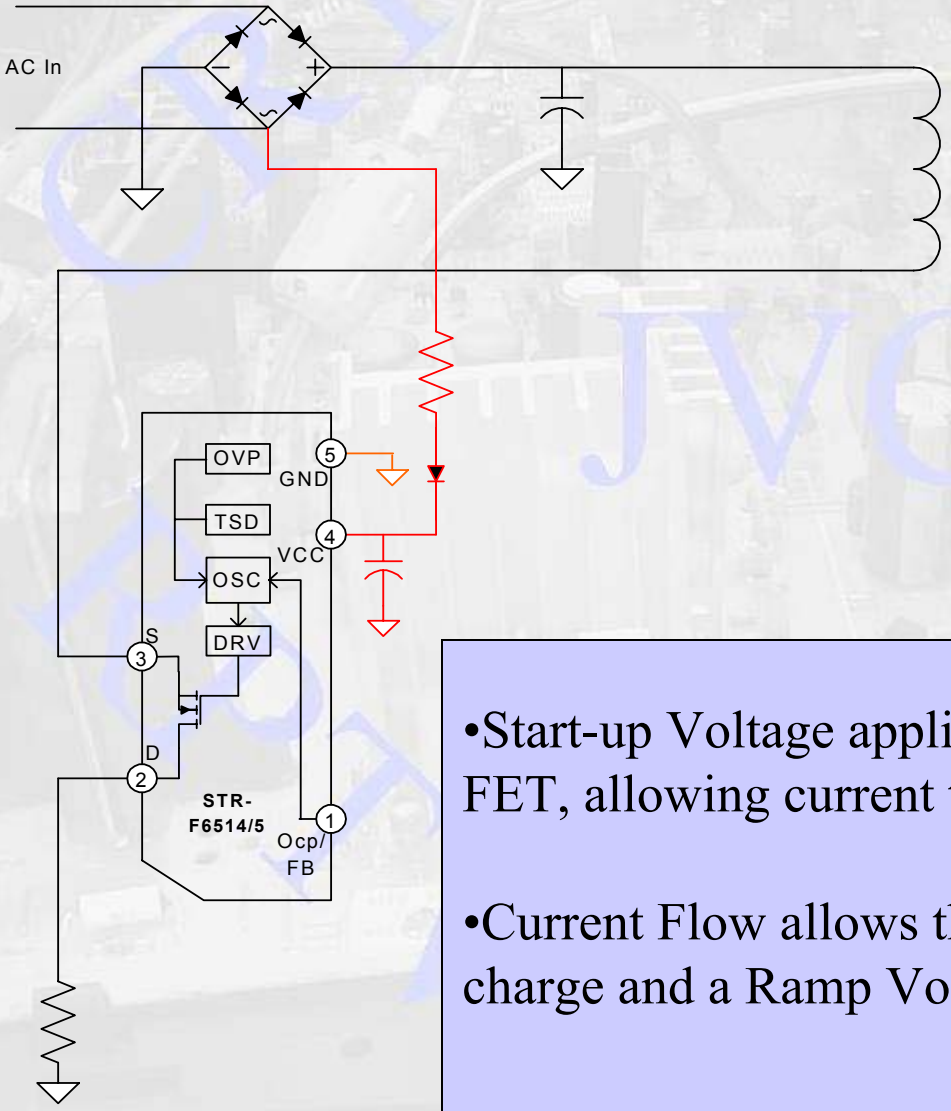
•DC voltage flows through the Transformer to the to FET.

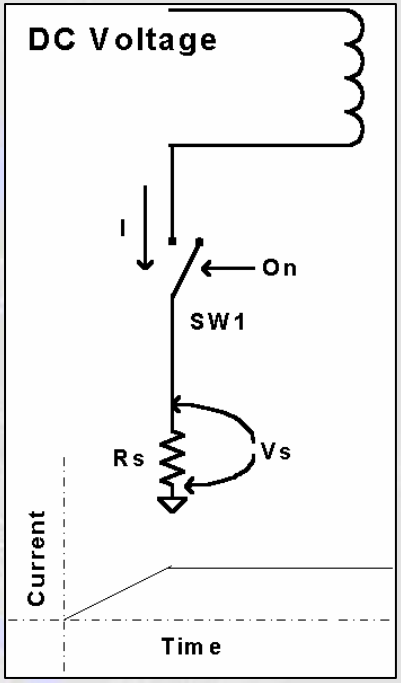
•When the Switching Device is turned ON, the FET will close.

•When the FET closes it will allow the DC voltage to be ground through the Resistor.

SWITCH CIRCUIT REVIEW

RAMPING VOLTAGE





- Start-up Voltage applied to IC turns On FET, allowing current through Inductor.
- Current Flow allows the Inductor to charge and a Ramp Voltage to Build at IC.

The Start-up DC is applied to the ICs Pin4 from the Bridge Rectifier through the Resistor and Diode.

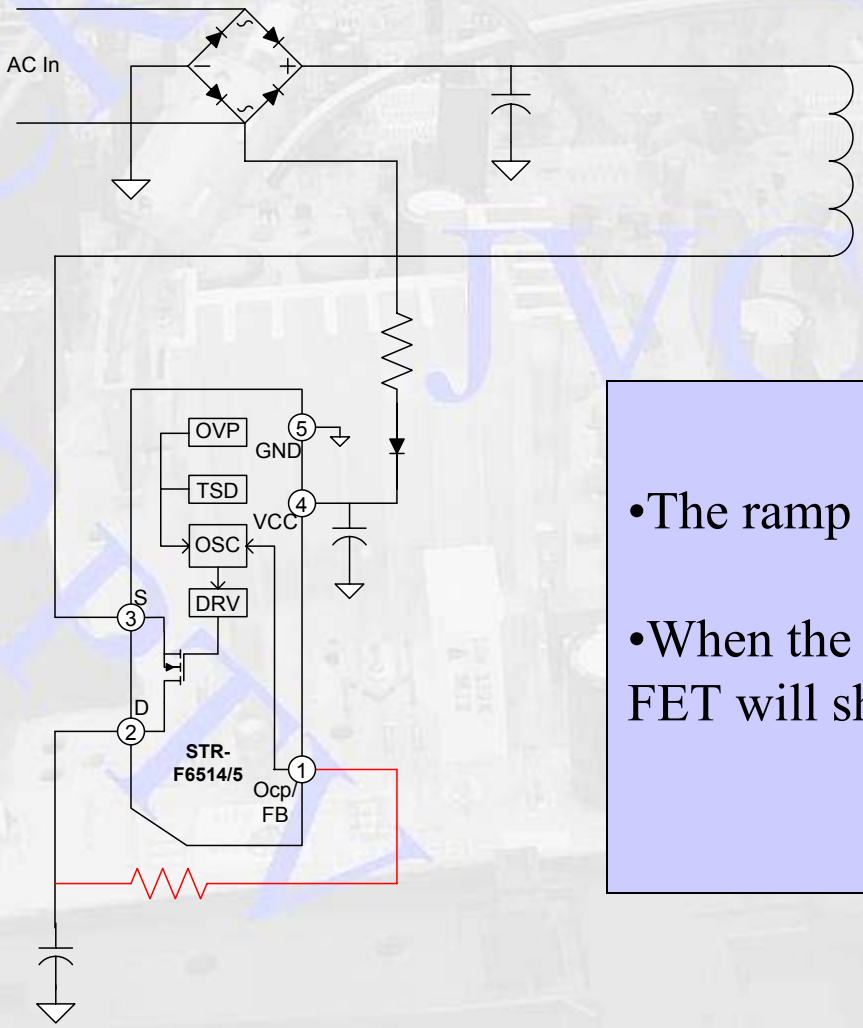
Powering up the IC turns On the FET allowing the DC voltage from the Transformer to pass through the FET.

The current flowing through the Transformer allows the inductor to charge.

At the same time the Inductor is charging, a Ramp Voltage builds up at the Feedback of the Switching IC

SWITCH CIRCUIT REVIEW

RAMP VOLTAGE FEEDBACK



- The ramp voltage is applied to pin1.
- When the ramp voltage reaches 0.7V the FET will shut off.

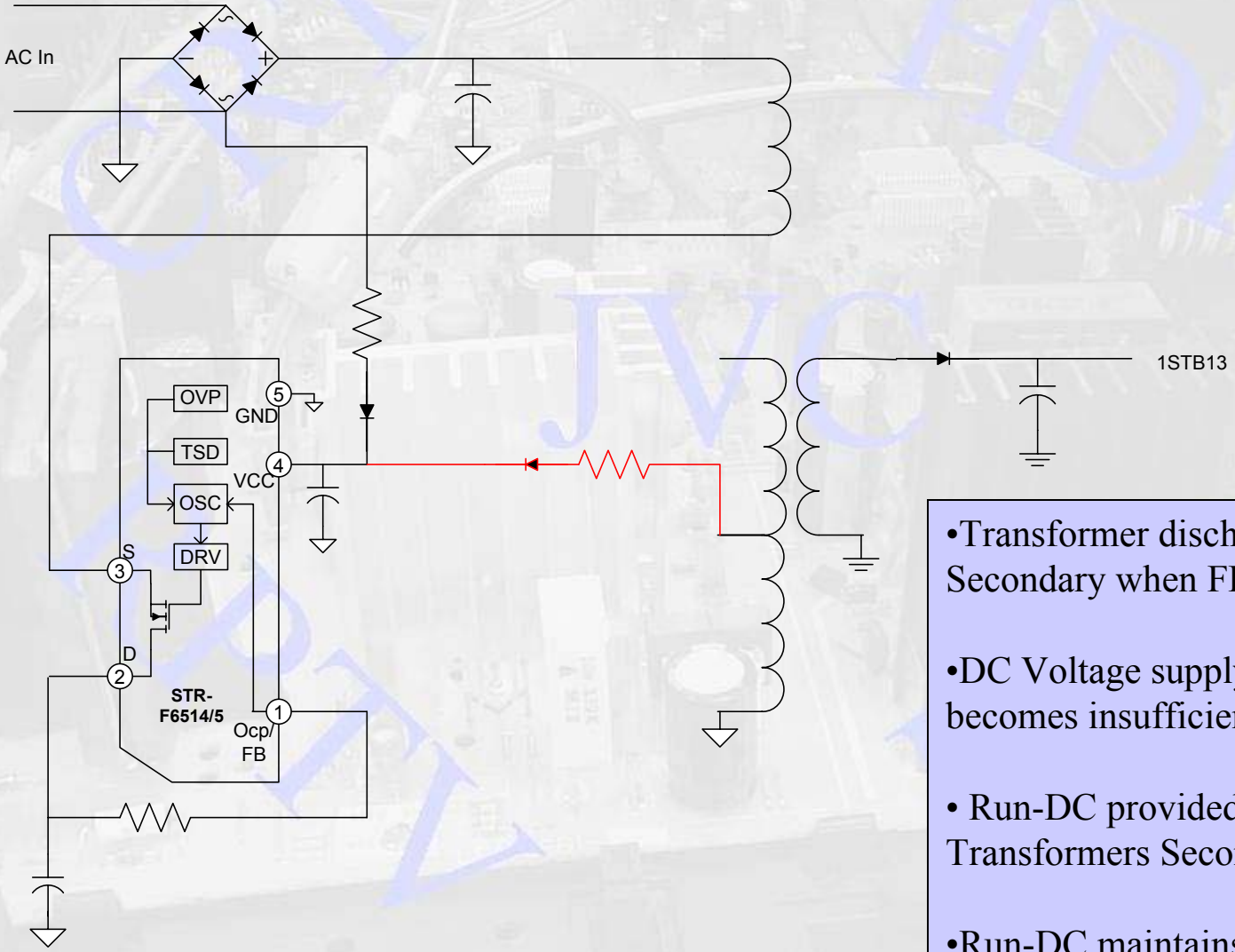
- When the Inductor is charged, it is necessary to turn Off the FET to allow the Inductor's stored energy to be released.

- The Feedback of the Ramping Voltage through the Resistor connecting pins 2 and 1 will turn OFF the FET when the ramping voltage reaches 0.7V.

- removing the 0.7 V will allow the IC to resume conduction in a pre-determined time.

SWITCH CIRCUIT REVIEW

RUN-DC



- Transformer discharges into the Secondary when FET shuts off.
- DC Voltage supplying the Switching IC becomes insufficient.
- Run-DC provided to IC from the Transformers Secondary.
- Run-DC maintains the ICs stable operation

•As the Transformer discharges, the Secondary Windings develop secondary voltages

•The DC Voltage supplying the Switching IC becomes insufficient.

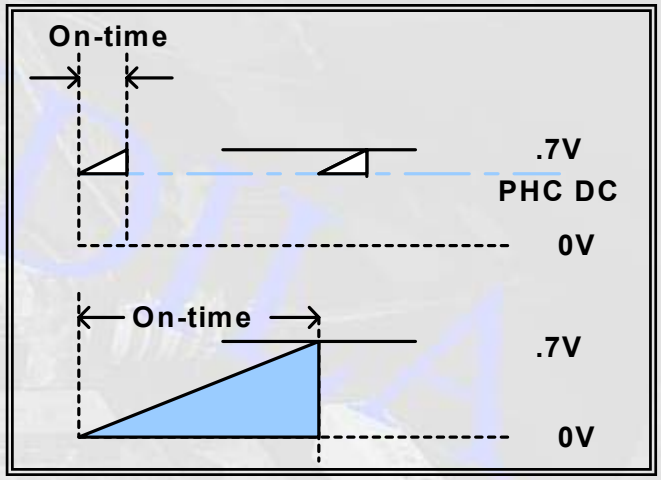
•As the Capacitor discharges the Switching IC requires additional voltage to maintain stable operation.

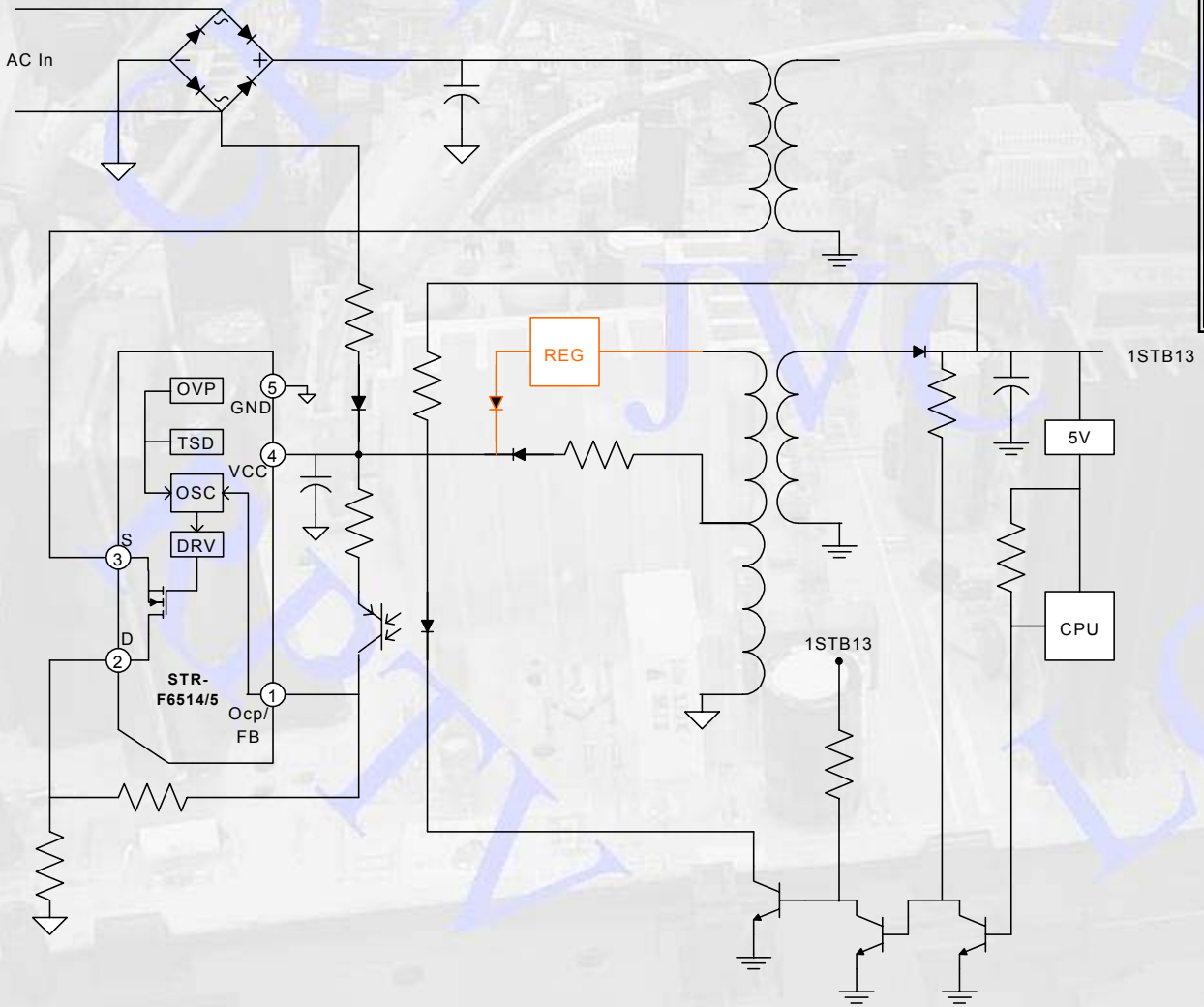
•Additional Run-DC is provided to the Switching IC from the Transformers Secondary.

•This Voltage maintains the ICs continuous operation and the Circuit becomes stable.

SWITCH CIRCUIT REVIEW

STANDBY OPERATION



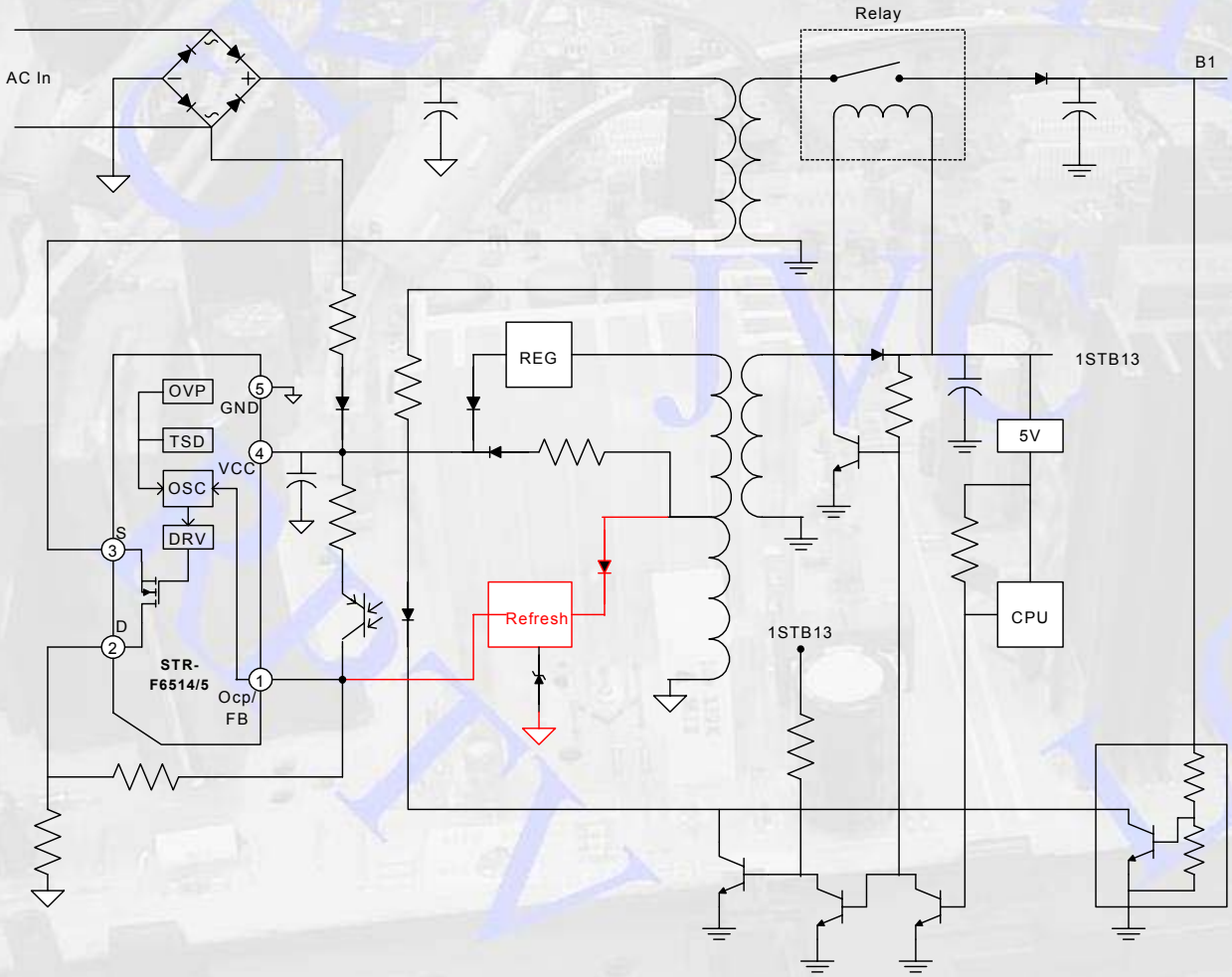


- Micon powered by Standby Voltage from Transformer secondary
- Micon turns on the Photo Coupler
- Photo Coupler adds DC shortening IC On time
- **TV is now in Standby Mode**
- Regulated DC added to RunDC

- TV Micon is powered by the Transformers Secondary Voltages.
- The Micon Turns on the Photo Coupler.
- The Photo Coupler adds additional DC to the Switching IC's feedback reducing its On Time.
- **The TV is now in Standby Mode.**
- Since the on-time is reduced, all voltages from Transformer are reduced including the Run DC that helps power the Switching IC.
- Regulated DC is added from a higher Transformer winding to ensure the IC does not shut when the TV is in Standby Mode.

SWITCH CIRCUIT REVIEW

POWER ON

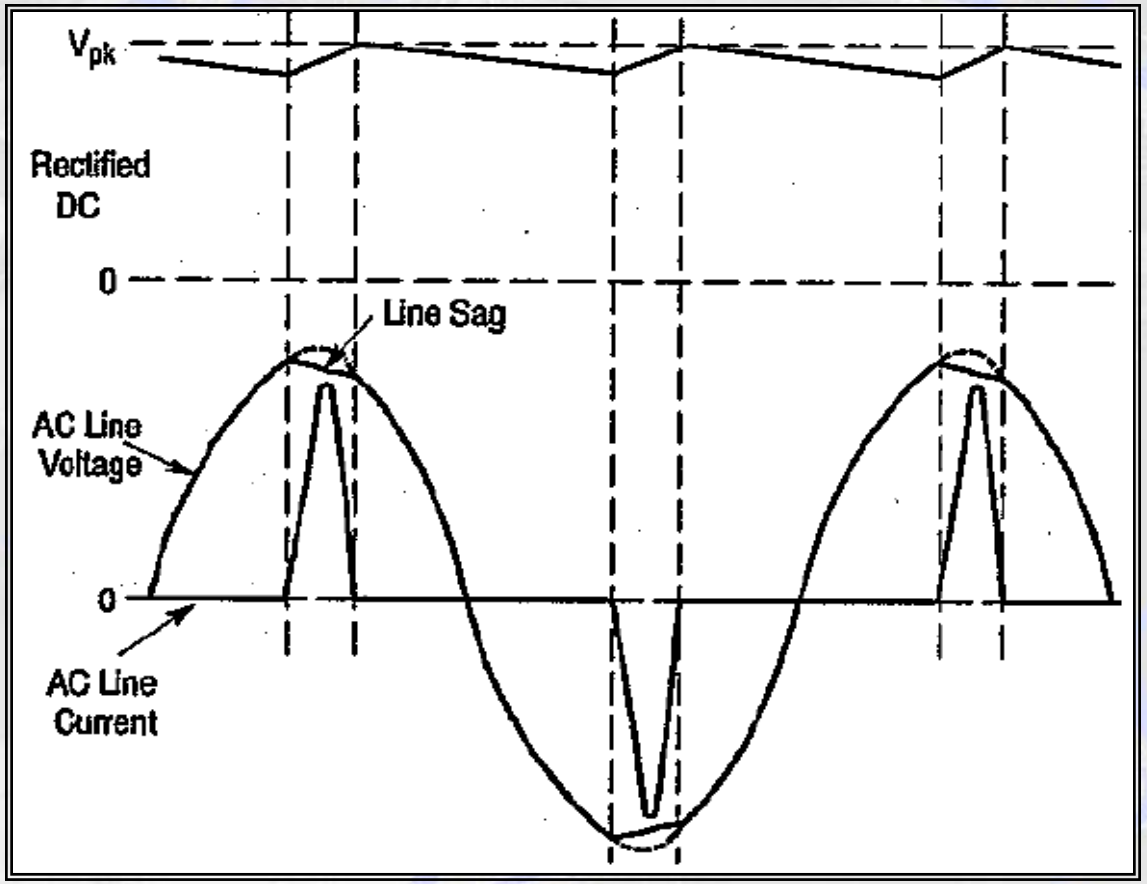


- Power ON command received by Micon
- Micon turns off Photo Coupler and turns on Main Power Relay and circuits
- Error Amp monitors B1 and controls Switching IC off time.
- Refresh Circuit added in case TV circuits require additional power.
- Refresh circuit allows Switching IC to be turned On whenever needed by applying 2V pulse to IC.

- When power is turned on the CPU turns off the Photo Coupler and turns on the relay for the main Power Circuits (B1 Voltage).
- Turning off the Photo Coupler means there is no control over the output
- The Error Amp is activated and Monitors the B1 supply.
- The Error Amp uses the Photo Coupler to control the Switching IC's Off times
- In case of additional power requirements by the TV circuits, instead of waiting for the internal Timing generator to turn ON the Switching IC, we can refresh the IC.
- The Refresh circuit is added and works by raising pin1 above 2.0V and dropping it back to zero.
- On the negative edge, the IC will reset again and start conduction.

JVC

POWER FACTOR CIRCUIT



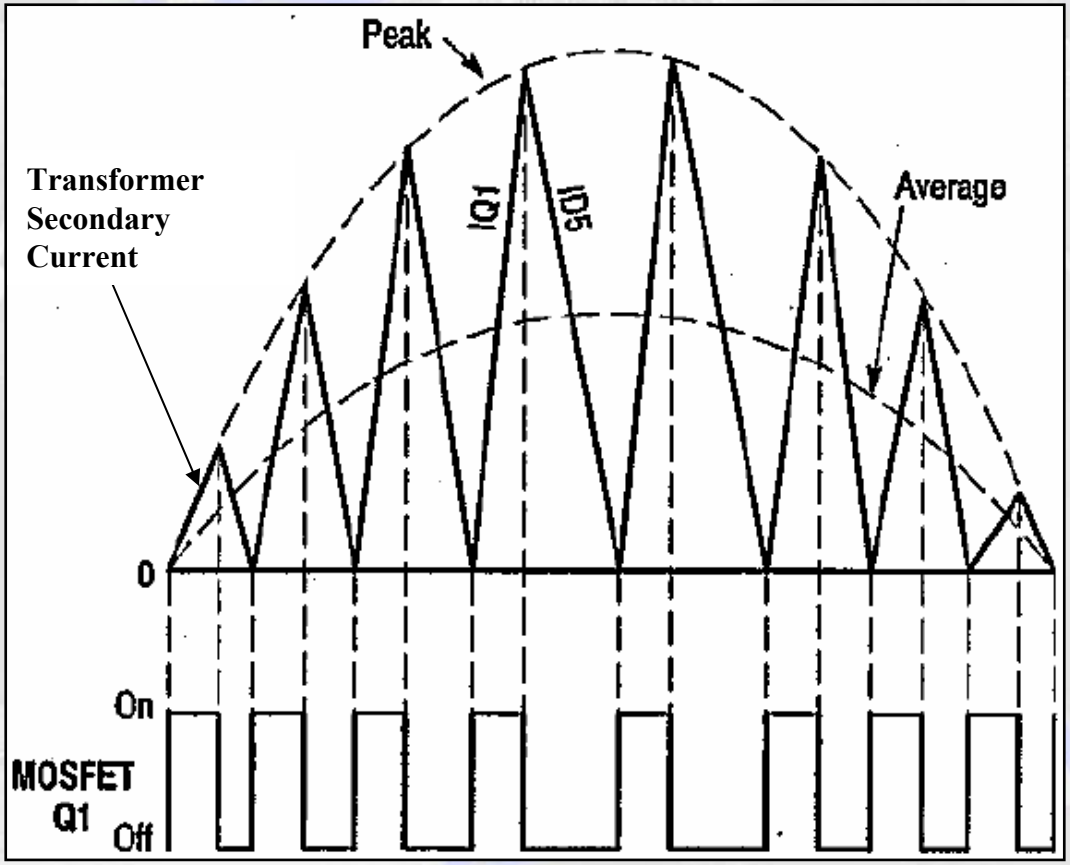
AC Line Without Power Factor Circuit

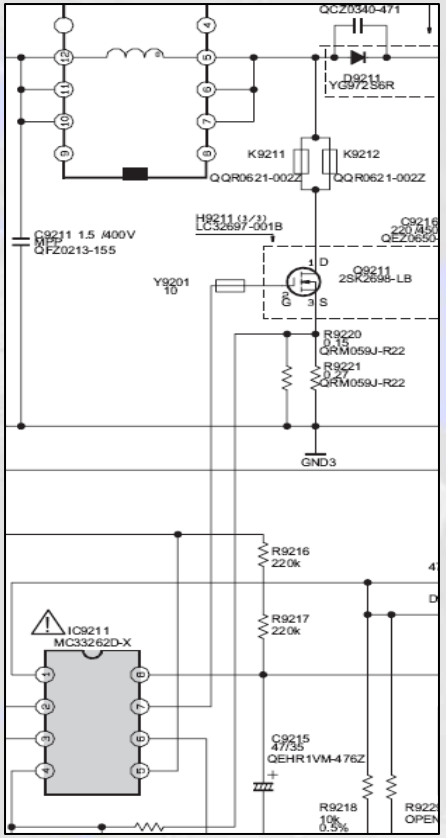
- Used in Some HDILA models.
- Power demand of TV circuits cause AC line current spikes.
- AC spikes affect rectified DC.

- Some HDILA TV Power Supplies utilized a Power Factor Circuit (PFC).
- The High current demand of the Ballast PWB and Circuit exceeded the ability of the Standard Bridge Rectifier/Capacitor combination to deliver the power.
- As the AC would rise, the Capacitors ability to supply power diminished causing the Ballast Circuit to Pull Power from the AC supply.
- The charge/discharge of these circuits happens quickly causing AC line Current spikes during these Peak Power Demand periods.
- As shown in the figure, this causes AC voltage dips and affects the Rectified B1 Voltage.

JVC

POWER FACTOR OPERATION





- PFC controls FET ON/OFF Operation
- Eliminates AC Line Spikes
- Smooth Power Output

JVC

- The PFC IC controls the Power FET.

- The FET increases Power output during spikes.

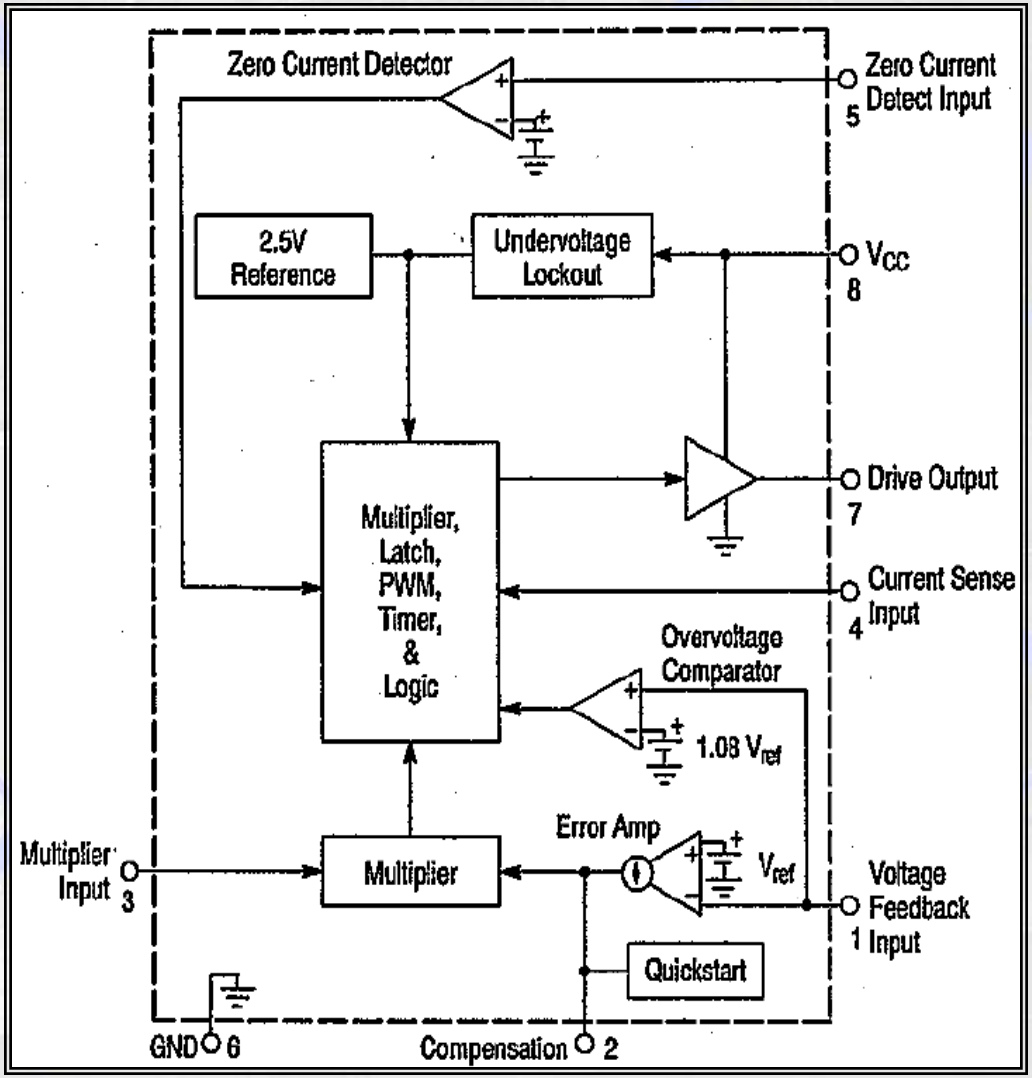
- The PFC IC monitors the incoming DC to the Transformer and Outgoing DC from the Transformer.

- As the Transformer Charges, the PFC IC turns the FET ON.

- When the Transformer is fully Charged and begins to discharge into it's secondary, the PFC IC turns the FET OFF.

JVC

POWER FACTOR IC



MC33262D-X

Pin Explanation

1. Monitors B1 Line and provide Voltage Feedback to IC

2. Compensation to allow IC to compensate for Temperature changes during operation

3. Samples Bridge Rectifier Output. Turns FET OFF when Bridge Rectifier goes to 0.0VDC.

4. Monitors FET current.

5. Switches FET ON when Transformers Secondary Current Reaches 0.0VDC.

6. IC Ground

7. Controls FET operation

8. IC VCC

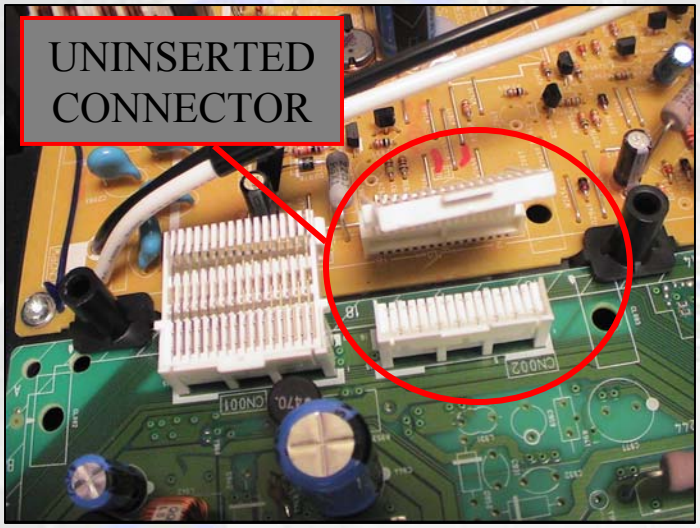
FUNCTION CHECK PROCEDURE

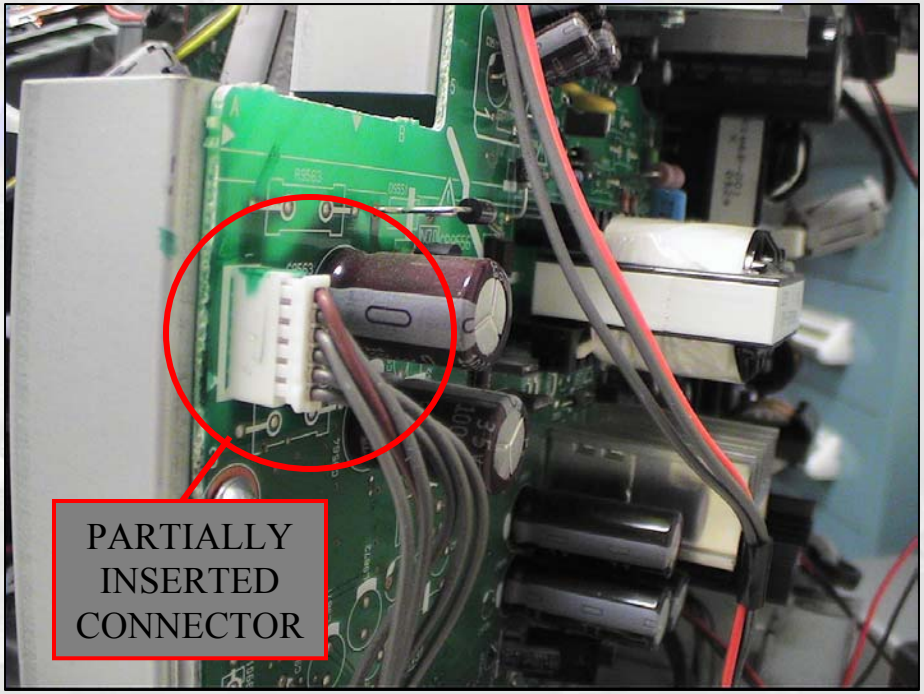
The following will explain steps that will allow the Powering Up of the Power Supply in a Stand Alone condition using (2) AA Batteries. This means that no other PWBs should be connected to the unit during the test.

Stand Alone power on of the units allows a technician to test the Power Supply without the effects of other PWBs, possibly isolating the trouble.

These steps must be carefully followed to prevent damage to PWB or injury to self.

FUNCTION CHECK
PROCEDURE INSPECT UNIT



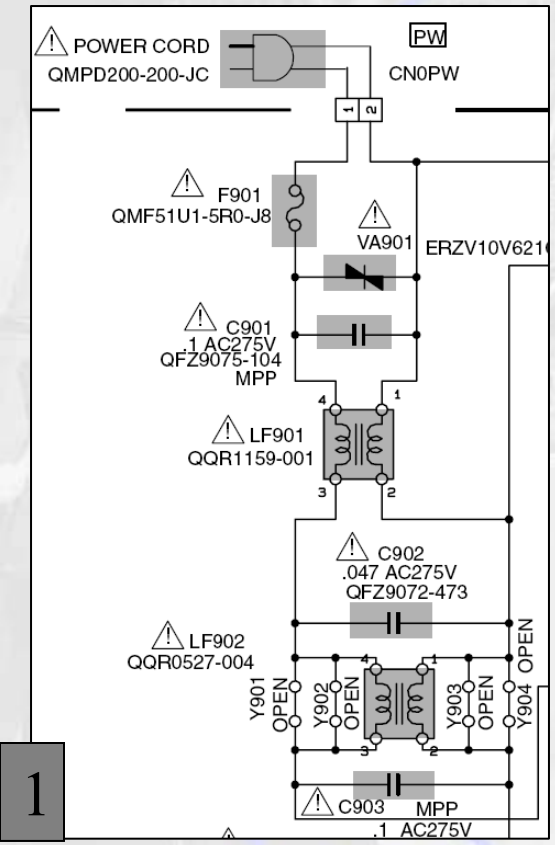


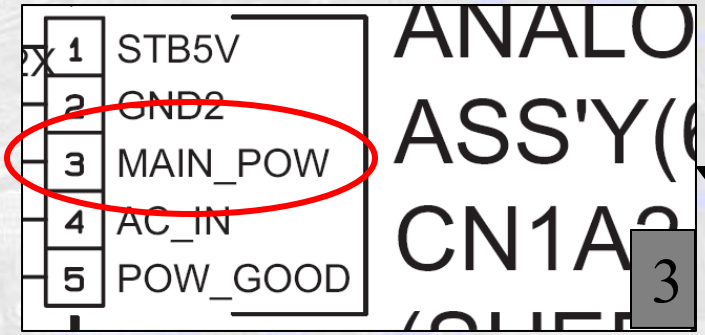
•**Before** and **After** performing any troubleshooting it is necessary to visually inspect the TV to ensure all connectors are properly inserted and there are no additional damaged or broken parts.

•These items may act as clues to help determine the cause of TV symptoms.

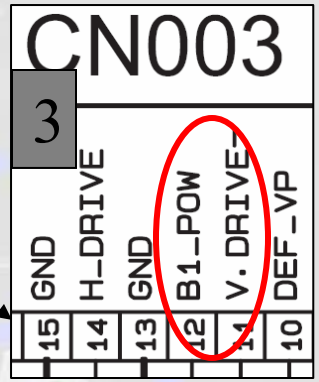
FUNCTION CHECK PROCEDURE

REQUIREMENTS FOR POWER ON

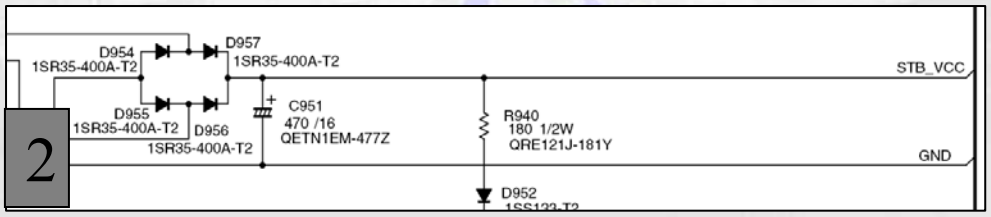


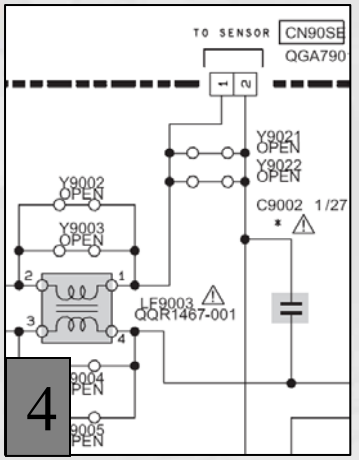


OR



1. AC line Voltage
2. Standby Voltage Circuit function
3. Power On Signal from Micon
4. In some models, Main AC line voltage switch must be closed





Provided all circuits function within a Power Supply, there are only (3 or 4) requirements for the Power Supply to function

1. AC Line input voltage: This voltage will be rectified and provide the DC for the Switching Circuits.

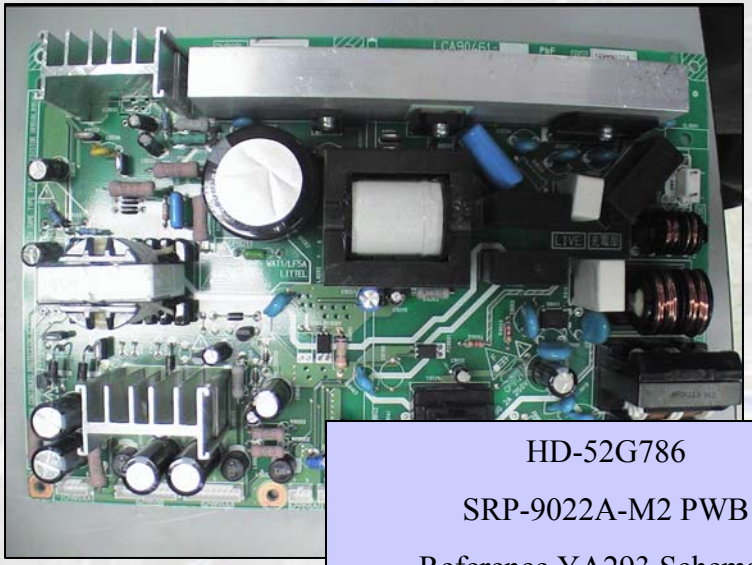
2. Standby Voltage: This voltage is needed to power the Micon.

3. Power On signal from Micon: The micon receives the Power on signal from the Remote or Front Panel. It will then send the "Power On" Signal to the Power Supply circuits. This always turns on a relay that activates the Main Power Circuits.

4. Main AC line voltage switch must be closed: In some units, primarily HDILA models, there is a switch that controls the AC line voltage. In HDILA models, this switch is the Temperature Sensor that is mounted above the lamp. In other models this may be a Main Power switch on the back of the unit. This switch must be closed before the Television may be powered on.

FUNCTION CHECK PROCEDURE

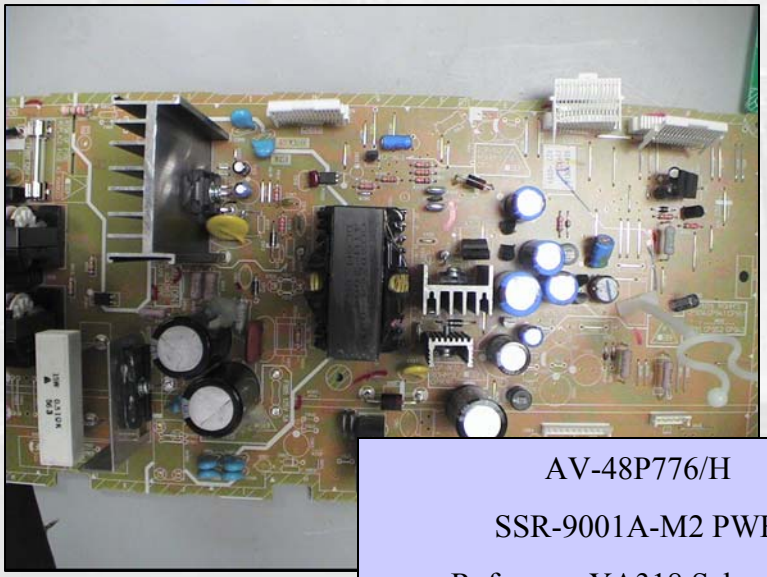
PROCEDURE



HD-52G786

SRP-9022A-M2 PWB

Reference YA293 Schematic



AV-48P776/H

SSR-9001A-M2 PWB

Reference YA318 Schematic

STEPS OF PROCEDURE

- Remove PWB from TV
- Inspect PWB
- Ensure Main Power Switch is Closed
- Plug unit into AC line
- Test Standby Circuits
- Simulate Micon “Power On” signal
- Check Switching Circuits.

Pictured are the (2) example PWBs that will be used in this procedure

This is a quick and simple procedure that can be used to quickly test the circuits operation.

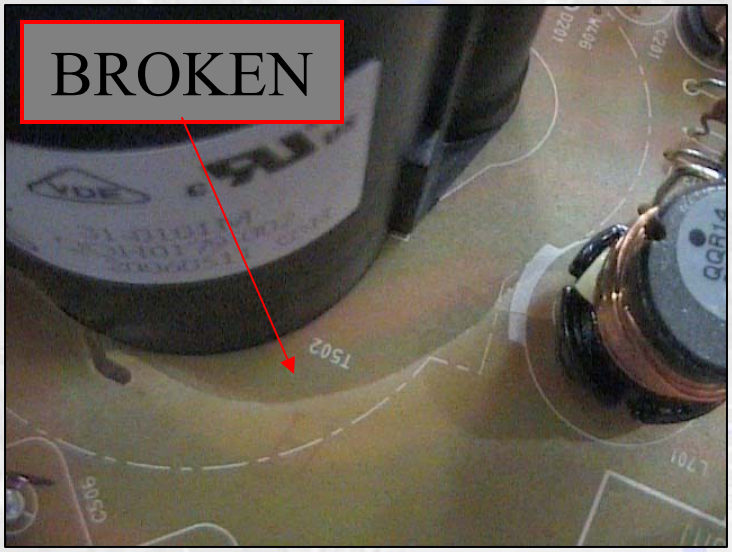
Ensure you have properly inspected the PWB for Shorted, Open, Damaged or Missing components.

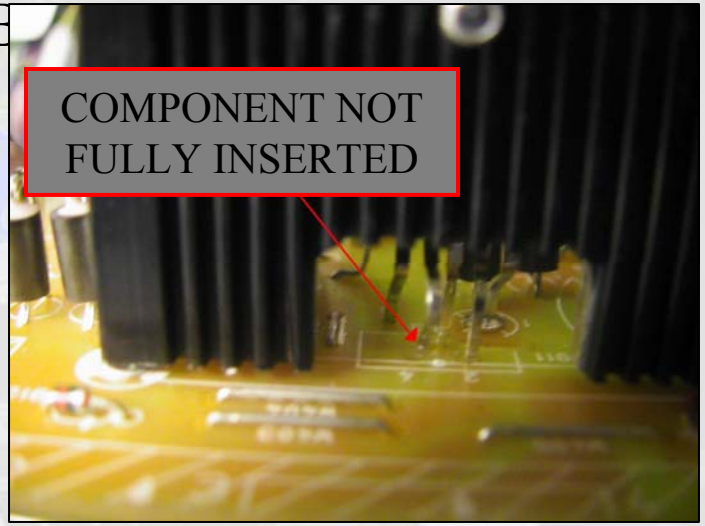
The Steps of the Procedure are as follow:

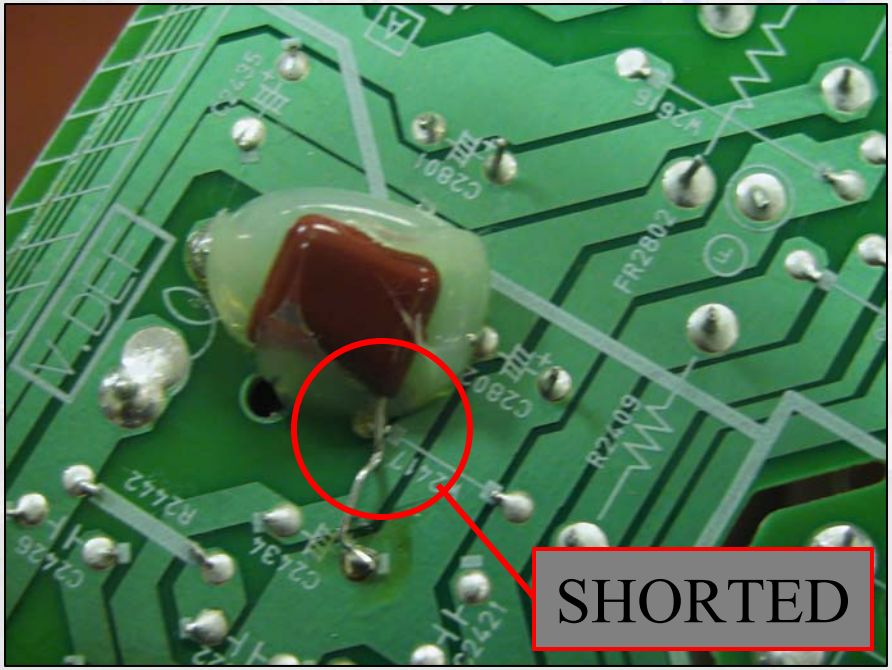
1. Remove PWB from Television
2. Inspect PWB for Shorted, Open, Damaged or Missing components.
3. Ensure Main Power Switch is Closed (Shorted) to allow AC in circuit
4. Plug unit into AC line to provide voltage to Standby VCC circuits.
5. Test Standby Circuits and Check “Standby” Operation of Switching Circuits.
6. Simulate or Activate Micon “Power On” signal to activate Main Power Circuits.
7. Check “Power On” function of Switching Circuits.

FUNCTION CHECK PROCEDURE

INSPECT PWB







•Before performing any troubleshooting steps it is necessary to visually inspect PWBs.

•Failure to Inspect PWB for these Items could result in further damaging the PWB

•Catching these items prior to troubleshooting can prevent wasted troubleshooting efforts.

TELEVISION

FUNCTION CHECK PROCEDURE PROVIDE AC AND CHECK STANDBY VCC

JVC

HD-52G786

SRP-9022A-M2 PWB

Reference YA293 Schematic

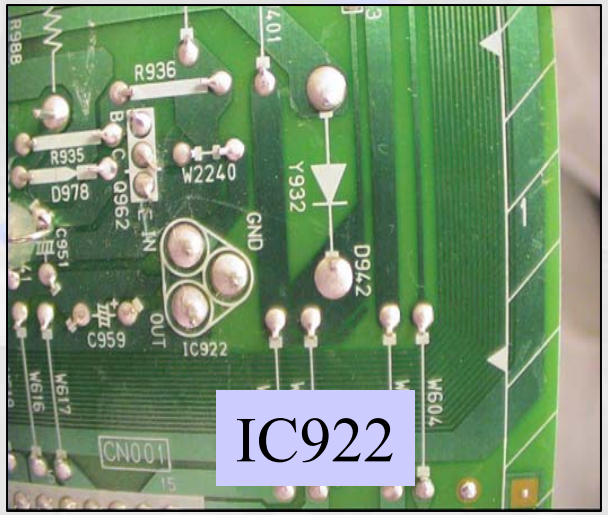
1. Short CN90SE
2. Plug in AC cord
3. Check for Standby VCC at IC9141

AV-48P776/H

SSR-9001A-M2 PWB

Reference YA318 Schematic

1. Plug in AC cord
2. Check for Standby VCC at IC922



When the AC cord is plugged in, the Standby Circuits should function. This Circuit will supply the VCC to the Micon. Check this Voltage prior to continuing.

SRP-9022A-M2 PWB

The SRP-9022A-M2 PWB utilizes Power Supplies whose Standby VCC is created by a circuit that is separate from the Switching Circuits.

- Check for the Standby VCC at the specified location.
- If the Standby VCC is not functional, begin at the incoming AC Line Voltage and check all voltages supplying the Standby VCC circuit.

SSR-9001A-M2 PWB

- The Standby VCC for the SSR-9001A-M2 PWB is created by the Switching Circuits.
- If the Standby VCC circuit is not functional, troubleshoot the Power line from the Transformer supplying this voltage. In this case it is the 28V line.
- **Remember**: In Standby Mode the Power Supply voltage is reduced. The 28V line will put out 14V in Standby Mode
- CP942 and CP941 may be removed to eliminate the possibility of others circuits creating shorts to this supply. Check the DC at C938

FUNCTION CHECK PROCEDURE

CHECK STANDBY CIRCUITS

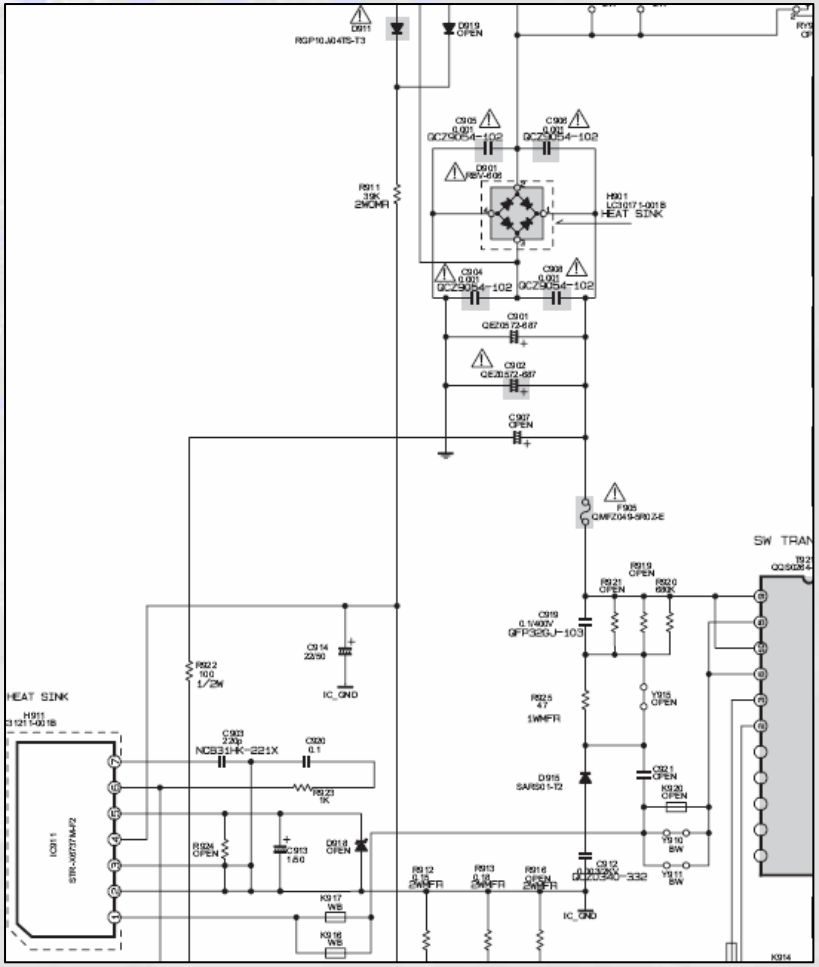
AV-48P776/H

SSR-9001A-M2 PWB

Reference YA318 Schematic

CHECK CIRCUITS

1. F905	Surge Protection
2. D901 and C907	Main rectifier
3. IC911	Switching Regulator
4. D911, R911 and C914	Startup
5. T921	Switching Transformer
6. R923, C903 and R920	Current Feedback
7. FR915 and D912	Run DC
8. PC921	Photo Coupler



• The **SSR-9001A-M2 PWBs** Switching Circuits Operate in Standby Mode, therefore it is possible to partially test these circuits function.

• An Operational Standby Voltage Source is a good sign that the other circuits are functional.

• It is still necessary to fully power up the Supply to ensure it is fully functional as some components may fail under a higher load voltage.

• The **SRP-9022A-M2 PWB** does not utilize a Switching Circuit during Standby Mode. Therefore these circuits cannot be tested in this PWB.

FUNCTION CHECK PROCEDURE

PROVIDE "POWER ON"

AV-48P776/H

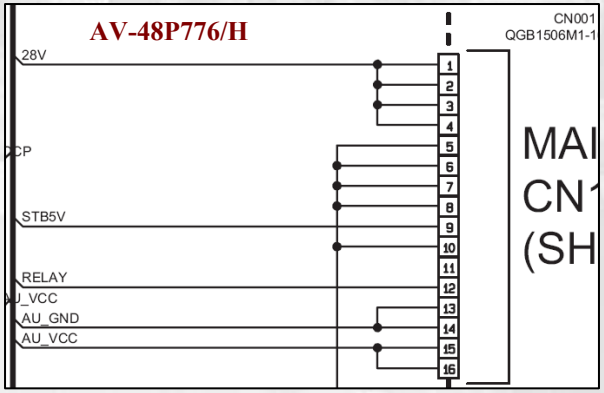
SSR-9001A-M2 PWB

Reference YA318 Schematic

1. Apply 3VDC Pulse to CN9003 pin12 "B1_POW" and CN001 pin12 "RELAY", use CN003 pin15 as Ground

2. Check all Supply Voltages

3. Check Switching Circuits Function



HD-52G786

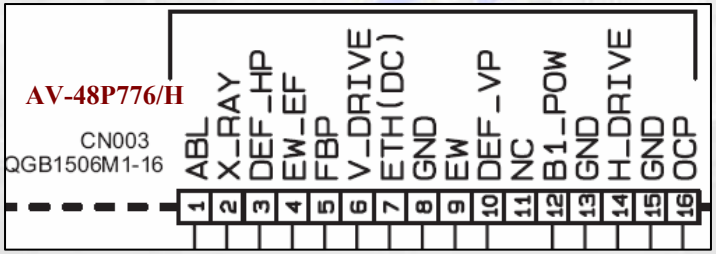
SRP-9022A-M2 PWB

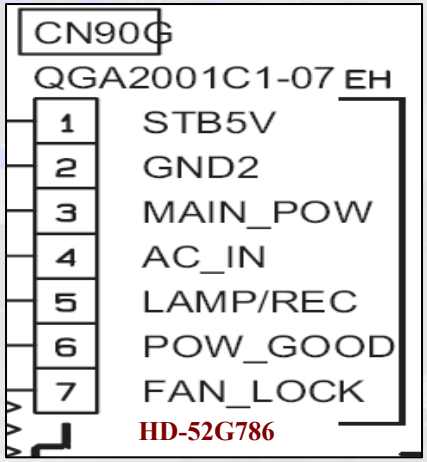
Reference YA293 Schematic

1. Apply 3VDC to CN90G pin3 "MAIN_POW", use pin2 "GND2"as Ground

2. Check all Supply Voltages

3. Check Switching Circuits Function





• Using (2) AA batteries connected in SERIES, connect the Positive end to the connector specified each PWB.

• Connect the GROUND end to the ground location specified.

• The AA batteries will provide a 3VDC to the Main Power Relay and other circuits necessary to turn on the Power Supply.

• Test all output voltages of the Supply.

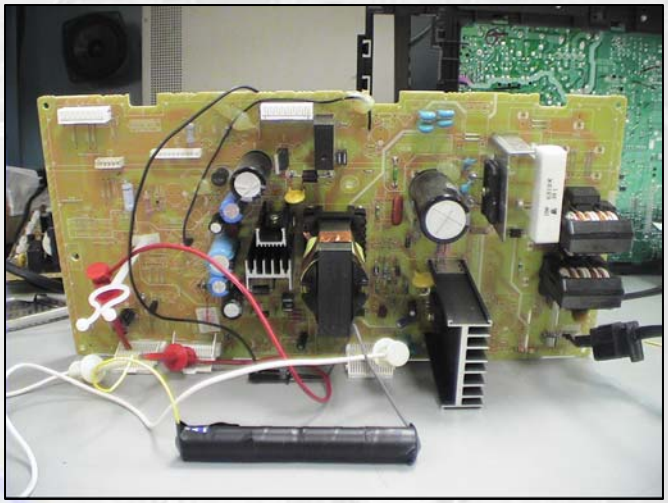
• If the supply does not activate, ensure the 3V source is connected properly, then troubleshoot the Switching Circuits.

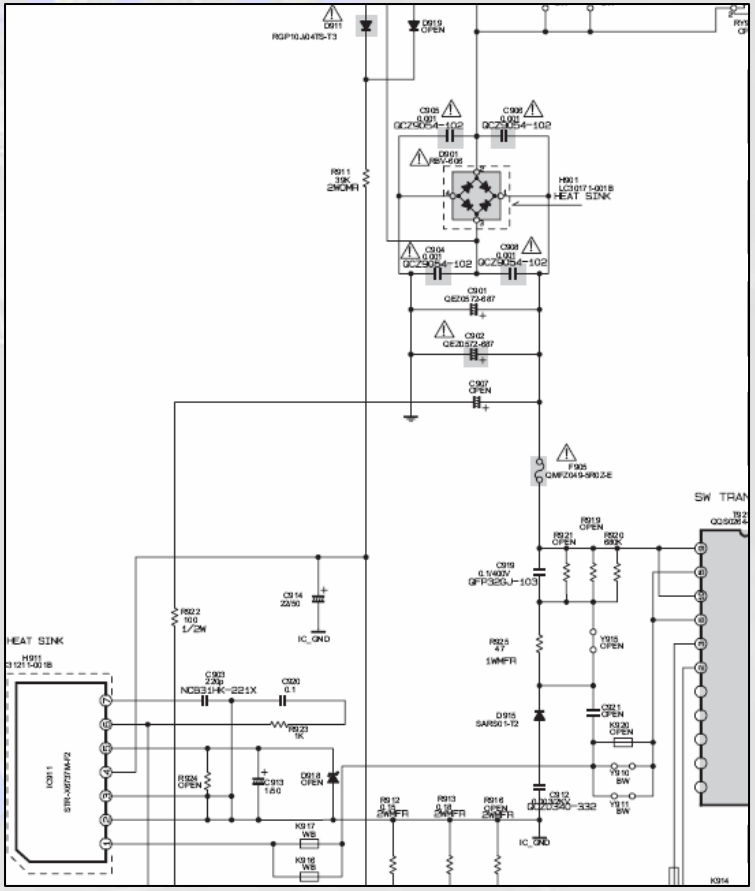
•Any external Power Supply may be used to provide the 3VDC turn on voltage.

FUNCTION CHECK PROCEDURE

ORDER OF FUNCTION CHECK

1. Surge Protection
2. Main rectifier
3. Switching Transformer
4. Switching IC
5. Startup
6. Photo Coupler
7. Run DC
8. Error Amp
9. Secondary Voltages
10. Current Feedback
11. Main Relay
12. Main Relay Drive





•By applying 3VDC to turn on the supply, you are now able to troubleshoot the supply in a Stand Alone Fully Powered Condition. This eliminates shorts caused by other PWBs.

•Check the circuits listed in the order specified to find PWB trouble.

•If a Circuit is found to be unsatisfactorily functional, use the troubleshooting procedures in the sections that will follow to aid in testing the specific circuit.

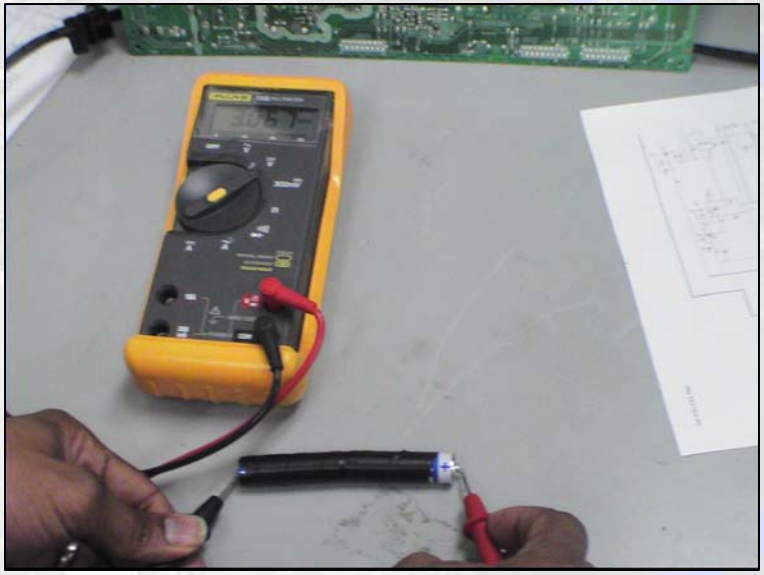
•The **SSR-9001A-M2 PWBs** Switching Circuits Operate in Standby Mode, therefore it is possible test many of these circuits by only applying AC line voltage. Although, Standby Mode will not provide full Output Voltage from the Transformer Secondary.

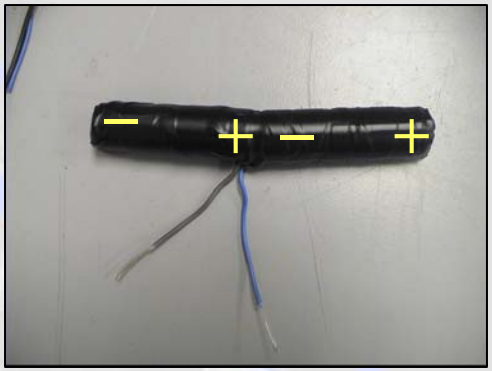
• B1 Power On at the correct Voltage is a good sign that the PWB has no defects.

•Refer to SWITCH CIRCUIT REVIEW section for assistance identifying the circuits and their functions.

FUNCTION CHECK PROCEDURE

BATTERY TESTING DEVICE





- (2)AA batteries may be used to supply a Power ON DC to the Power Supply
- Use the images to create a simple test Jig.
- Ensure that you properly connect the batteries in series with the positive of one battery connect to the negative of the other
- When connecting wires to the batteries it is wise to use (2) different colors to represent positive and negative to prevent later confusion.
- Always measure the voltage to ensure you have a proper connection between the batteries and they are outputting the correct voltage.

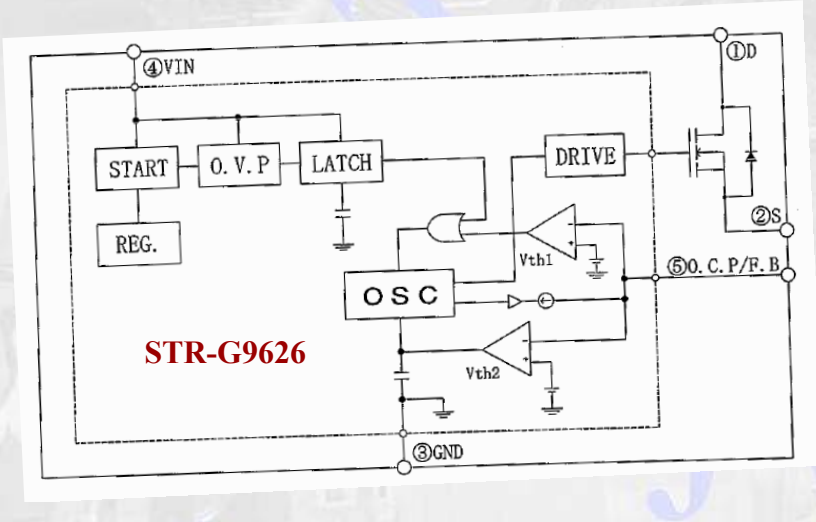
TROUBLESHOOTING

The following goes over procedures that will allow the testing of specific circuits of the Power Supply.

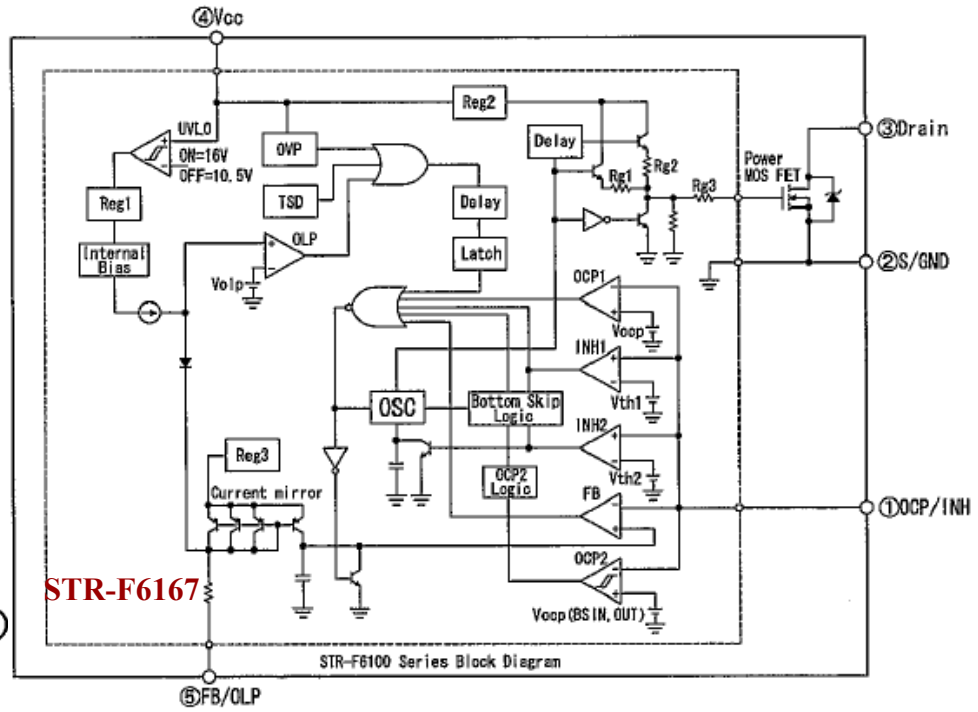
These steps must be carefully followed to prevent damage to PWB or injury to self.

TROUBLESHOOTING

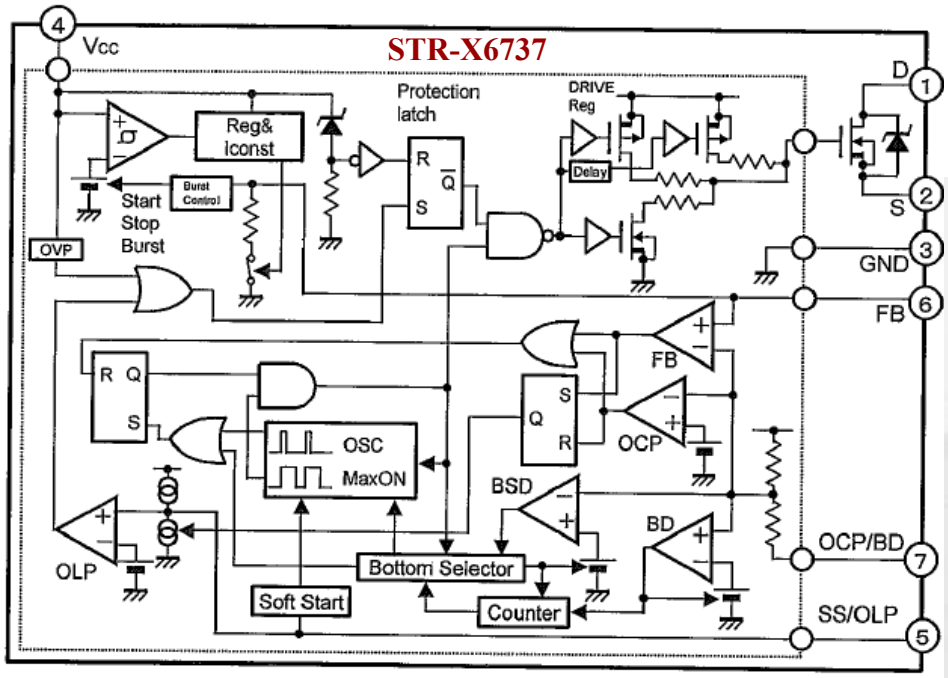
SWITCHING IC



STR-G9626



STR-F6167



- Check VCC
- Check Ramp Voltage at Feedback Pin
- Check for DC voltage at FET input
- Check that FET is not shorted to GND
- Always Replace IC and Capacitor together.

•The (3) versions of the Switching IC are shown; G, F and X. These pin out schematics of the ICs can be used to assist with troubleshooting.

•Check the ICs VCC for approximately 14V. This is the StartUp and RunDC voltage that is required to power the amp.

•Check for the Ramping Voltage at the Feedback Pin. This voltage will vary between models, but .7VDC is the average measurement. Some PWBs have shown 1.4VDC at this pin.

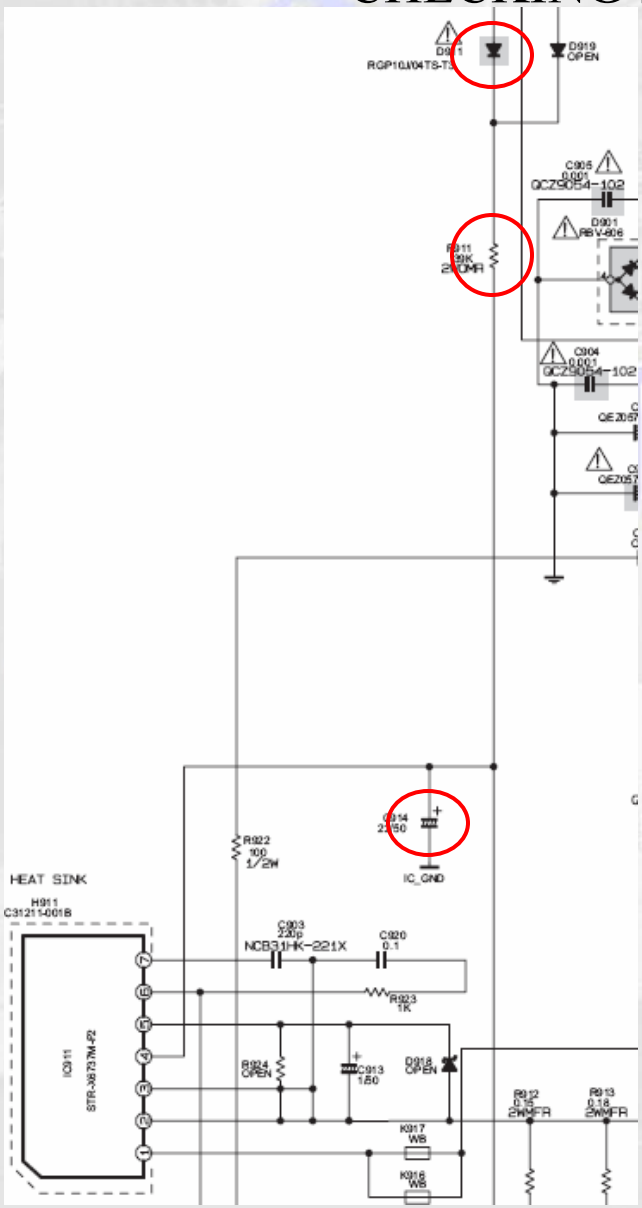
•Check for DC voltage at FET input. It should be the same as the Input to the Transformer and is usually about 170VDC.

•Check that the FET is not shorted to GND. Ensure the Power Supply is Off before making this measurement

Always Replace the IC and the Capacitor on the VCC input together.

TROUBLESHOOTING

CHECKING SWITCHING IC SUPPLY "STARTUP"



- Power On and check IC supply
- Usually a Diode/Resistor and Capacitor connected directly to the AC and bypassing the Main Bridge Rectifier
- Desoldered components to isolate StartUp supply if needed
- Always Replace Capacitor and IC together.

Reference YA318 Schematic

• Use the FUNCTION CHECK PROCEDURE to power on the Television.

• Check the Switching ICs pin4 VCC for approximately 14VDC. This is supplied by the StartUp circuit previously outlined.

• If this voltage is not present, check the circuits that supply this voltage to the IC.

• Check the Diode, Resistor and Capacitor that make up this circuit for opens or shorts.

• This circuit is connected to the Photo Coupler circuit so it may be necessary to check or desolder these components to eliminate the possibility of them being the trouble.

• Desoldering and Lifting the ICs pin 4 will allow the check of this voltage without the influence of the Switching IC.

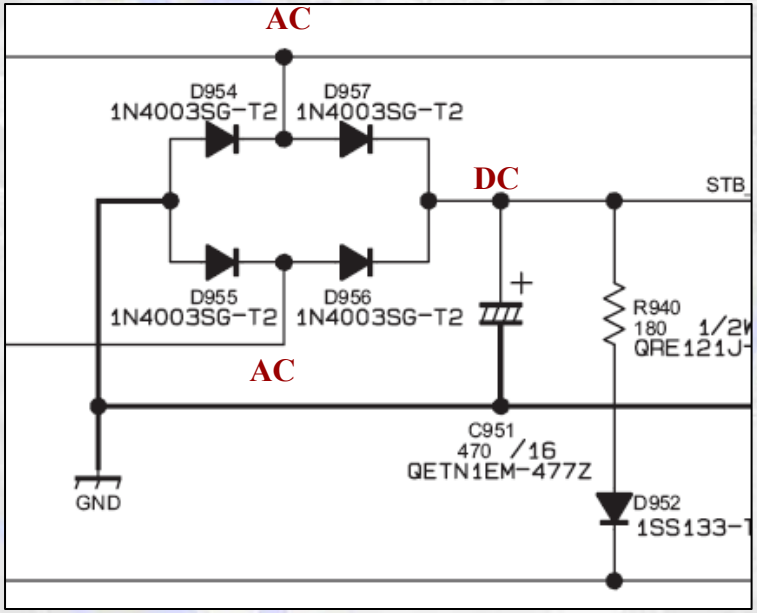
Always Replace the IC and the Capacitor on the VCC input together.

TELEVISION

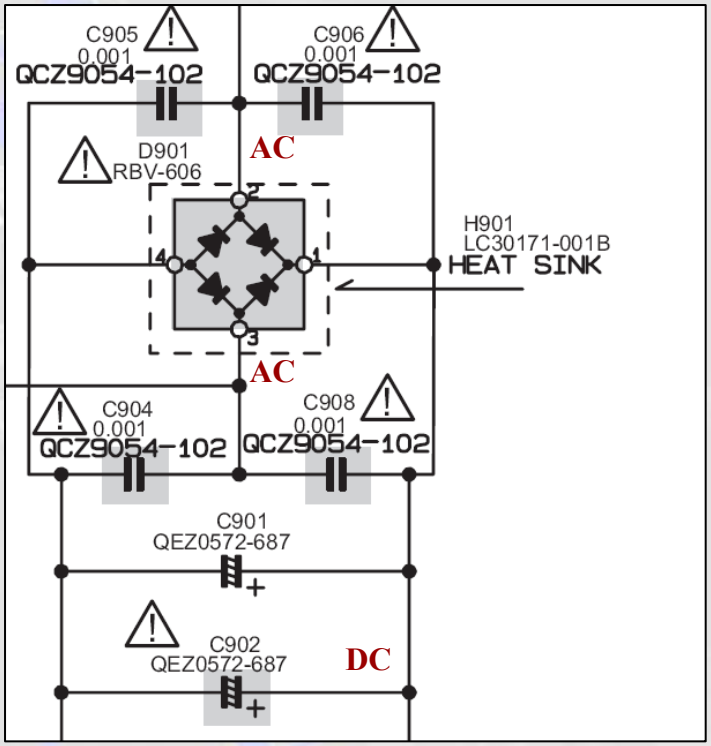
TROUBLESHOOTING

JVC

CHECK BRIDGE RECTIFIER



YA389 Schematic



YA293 Schematic

Rectifier Circuits always used to Provide DC Out from AC In

Check Incoming AC

Check DC Voltage at Capacitor

Desolder components after capacitor to isolate Bridge from shorting

JVC

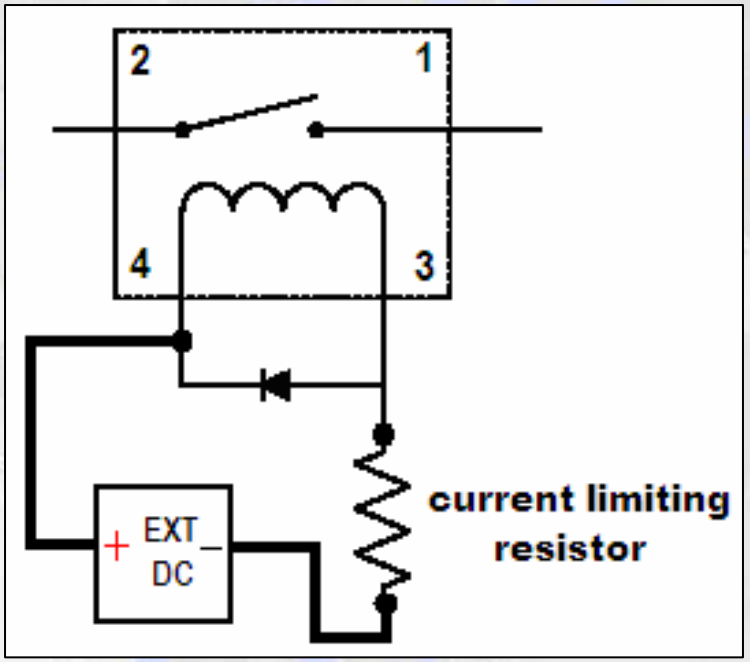
- The Bridge Rectifies converts the AC line input into a DC voltage that is usable by the TV circuits.
- Begin troubleshooting this Device by first checking the incoming AC line voltage, then checking the DC voltage at the Capacitor.
- It may be necessary to desolder components to eliminate them as a possible cause of problems. If so, desolder the components after the Capacitor.

TROUBLESHOOTING

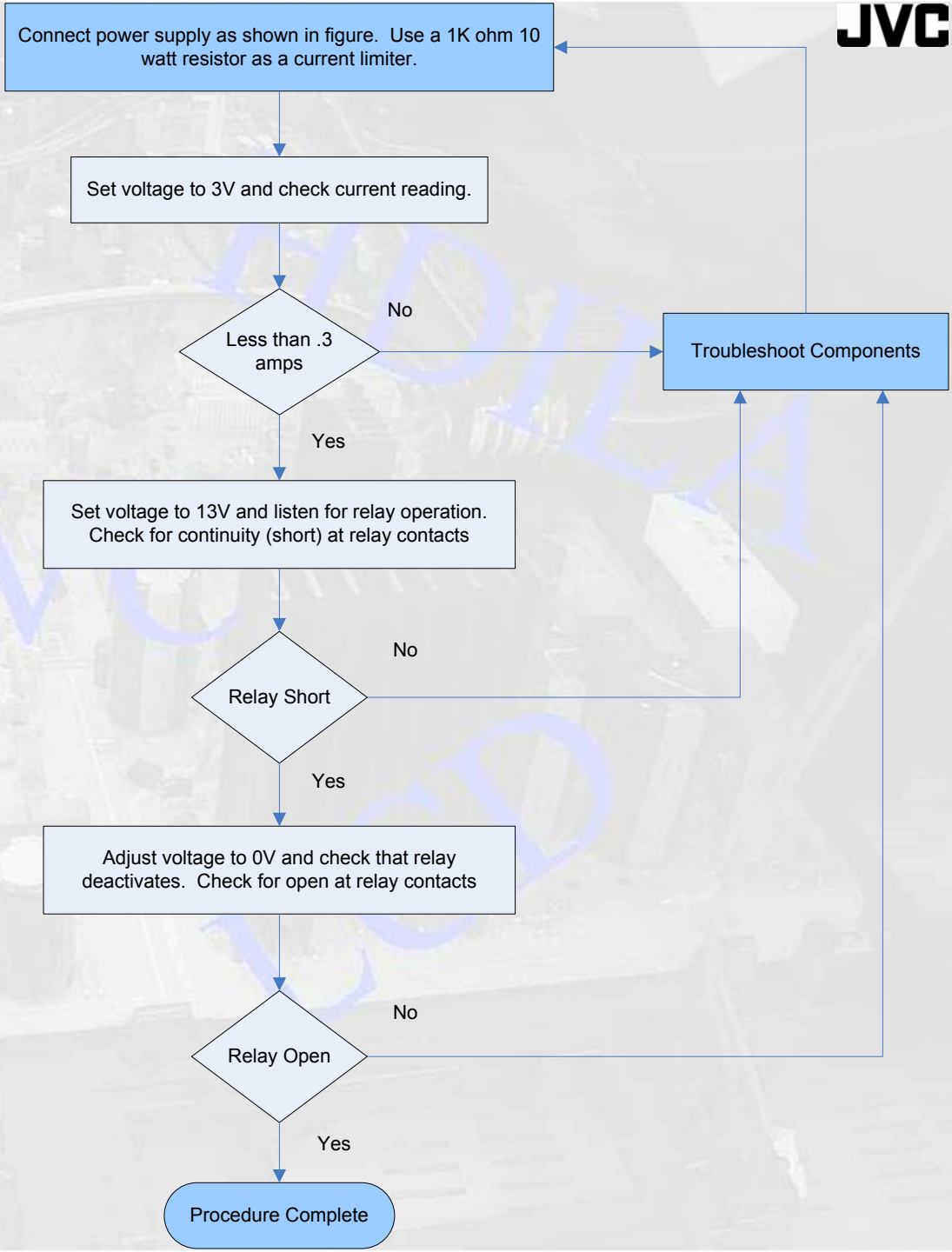
RELAY FUNCTION CHECK

Use this circuit to test the Relay

Follow Steps to assist



- It is possible that the Relay contacts may wear or the supply circuits to the relay may not function.
- Use this circuit to test the relays function.
- Follow the Steps to assist in troubleshooting.

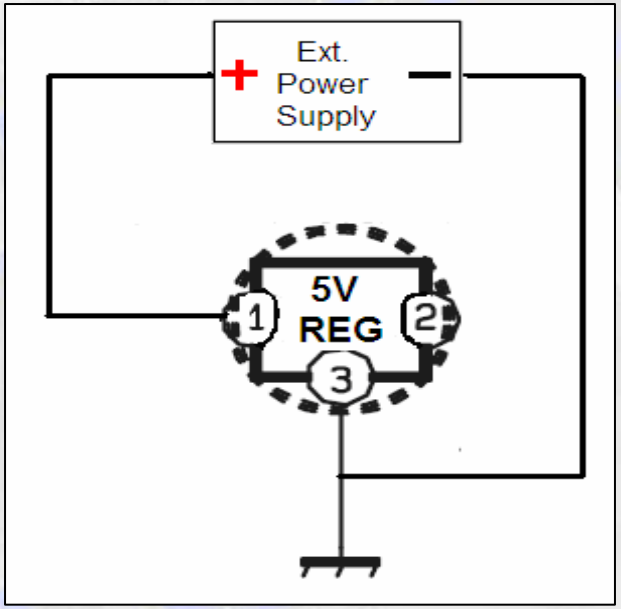


TROUBLESHOOTING

REGULATOR CHECK

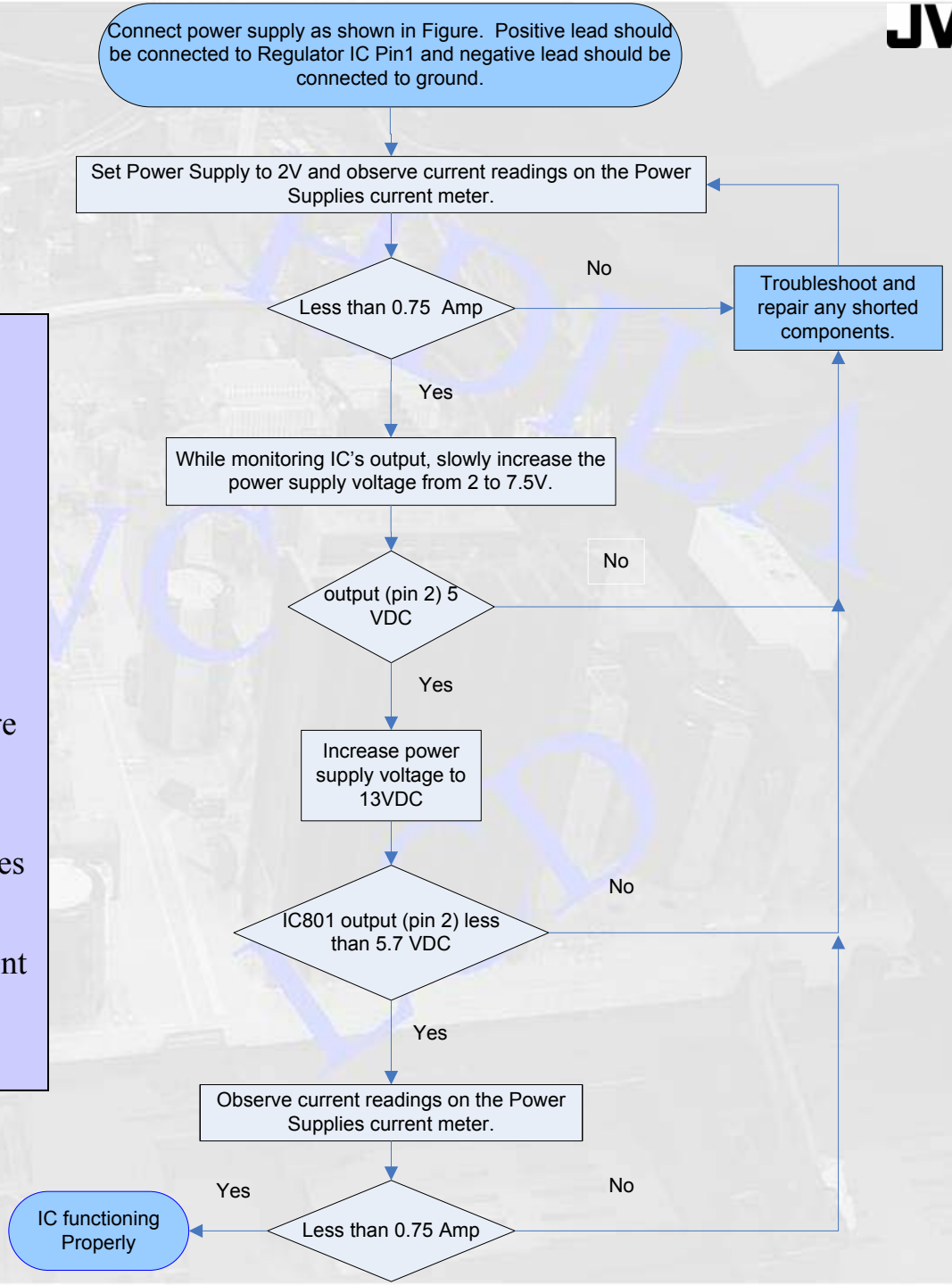
Use this circuit to test the Regulators

Follow Steps to assist



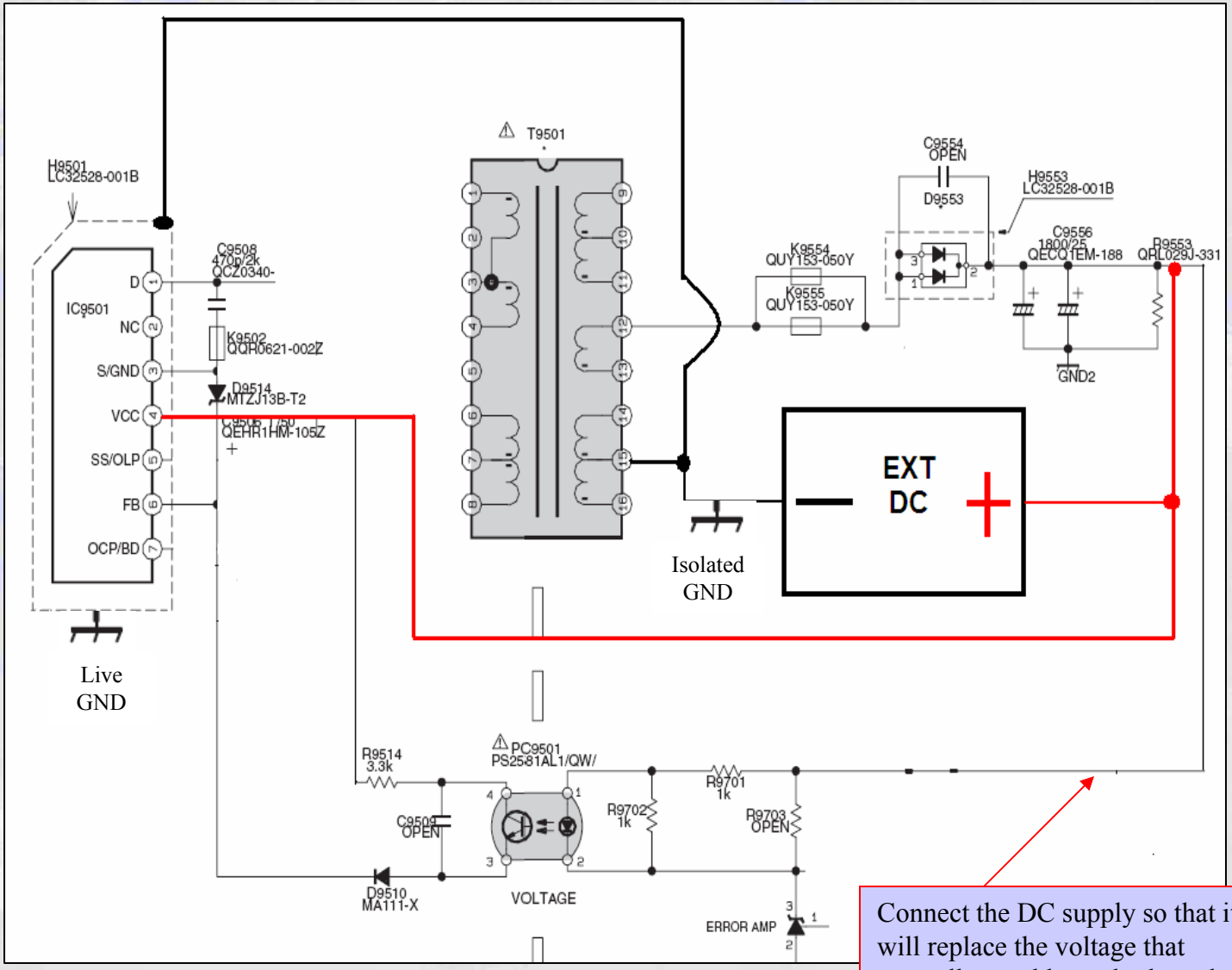
- The Circuit may be used to test the Voltage Regulators used in the Power Supply.
- The voltages shown apply to a 5V regulator.
- If a larger regulator is being tested follow these rules:

1. Positive On input, Negative to GND
2. Begin by inputting 2-4V
3. Check current, if it is excessive then there is possibly a short.
4. Raise voltage approx 4 volts above regulator voltage and check that the DC does not exceed the ICs rating
5. Always monitor current and stop if current becomes excessive.



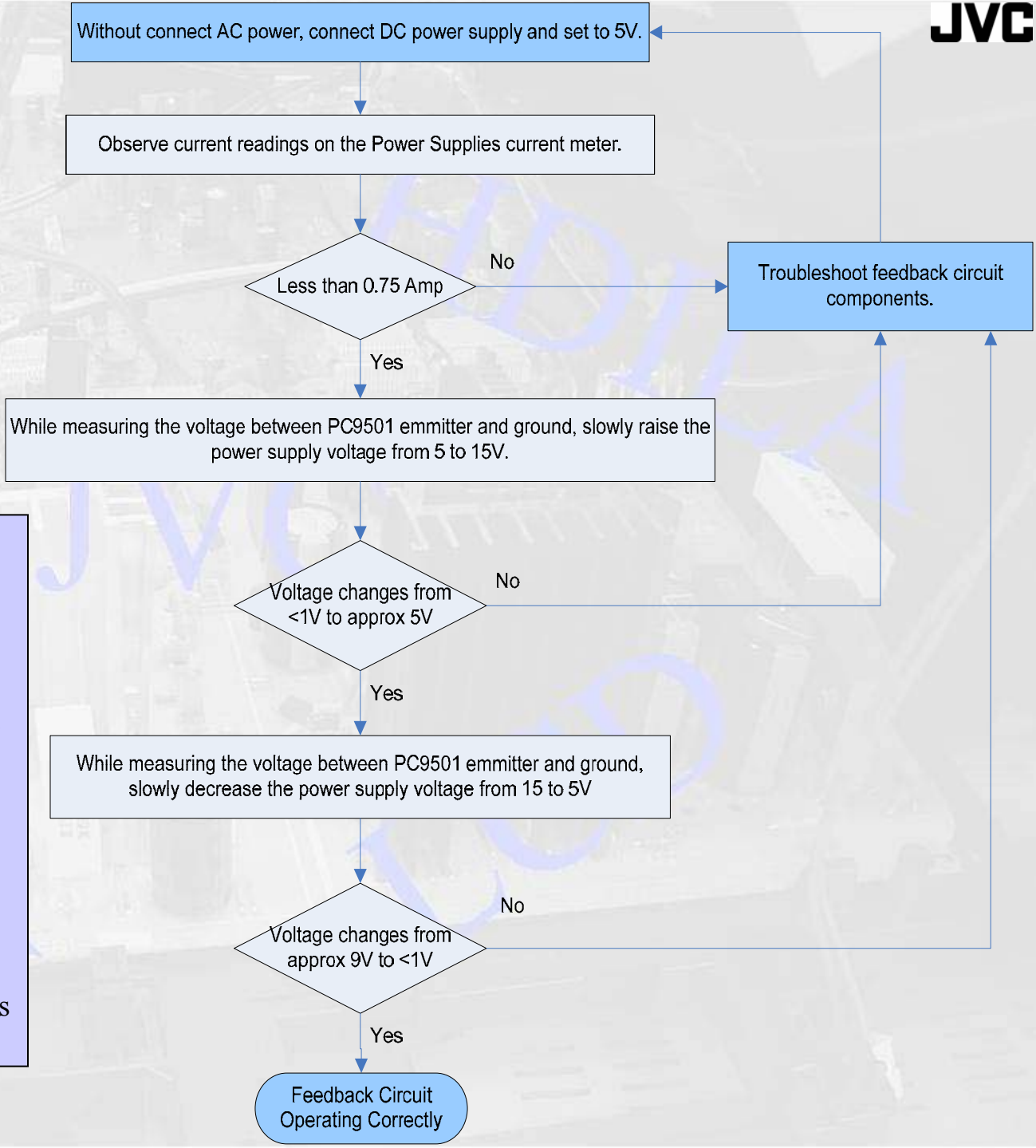
TROUBLESHOOTING

FEEDBACK PHOTO COUPLER



Reference YA293 Schematic

Connect the DC supply so that it will replace the voltage that normally would supply the voltage Photo Coupler



- Check the Operation of Feedback Photo Coupler by connecting the circuit shown.

- When the Photo Coupler becomes operational you will see the voltage at the emitter of the Photo Coupler Transistor rise from 0 to approximately 5V.

- When checking this circuit using the FUNCTION CHECK PROCEDURE you will notice a 1V difference between the Photo Coupler Transistors pins.

TROUBLESHOOTING

SYMPTOM/CAUSE

B1 VOLTAGE HIGH/ LOW SECONDARY VOLTAGES

- Leaky Error Amps may can cause High B1 voltages
- Check voltages at error amp.
- If it is excessive then change.
- The Zener Diode on between the Photo Coupler and Error Amp may cause similar Low Power issues

NO STANDBY VCC

- In many HDILA models the Transformer, Regulator or Rectifier circuit fails.
- Check the input to the Bridge Rectifier then measure the DC output voltage at all points up to the Regulator to find the faulty component.
- In Models with Standby supplied by Switching Circuits, measure the supply voltage to this circuit. Many times other PWBs have failed in the TV shorting the supply line for the Standby Voltage.
- Ensure the Circuit Protectors have not blown on this supply line..

POWER ON/OFF RAPIDLY

- This can result from many things, but the likely culprit is the supply to the switching IC.
- This is similar to what causes lamp flicker, the power supply is oscillating due to insufficient supply voltage.
- Check the circuit that supply the Run DC and Startup DC.
- Measure the Ramping Voltage at the Feedback. If it is less than .7V, this means the IC is not stable.

LAMP FLICKER IN HDILA

- Run DC is important to maintaining a stable supply, if this is low the supply may oscillate.
- This oscillation will appear in the voltage and in HDILAs this may cause the lamp to flicker.
- Check the circuit that supply the Run DC and Startup DC.
- Measure the Ramping Voltage at the Feedback. If it is less than .7V, this means the IC is not stable.