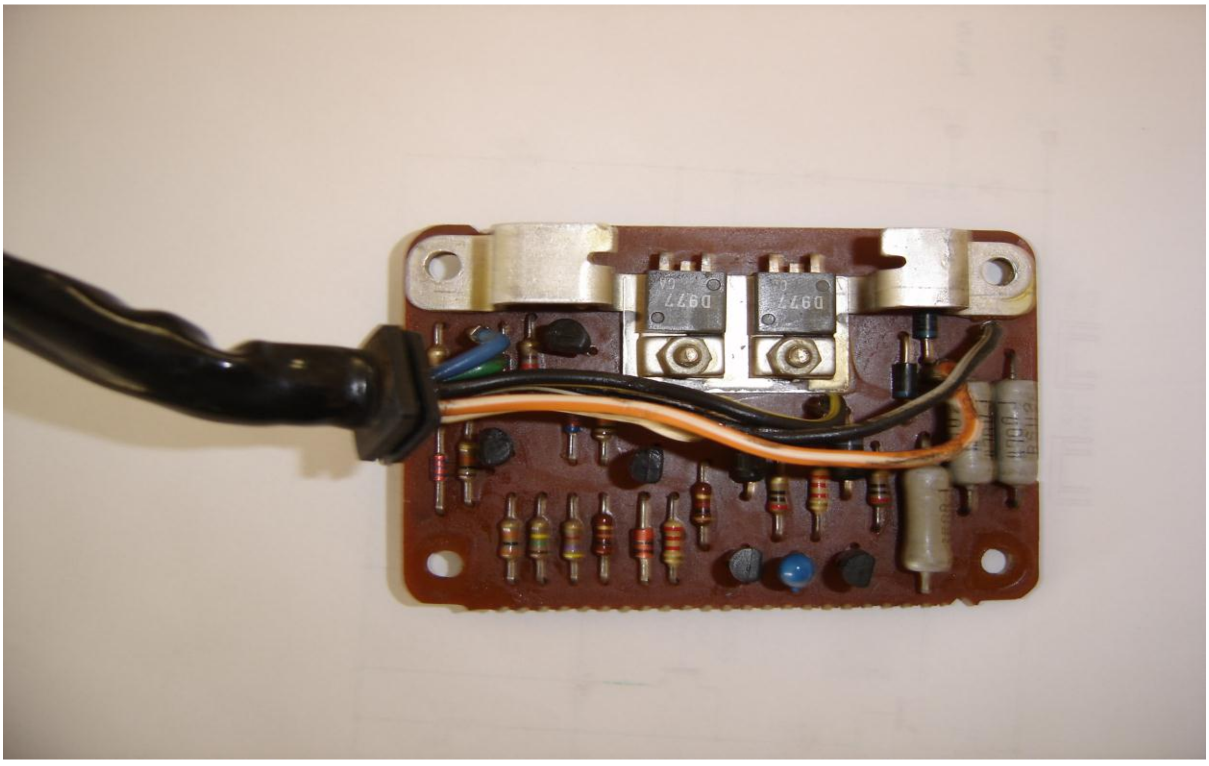
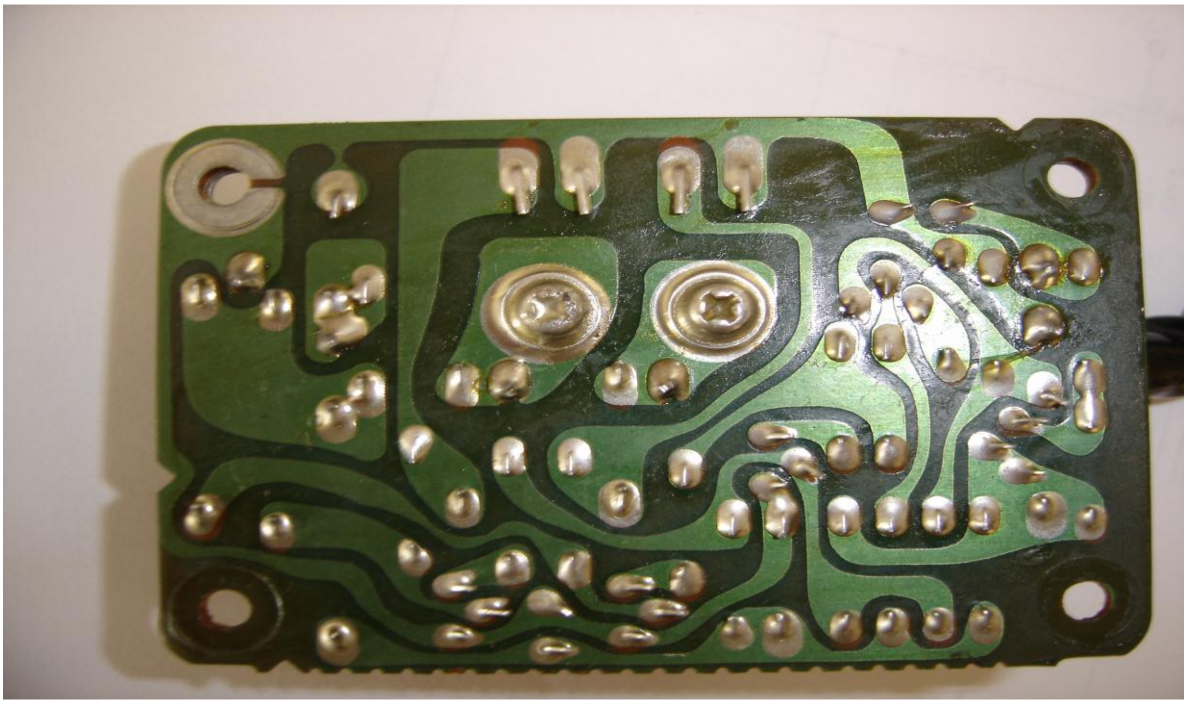
# Ignition Igniter for Suzuki GS1000GT 1980



The following contains details on the construction of the igniter unit and information useful for repairing or even rebuilding it and replacing the PCB. Specifications of some of the components are given to allow equivalents to be sourced.

The schematic has not been tested or double checked by anyone for accuracy as it was made for my own backup, in case the igniter fails sometime in the near future and I need to fix it. If anyone finds any discrepancies please give feedback and I will gladly update this write up.

The final part also contains some steps to actually functionally test the ignition system off or on the bike and to prove which part or component is faulty. Obviously some average understanding and competency in electronics is required, but everything here is quite basic.

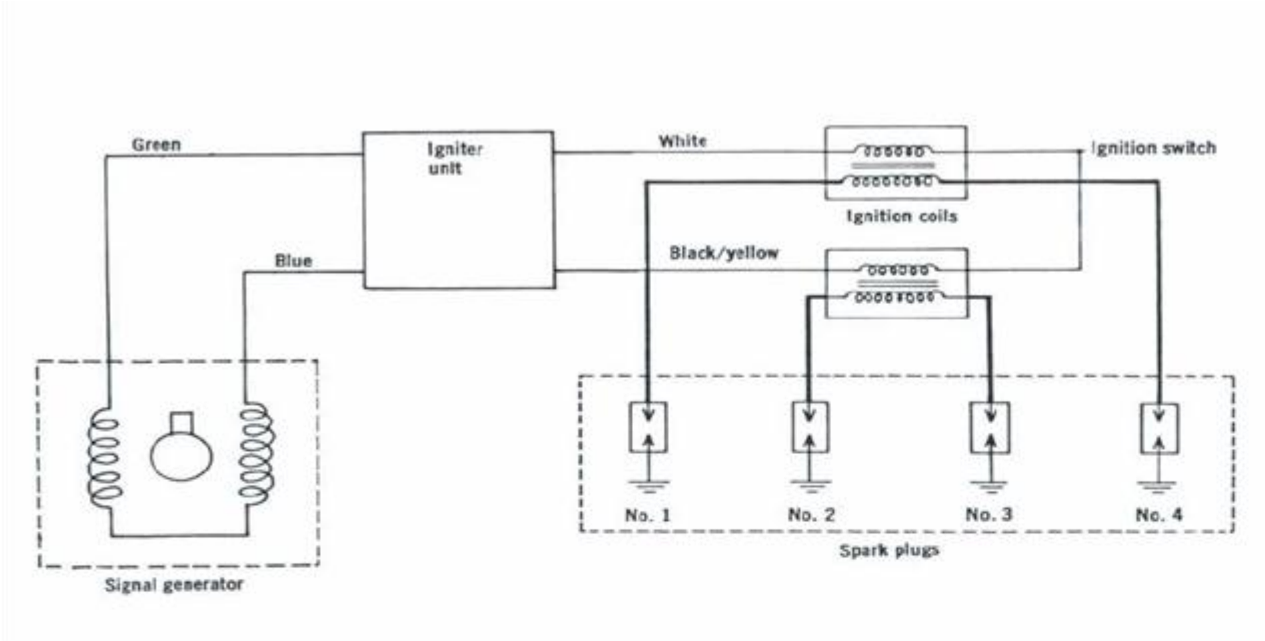
I have also added and addendum at the end that shows how to build a replacement igniter by using two HEI modules which are readily obtainable from any motor spares suppliers. This is not my work and all credit goes to Lou. I have built two of these and they do work.

Please read the complete document before attempting to build or repair one.
The igniter Suzuki part number 32900-45110 is superseded by 32900-45120
What you have just seen above is the little black box that can cost you $400 if buying a new replacement!

The schematic shown later is a copy made of the OEM Igniter for the 1980 GS1000G. It may fit some other models as well. This model has a mechanical advance. Later models have the advance controlled electronically inside the igniter. The zener diodes D4 & D5 are to clamp the voltage generated by the primary coil windings to limit voltages higher than T1 and T2's limits.

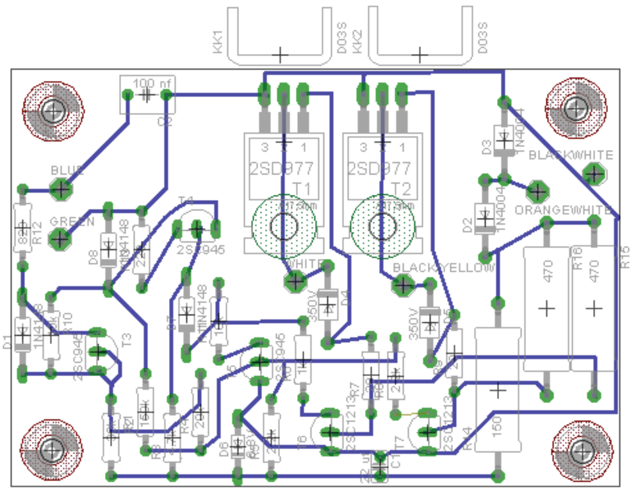
The PC board inside the Igniter is replaceable and repairable, it is thus not necessary to discard a failed, but expensive and scarce igniter, as it can possibly be repaired for surprisingly little cost. You can also replace it with an after market kit, inclusive of signal generator, sometimes new coils as well.

The following schematic shows the ignition wiring for the GS1000. Please note that the igniter is designed to be used with standard OEM coils and the components are rated maximum 6Amp. If you are using non standard coils that have a lower passive resistance than the OEM of 2 ohms then they may be drawing more current and the igniter may fail. Rebuilding the igniter is possible with a higher current output handling capability, using higher rated components.

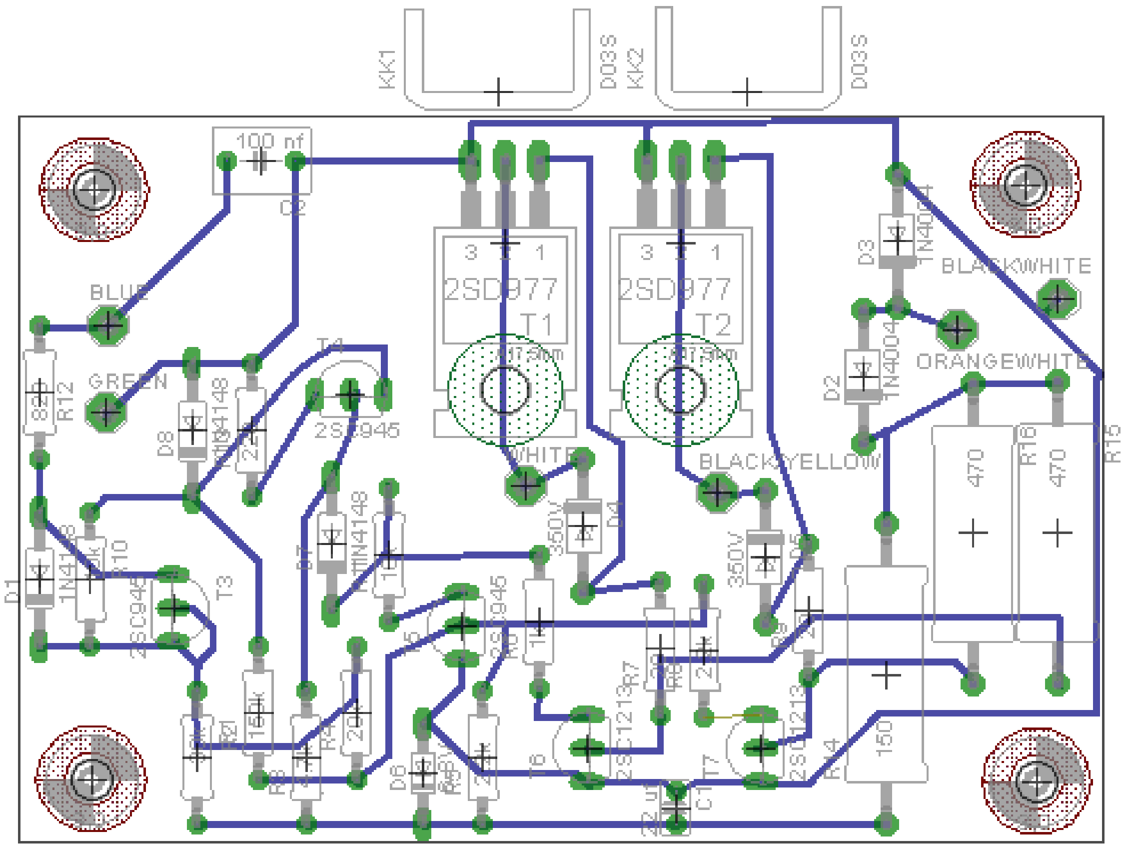



<u>**The basic working for understanding**</u>**:**
When the ignition is switched on, 12 volt positive is applied to each coil via a fuse, the ignition switch and kill switch on the orange/white wires. The other sides of the coils are wired to the igniter via the White wire for coil - cylinders 1 & 4, and the Black/Yellow wire for coil - cylinders 2 & 3.
Two small pickup coils on magnets are fitted that will signal back to the igniter when the spark plugs are to be fired. The igniter then sends a negative pulse to the coils and the spark is generated by sending a short burst of high voltage to the spark plugs.
Before suspecting the igniter as faulty it is necessary to first check and test that all the other components in the ignition circuit are in good order. A more detailed test step guide is given towards the end of this document.
Inspect and test the pickup coils, inspect and test the wiring from the pickup coils to the igniter. Inspect and test the connectors on the igniter. Make sure that a proper ground (negative) is present on the Black/White wire going into the igniter. Make sure that a full 12 Volt positive is present at the coils on the Orange/White wire. Check that a full positive is present on the Orange/White wire going into the igniter. Check the colour code of the wires as well, as someone may have erroneously swapped wires, at coils, at pickups or at the igniter. Incorrect wiring or components may have been fitted and then abandoned.
A coil can be tested by disconnecting the plug connector from the igniter wires at the coil and connecting a 12 V positive directly on the Orange/White wire to the coils. Connect a spark plug to the HT lead and ground the outside of the plug to the engine. Then very briefly flick a negative ground on the Black/Yellow or the White wire and a spark should jump on the spark plug. Do not connect the ground for long periods and thus overheating the coil and burning it out, just give it a quick flick to simulate a ground pulse from the igniter or points.

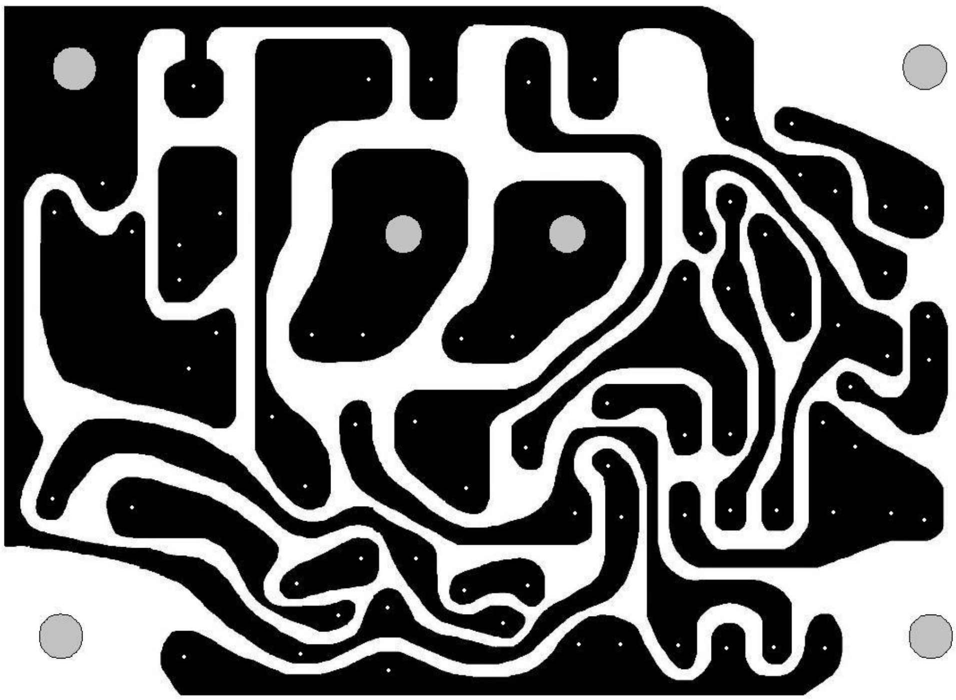
The next shows a diagram of the PCB, seen from the component side, which is size 80 mm x 55




mm, single side copper to fit into the original case. There is a special heat sink for the two output transistors and they are bonded with insulating washers and heat conductive paste to enable proper cooling. Four Phillips screws mount the PCB inside the case.
It would be possible to make up a replacement PCB and fit all components and just replace with a complete new PCB. You can also use higher current rated components for more durability. Most failures are due the output transistors or a diode failing or a dry solder joint due to age.
Note that the completed component board must be coated with a protective layer specially designed for keeping water and other dampness off the components, in PCB's that could cause failure after all testing has been done. It is usually a thin layer of plastic or epoxy and is very important. A more durable epoxy or plastic layer is better, but makes testing and replacing components difficult later.
The replacement PCB below was designed for replacement transistors with TO92 base in the center and needs to be changed slightly if you are not using more readily available equivalents.

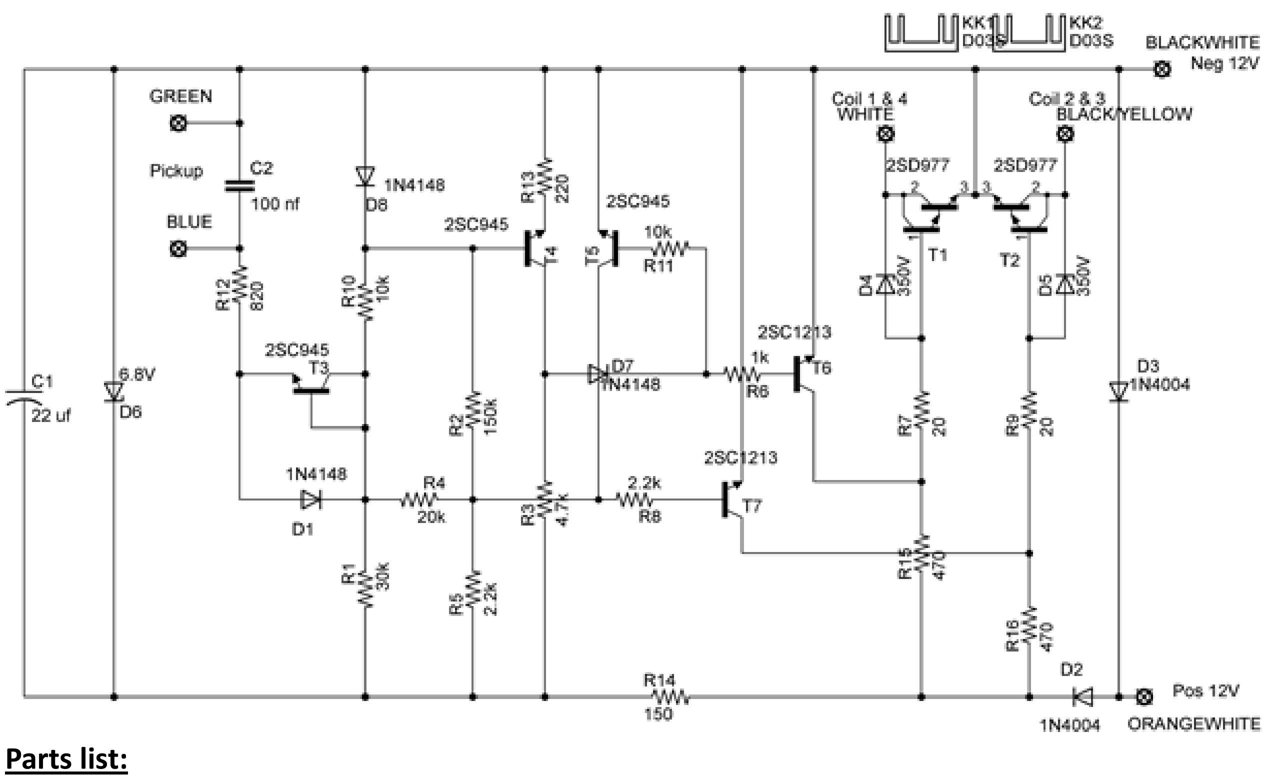


Actual size, 80mm x 50 mm, shown from component side.



Replica of the stock PCB if you need to replace it

## Suzuki GS1000GT 1980 Igniter




**Parts list:**

Equivalent parts are given in the text.

T1, T2 = 2SD977 (Obsolete) or equivalent (2SD799 could be a better replacement)

(Specs: Si, NPN, Darlington Pair Transistors, 40W, 600V, 400V, 6A, TO-220)
2 screws and insulation kits for T1 and T2 and 2 heat sinks TO220 for T1 and T2 or preferably fabricate the same as the OEM shape.

T3, T4, T5 = 2SC945 or equivalents
T6, T7 = 2SC1213 or equivalents
D1, D7, D8 = 1N4148
D2, D3 = 1N4004..7 or preferably a Schottky 1N5819 diode
D4, D5 = 350 V Zener 1W (Or use two 180V Zeners in series)
D6 = 6.8V 1.3 Watt (BZV85C 6V8)
R1 = 30k
R2 = 150k
R3 = 4.7k
R4 = 20k
R5, R8 = 2.2k
R6 = 1k
R7, R9 = 20 ohm
R10, R11 = 10k
R12 = 820
R13 = 220
R14 = 150 2W
R15, R16 = 470 2W
C1 = 22uF 16v tantalum
C2 = 100nF 135V ceramic
Single sided copper PCB
Heat conducting compound
6 pin posts for wires
Box aluminium for PCB
Tectyl spray or preferably electrical insulating plastic coating spray.


**Please note:** A list of possible equivalent components follows, but some may have different lead configurations and may need adapting, but could possibly be used. The TO92 Japanese 2SCxxx transistors have lead configurations (ECB) with the collector in the center. The OEM PCB may have to be changed to accommodate the equivalent TO92 with different lead configurations. The PCB given here is not an exact replica of the original and allows for the TO 92 base connections to be corrected for an equivalent, the copper conductors must be broadened to the maximum width for the high currents – see the picture of the OEM PCB. (More possible equivalents 2SD978, 2SD835, BU806, 2SD789-99)

| **Transistor list NPN for Igniter** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | **Base** | **Type NPN** | **Voltage V CBO** | **Voltage V CEO** | **Current IC Amps** | **P C Watts** | **Comments** |
| **2SD977** | TO 220 | Darlington | 450 | 400 | 4 | 40 | Original – obsolete |
| **2SD799** | TO220 | Darlington | 600 | 400 | 6 | 30 | Better replacement |
| **2SD1245** | TO 220 | Darlington | 500 | 400 | 5 | 40 | Direct equivalent for 2SD977 |
| 2SD1409 | TO 220 | Darlington | 600 | 400 | 6 | 25 | Avail R21 |
| 2SD1071 | TO 220 | Darlington | 450 | 450 | 6 | 40 | with zener |
| TIP152 | TO 220 | Darlington | 400 | 400 | 7 | 80 | |
| BU323Z | TO 218 | Darlington | | 350 | 10 | | |
| BU806 | TO 220 | Darlington | 400 | 200 | 8 | 60 | Avail R11 |
| BU810 | TO 220 | Darlington | 600 | 400 | 7 | 75 | |
| BU911 | TO 220 | Darlington | 450 | 400 | 6 | 60 | |
| BU931P | TO 218 | Darlington | 500 | 400 | 15 | 135 | |
| BU807 | TO 220 | Darlington | 400 | 330 | 8 | 60 | |
| TIP162 | TO 220 | Darlington | 380 | 380 | 10 | 50 | |
| TIP665 | TO 3 | Darlington | 500 | 400 | 20 | 150 | |
| MJ10012 | TO 3 | Darlington | 600 | 400 | 10 | | Avail R97 |
| | | | | | | | |
| **2SC945** | TO 92 | UNI | 60 | 50 | 0.1 | 0.25 | Original, ECB |
| 2SC1509 | TO92L | | 80 | 80 | 1 | 1 | ECB |
| BC182L | TO 92 | Gen purpose | 50 | 60 | 0.1 | 0.3 | |
| BC546 | TO 92 | Gen purpose | 80 | 65 | 0.1 | 0.5 | |
| BC547B | TO 92 | Gen purpose | 50 | 45 | 0.1 | 0.5 | |
| 2N3904 | TO 92 | Switching | 60 | 40 | 0.2 | 0.5 | |
| BC237B | TO 92 | Gen purpose | 50 | 45 | 0.2 | 0.5 | |
| | | | | | | | |
| **2SC1213** | TO 92 | | 35 | 35 | 0.5 | | Original, ECB |
| BC184L | TO 92 | Signal | 45 | 50 | 0.5 | 0.3 | |
| 2N3417 | TO 92 | Gen purpose | 50 | 50 | 0.5 | 0.6 | |
| 2N3704 | TO 92 | Signal | 50 | 30 | 0.5 | 0.6 | |
| BC337 | TO 92 | Switching | 50 | 35 | 0.8 | 0.6 | |

**Making the PCB**:

The PCB can be etched in the following way. Size it to 80mm x 55mm and print the layout copper track (mirror image if needed) with a laser printer on a sheet of glossy photo paper or even a glossy magazine cover. Cut the copper board to the above size and clean the copper then iron the paper with the black tracks onto the copper. Dissolve the paper in water and only the tracks should remain stuck to the copper. Now etch the board in a ferric chloride solution until the uncovered copper is dissolved. Then clean the black off and drill the board. Also drill 4 larger holes at the corners for mounting purposes.

It may be better to fabricate your own heat sink from a strip of aluminium sheet and to the same size as the OEM type; otherwise fitting inside the original case may be an issue. The case is connected to the OEM heat sink and also helps with dissipating heat. You could also change the layout and use standard heat sinks as shown below, but you may need a slightly larger case.

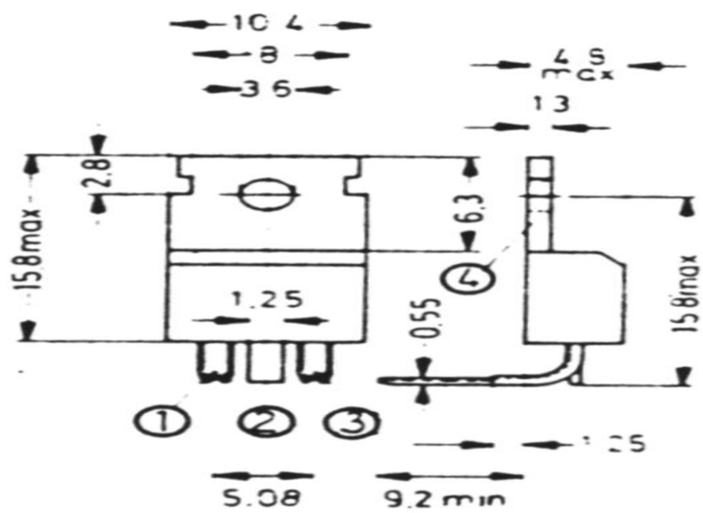
Fit the heat sink and T1 and T2 with the insulator kits and some heat conducting compound. The collector is picked up via the mounting tab and the center leg is cut off to give more space for a wider track to the base and emitter. The mounting screw for the heat sink is soldered to the large copper part on the PCB to allow for better connection and heat transfer.

Next install the rest of the components, pins, wires and solder properly. Solder in the old wires or make up with new wires.

Test the unit on the bench. The usual passive testing of the board on the bench is assumed first without and then with 12 V connected before any functional tests are tried. Then connect 12 volts, and a coil with a spark plug to check if a spark is generated, by briefly connecting a 1.5 V dry cell battery with negative to the blue and flick positive to the green wire, thus simulating what the pickup does. If this works and nothing smokes or burns out, only then install in your bike and test functionally.

The following data sheets are given to help determine a close equivalent transistor.

P/M




M22

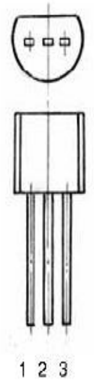
SOT-78
TO-220AA

# TO-92 Plastic-Encapsulated Transistors

**2SC1213** TRANSISTOR (NPN)

**2SC1213A**

TO-92




1. EMITTER

2. COLLECTOR

3. BASE

**FEATURE**

Power dissipation

$P_{CM}$: 0.4 W (Tamb=25℃)

Collector current

$I_{CM}$: 0.5 A

Collector-base voltage

$V_{(BR)CBO}$: 2SC1213 : 35 V

2SC1213A : 50 V

Operating and storage junction temperature range

$T_J$, $T_{stg}$: -55℃ to +150℃

ELECTRICAL CHARACTERISTICS(Tamb=25℃ unless otherwise specified)

| Parameter | Symbol | Test conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Collector-base breakdown voltage 2SC1213<br>2SC1213A | $V_{(BR)CBO}$ | $I_C$= 10μA , $I_E$=0 | 35<br>50 | | | V |
| Collector-emitter breakdown voltage 2SC1213<br>2SC1213A | $V_{(BR)CEO}$ | $I_C$= 1 mA , $I_B$=0 | 35<br>50 | | | V |
| Emitter-base breakdown voltage | $V_{(BR)EBO}$ | $I_E$=10μA, $I_C$=0 | 4 | | | V |
| Collector cut-off current | $I_{CBO}$ | $V_{CB}$= 20V , $I_E$=0 | | | 0.5 | μA |
| DC current gain | $h_{FE(1)}$ | $V_{CE}$=3V, $I_C$= 10mA | 60 | | 320 | |
| | $h_{FE(2)}$ | $V_{CE}$=3V, $I_C$= 500mA | 10 | | | |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C$= 150mA, $I_B$= 15 mA | | 0.2 | 0.6 | V |
| Base-emitter voltage | $V_{BE}$ | $V_{CE}$= 3V, $I_C$= 10 mA | | | 0.75 | V |

3 2 1

# NEC

## NPN SILICON TRANSISTOR

# 2SC945

**DESCRIPTION** The 2SC945 is designed for use in driver stage of AF amplifier and low speed switching.

**FEATURES**

- High Voltage $LV_{CEO}$ : 50 V MIN.
- Excellent $h_{FE}$ Linearity
  $h_{FE1}$ (0.1 mA)/$h_{FE2}$ (1.0 mA) : 0.92 TYP.

**ABSOLUTE MAXIMUM RATINGS**

Maximum Temperatures

Storage Temperature . . . . . . . . . . . . . . −55 to +125 °C

Junction Temperature . . . . . . . . . . . . +125 °C Maximum

Maximum Power Dissipation (Ta = 25 °C)

Total Power Dissipation . . . . . . . . . . . . . . . . 250 mW

Maximum Voltages and Currents (Ta = 25 °C)

$V_{CBO}$ Collector to Base Voltage . . . . . . . . . . 60 V

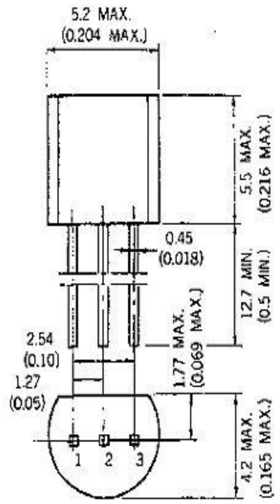
$V_{CEO}$ Collector to Emitter Voltage . . . . . . . . 50 V

$V_{EBO}$ Emitter to Base Voltage . . . . . . . . . . . 5.0 V

$I_C$ Collector Current . . . . . . . . . . . . . . . 100 mA

$I_B$ Base Current . . . . . . . . . . . . . . . . . . 20 mA

**PACKAGE DIMENSIONS**
in millimeters (inches)




1. EMITTER
2. COLLECTOR
3. BASE

EIAJ : SC 43B
JEDEC : TO 92
IEC : PA33

**ELECTRICAL CHARACTERISTICS** (Ta = 25 °C)

| SYMBOL | CHARACTERISTIC | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| $h_{FE1}$ | DC Current Gain | 50 | 185 | | | $V_{CE}$=6.0 V, $I_C$=0.1 mA |
| $h_{FE2}$ | DC Current Gain | 90 | 200 | 600 | | $V_{CE}$=6.0 V, $I_C$=1.0 mA |
| NF | Noise Figure | | 0.8 | 15 | dB | $V_{CE}$=6.0 V, $I_C$=0.1 mA, $R_G$=2.0 kΩ, f=1.0 kHz |
| $f_T$ | Gain Bandwidth Product | 150 | 250 | 450 | MHz | $V_{CE}$=6.0 V, $I_E$=−10 mA |
| $C_{ob}$ | Collector to Base Capacitance | | 3.0 | 4.0 | pF | $V_{CB}$=6.0 V, $I_E$=0, f=1.0 MHz |
| $I_{CBO}$ | Collector Cutoff Current | | | 100 | nA | $V_{CB}$=60 V, $I_E$=0 |
| $I_{EBO}$ | Emitter Cutoff Current | | | 100 | nA | $V_{EB}$=5.0 V, $I_C$=0 |
| $V_{BE}$ | Base to Emitter Voltage | 0.55 | 0.62 | 0.65 | V | $V_{CE}$=6.0 V, $I_C$=1.0 mA |
| $V_{CE(sat)}$ | Collector Saturation Voltage | | 0.15 | 0.3 | V | $I_C$=100 mA, $I_B$=10 mA |
| $V_{BE(sat)}$ | Base Saturation Voltage | | 0.86 | 1.0 | V | $I_C$=100 mA, $I_B$=10 mA |

Classification of $h_{FE2}$

| Rank | R | Q | P | K |
|---|---|---|---|---|
| Range | 90 − 180 | 135 − 270 | 200 − 400 | 300 − 600 |

$h_{FE2}$ Test Conditions : $V_{CE}$ = 6.0 V, $I_C$ = 1.0 mA

**According to older records the 2SD977 has a direct equivalent 2SD1245, shown below:**

PANASONIC INDL/ELEK{SEMI} 72C D 6932854 0009550 1 T-33-29



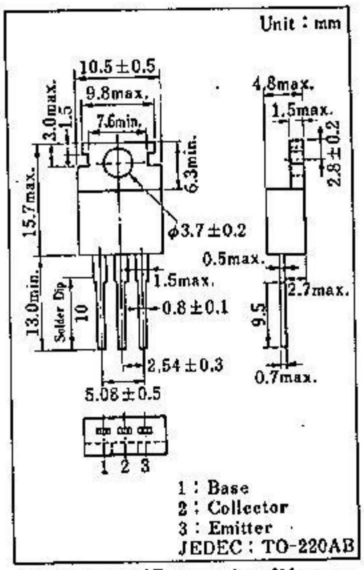
# 2SD1245

シリコンNPN三重拡散プレーナ形ダーリントン／Si NPN Triple Diffused Planar Darlington

低周波電力増幅用／AF Power Amplifier

■ 特　徴／Features

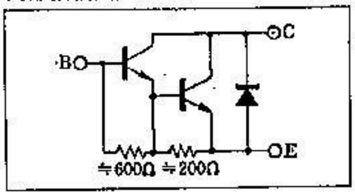
- 直流電流増幅率 $h_{FE}$ が高い。／High $h_{FE}$
- コレクタ・ベース電圧 $V_{CBO}$ が高い。／High $V_{CBO}$




■ 絶対最大定格／Absolute Maximum Ratings (Ta=25 ℃)

| Item | Symbol | Value | Unit |
|---|---|---|---|
| コレクタ・ベース電圧 | $V_{CBO}$ | 500 | V |
| コレクタ・エミッタ電圧 | $V_{CEO}$ | 400 | V |
| エミッタ・ベース電圧 | $V_{EBO}$ | 5 | V |
| せん頭コレクタ電流 | $I_{CP}$ | 10 | A |
| コレクタ電流 | $I_C$ | 6 | A |
| コレクタ損失(Tc=25 ℃) | $P_C$ | 40 | W |
| 接合部温度 | $T_j$ | 150 | ℃ |
| 保存温度 | $T_{stg}$ | −55～+150 | ℃ |

内部接続図／Connection Diagram




■ 電気的特性／Electrical Characteristics (Ta=25 ℃)

| Item | Symbol | Condition | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| コレクタしゃ断電流 | $I_{CBO}$ | $V_{CB}$=350 V, $I_E$=0 | | | 100 | μA |
| コレクタ・エミッタ電圧 | $V_{CEO(sus)}$ | $I_C$=2 A, L=10 mH | 400 | | | V |
| エミッタ・ベース電圧 | $V_{EBO}$ | $I_E$=100 mA, $I_C$=0 | 5 | | | V |
| 直流電流増幅率 | $h_{FE}$ | $V_{CE}$=2 V, $I_C$=2 A | 500 | | | |
| コレクタ・エミッタ飽和電圧 | $V_{CE(sat)}$ | $I_C$=3 A, $I_B$=60 mA | | | 1.5 | V |
| コレクタ・ベース飽和電圧 | $V_{BE(sat)}$ | $I_C$=3 A, $I_B$=60 mA | | | 2.5 | V |

**The Z330 should replace the 1S350 Zener diodes D4 & D5, or else you can put two Z180 Zeners in series to get 360 V.**

Z330

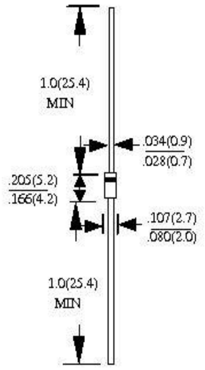
## 1WATT ZENER DIODE

**FEATURES**

- PLASTIC PACKAGE HAS UNDERWRITERS LABORATORY FLAMMABILITY CLASSIFICATION 94V-0
- LOW ZENER IMPEDANCE
- EXCELLENT CLAMPING CAPABILITY

**MECHANICAL DATA**

- CASE：MOLDED PLASTIC
- TERMINALS：AXIAL LEADS,SOLDERABLE PER MIL-STD-202, METHOD 208
- POLARITY：COLOR BAND DENOTES CATHODE
- MOUNTING POSITION：ANY
- WEIGHT：0.34 GRAM




CASE-DO41

DIMENSIONS IN INCHES AND (MILLIMETERS)

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS
RATINGS AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED
STORAGE AND OPERATING TEMPERATURE RANGE -55 TO + 150℃

ELECTRICAL CHARACTERISTICS (TA=25℃ UNLESS OTHERWISE NOTED) VF=1.2V MAX, IF= 200mA FOR ALL TYPES

| TYPE | ZENER BREAKDOWN VOLTAGE | DYNAMIC IMPEDANCES @ 25℃TA | | | | MAXIMUM REVERSE CURRENT @ MEASUREMENT VOLTAGE AND 25℃TA | | MAXIMUM FORWARD VOLTAGE @25℃TA @IF=1.0A |
|---|---|---|---|---|---|---|---|---|
| | $V_Z$ | $I_{ZT}$ | $Z_{ZT}$ | $I_{ZK}$ | $Z_{ZK}$ | $V_R$ | $I_R$ | $V_F$ |
| | V | mA | ohms | mA | ohms | V | μA | V |
| Z110 | 110 | 5 | 750 | 0.25 | 5000 | 80 | 0.5 | 1.0 |
| Z115 | 115 | 5 | 750 | 0.25 | 5000 | 85 | 0.5 | 1.0 |
| Z120 | 120 | 5 | 850 | 0.25 | 5000 | 90 | 0.5 | 1.0 |
| Z130 | 130 | 5 | 1000 | 0.25 | 5000 | 95 | 0.5 | 1.0 |
| Z140 | 140 | 5 | 1200 | 0.25 | 5000 | 105 | 0.5 | 1.0 |
| Z150 | 150 | 5 | 1300 | 0.25 | 5000 | 110 | 0.5 | 1.0 |
| Z160 | 160 | 5 | 1500 | 0.25 | 5000 | 120 | 0.5 | 1.0 |
| Z170 | 170 | 5 | 2200 | 0.25 | 5000 | 130 | 0.5 | 1.0 |
| Z180 | 180 | 5 | 2200 | 0.25 | 5000 | 140 | 0.5 | 1.0 |
| Z190 | 190 | 5 | 2500 | 0.25 | 5000 | 150 | 0.5 | 1.0 |
| Z200 | 200 | 5 | 2500 | 0.25 | 8000 | 165 | 0.5 | 1.0 |
| Z210 | 210 | 5 | 5000 | 0.25 | 9000 | 165 | 0.5 | 1.0 |
| Z220 | 220 | 5 | 5000 | 0.25 | 9000 | 170 | 0.5 | 1.0 |
| Z230 | 230 | 5 | 5000 | 0.25 | 9000 | 175 | 0.5 | 1.0 |
| Z240 | 240 | 5 | 5000 | 0.25 | 9000 | 180 | 0.5 | 1.0 |
| Z250 | 250 | 5 | 5000 | 0.25 | 9000 | 190 | 0.5 | 1.0 |
| Z260 | 260 | 5 | 5000 | 0.25 | 9000 | 195 | 0.5 | 1.0 |
| Z270 | 270 | 5 | 5000 | 0.25 | 9000 | 200 | 0.5 | 1.0 |
| Z280 | 280 | 5 | 5000 | 0.25 | 9000 | 210 | 0.5 | 1.0 |
| Z290 | 290 | 5 | 5000 | 0.25 | 9000 | 215 | 0.5 | 1.0 |
| Z300 | 300 | 5 | 5000 | 0.25 | 9000 | 220 | 0.5 | 1.0 |
| Z310 | 310 | 5 | 5000 | 0.25 | 9500 | 225 | 0.5 | 1.0 |
| Z320 | 320 | 5 | 5000 | 0.25 | 9500 | 233 | 0.5 | 1.0 |
| Z330 | 330 | 5 | 5000 | 0.25 | 9500 | 240 | 0.5 | 1.0 |

NOTE：STANDARD± 20%, SUFFIX "A" ± 10%,SUFFIX "B" ± 5%

**Testing the ignition system:**

Properly localizing a problem with the ignition is sometimes a bit confusing and the following below should of assistance:

1) Basic test, remove spark plugs. Fit them to the plug HT leads and ground them to the engine. Turn engine with starter and see if plugs spark. If any one spark plug does not spark swap it out. If the spark seems good on all 4 plugs, the ignition system is very likely in order. If spark is not present or very weak proceed with the following relevant tests.
2) Always check, inspect and clean all connector terminals as you follow the testing procedure. A poor connection or wire crimp can really chase you around. Repair or solder any wrapped joints made by PO. Check poor routing and insulation, especially pinched wires.
3) Remove the tank, left side cover, seat and signal generating unit (pickup) cover at bottom right of engine.
4) A good habit is to check the coils and igniter to see if they do not get very hot once the ignition is switched on, as this will most likely be the indication of a failed component of faulty connection or wire.
5) If the spark is weak but present, inspect the HT leads and plug caps. Suspect coil wires and spark plug caps, or voltage at the coils and thus the battery condition. It could also be due to coils with partially shorted windings, but do not jump on this cause immediately, and they may get hot.
6) Overheating coils with no spark may also be due to them getting a permanent full ground either from a faulty igniter or a grounded and pinched wire. Disconnect the coil plug connectors and proceed with tests.
7) Measure the battery voltage directly across the battery terminals. If lower than approximately 12.6V first charge battery fully before proceeding.
8) Next measure voltage at the coil connector plug, orange/white wire and the battery negative terminal. If lower than 12 Volt inspect the wiring for poor contacts and localize cause of voltage drop.
9) Again measure directly across the battery, but pull off the spark plug leads to prevent engine from firing and swing with starter. While starter is turning the voltage should stay at least above 11 Volt.  Also swing the starter with the headlights on to see that the voltage does not drop significantly at the coils while the starter plus headlights load the battery, which could prove that even if your battery is fully charged, it cannot give full or sufficient current and is on its way out or your starter may be drawing excess current (usually unlikely if starter is spinning at full speed) and pulling the battery down. If it drops much lower, charge battery fully or have it load tested and replaced if faulty.
10) If all is well up to here you can assume your battery and the positive feed to your coils are in good order.
11) To test a coil, disconnect igniter connector plug, fit a spark plug to a coil wire and ground, remove the 2 wire connector plug to the coil, run a temporary wire from the coil side Orange/White wire connected to the battery positive terminal and another from the Black/Yellow or Black/White and if briefly scratched to ground a spark should be seen. To make the spark more significant use a car points type condenser. (body of condenser to ground, wire of condenser to to Black/Yellow or Black/White, then scratch to ground a nice blue spark should be seen) If this works your coils are good.
12) With the coil plug connectors disconnected, use an ohm meter and measure the resistance

of both windings on each of the coils. Exact resistance measurements are not too important, but continuity of the windings close to the approximate resistance values given indicates that the coils are in good condition. It must be noted that it is possible for the coils to only show up a fault when at higher operating temperatures, but this does not happen frequently.

Ignition coil resistance:

Between the two HT plug caps of the same coil, secondary HT winding, approximately 30 – 35 K ohm

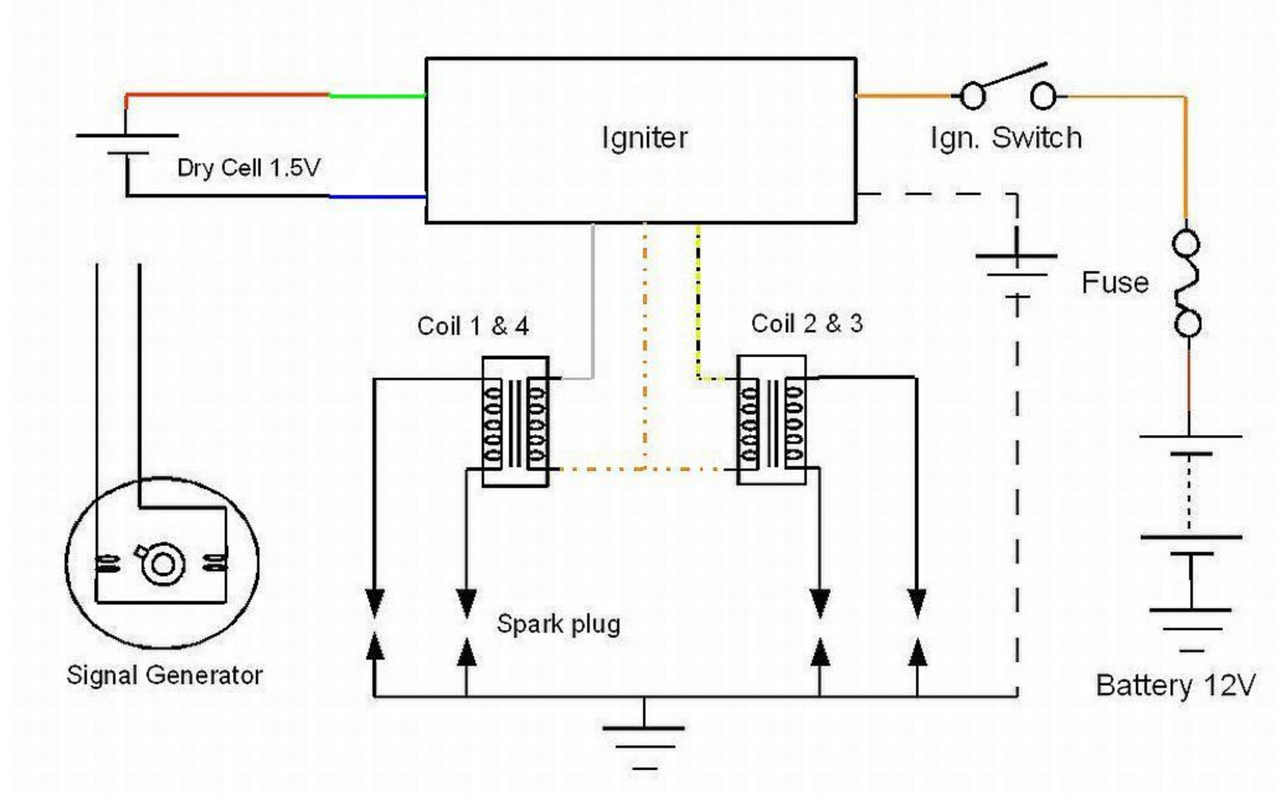
Between the orange/white and white on the first coil and orange/white and black/yellow on the second coil, primary winding, approximately 2-5 ohm. If this test is within limits you likely have two good coils.

13) Locate the igniter and disconnect the plug with the blue and green wires coming from the signal generator (pickup) at the right bottom of the engine. Test the resistance across these wires coming from the signal generator pickup coils; it should be approximately 250 – 360 ohm. You should not test any resistance between these two wires to ground. If this is in order you have proved the pickups and the wires to be good.
14) The little back box or igniter is now tested as follows. With the ignition on, kill switch on, test for 12 Volt DC between the orange/white and the black/white wires in the plug going into the igniter. This proves that it is getting the correct voltage.
15) Next test for 12 volt between the Orange/White wire and the Black/White wire going into the igniter, this proves whether your igniter is getting power.
16) The next step is to prove whether the igniter is powering your coils. Remove all 4 spark plugs and connect the HT lead caps to a spark plug #1, #2, #3 and #4 then ground the plugs and locate them to enable you to see the spark. Ensure all the connector plugs are back in, except the one with the green and blue wires from the signal generator.
17) To simulate the small voltage generated by the pickup coil, prepare an ordinary 1.5V dry cell with two wires red for positive and black for negative. Connect the negative black wire from the dry cell to the blue wire on the connector plug going into the igniter. Switch on the ignition and kill switch to power the igniter and briefly touch the red wire from the dry cell positive to the green wire connector going into the igniter. You should see a spark on plugs #1 and #4 when you touch the wire and on #2 and #3 when you remove the wire. If this works your igniter is in a working condition.
18) One other check that is often overlooked. Run the bike at night with all lights off in a dark area and check that no sparks are jumping from the HT leads to the frame or tank. If so they may need replacing.
19) At this stage if all tests have passed you MUST get a spark at all the plugs when everything is reconnected and the engine is turned with the starter.
20) If a spark that was previously missing has mysteriously appeared, have a very good look at your wiring and connectors, as something may be making intermittent contact and corrected itself temporary when you moved the wires.
21) If there is a spark, but the engine will not fire, it could be due to ignition timing, valve timing or fuel problems. Ignition timing and valve timing problems are more likely on a bike that has not run yet after being disassembled and more unlikely to be the cause if the bike was not taken apart and was running before.
22) A quick test with a few drops of fuel directly into the cylinders before replacing the spark plugs and then trying to start will prove it to either the fuel system or ignition system.
    1. If the engine then starts and runs for a few RPM's the ignition is correct and you need to look at the fuel and carburetor side.
    2. If the engine does not fire, but occasional gives one load pop through the carburetors or

even exhaust, it may be igniting when the valves are open; the valve timing may be a problem, cam chain or swapped wires from pickup – plugs firing at wrong time.

3. Other reasons could be extremely low compression, too tight valve clearances, thus not closing fully (usually unlikely on all cylinders at the same time, but plausible), carburetor faulty or dirty, fuel line, filter or petcock faulty. Filter can cause an airlock if not positioned properly to allow free gravity feed.
4. Then finally the ignition timing must be set properly. At less than 1500 RPM connect a timing light to #2 or # 3 spark plug and check that the timing marks line up for 2-3 on F, then move to #1 or #4 spark plug and check that marks line up for 1-4 on F. Check the advance by pushing revs up to 2350 RPM and the timing marks should both line up on the 45 mark behind the signal generator mounting plate through the sight hole at the top. The three mounting screws can be loosened and the mounting plate can be moved slightly in the elongated holes to meet this.

**Test connection for igniter:**



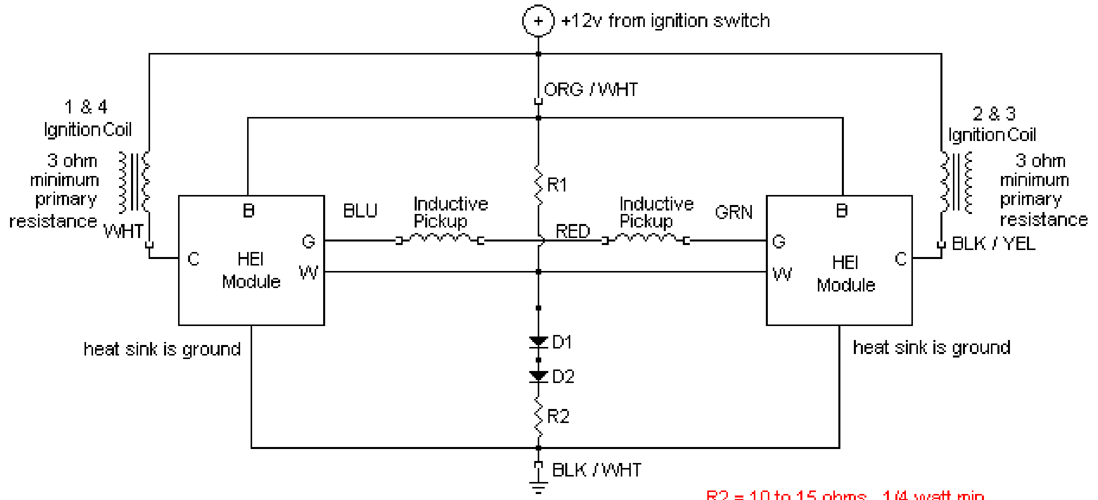

If you start fault finding here, it would be a very good idea to have a copy of your bikes wiring diagram at hand and study the ignition part.
This was drawn up to a back door available if I have any future problems and anyone making use of it and finding different or better methods or components or any correction, please send me a PM via the GSR forum. I will gladly incorporate it.
I would also suggest that you compare your Igniter component and layout with the given schematic and PCB layout before attempting to build a complete new PCB.
So please note that I cannot be held liable if anything here does not work as it should.
If this seems a bit daunting to anyone, then the other option is to purchase an after market unit, such as Dyna and others.

Andre aka "Matchless"
GSR Forum 2008/11/20 updated 2010/05/19

# Addendum A:

## Using two Chevy HEI modules to build a replacement igniter for your GS1000GT

**GM HEI ignition module** **Preliminary test circuit** **for 1980 GS1000G**

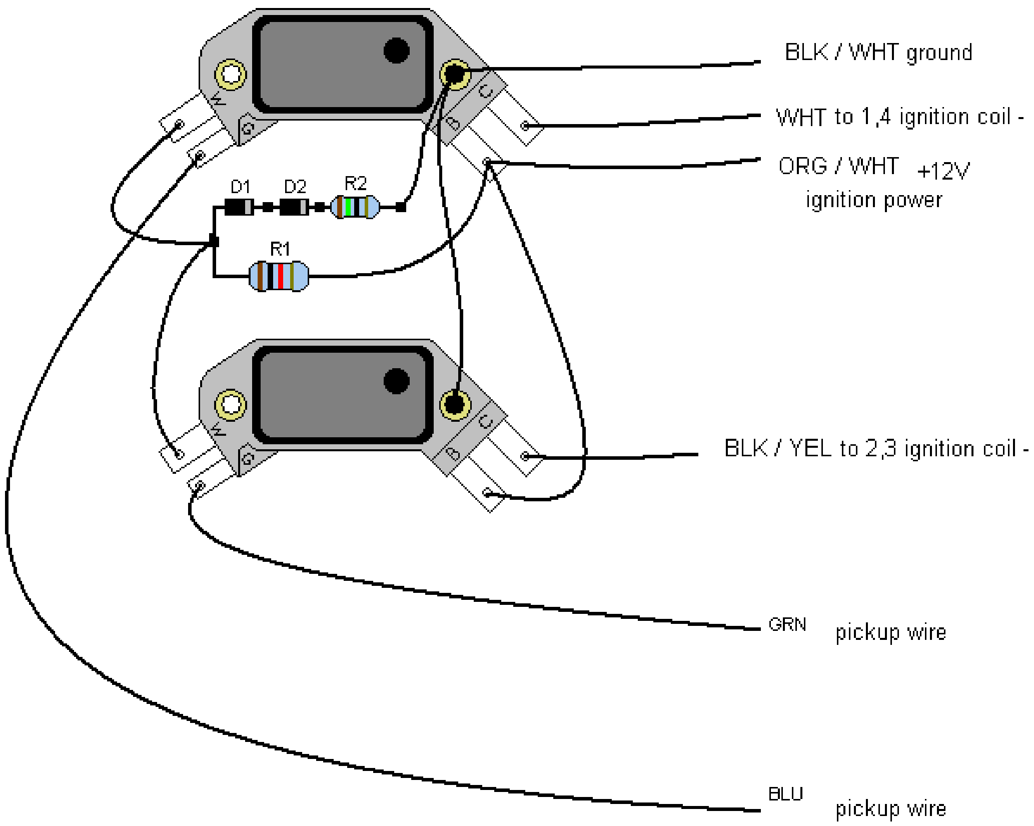



D1 , D2 = 1N4002 or 1N4003 or 1N4004 or 1N4005, 1 Amp diode

R2 = 10 to 15 ohms, 1/4 watt min.
R2 was added to increase the pickup bias into the range between the coil on and coil off thresholds.

R1 = 1K Ohm, 1 Watt resistor

GM HEI module = Wells model DR100 or equivalent




You need tw of these  Chevy HEI modules usually inside the distributor. Wire them up as above, fix to a good heatsink, such as a heavy piece of alluminium and use the heat conducting paste supplied with the modules.

All credit goes to Lou on this one.