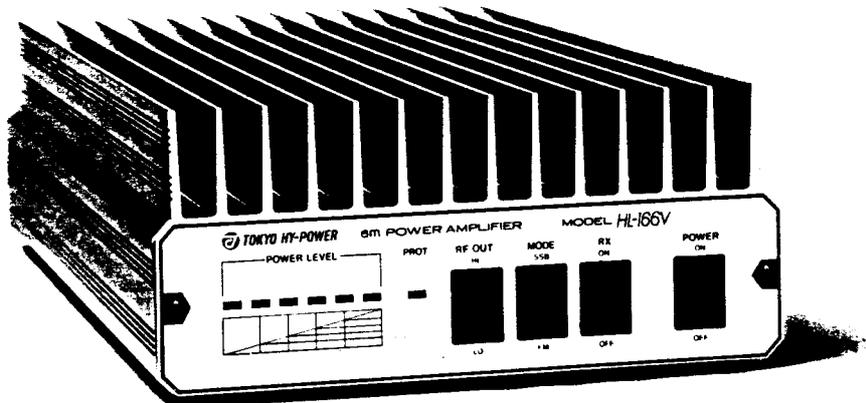


\* I N S T R U C T I O N M A N U A L \*

50MHz Band All Mode Power Amplifier

Model HL-166V



Tokyo Hy-Power Labs., Inc.

HL-166V is a high power linear amplifier designed for 50MHz band all mode operation. It provides a maximum output power of 160W when driven by any 3W, and /or 10W radio.

Using the built-in low noise JFET receive pre-amp, the HL-166V enables you to enjoy a more comfortable VHF DX QSO.

## FEATURES

\*Automatic RF Input select:3W/10W

You can operate the amp with either 3W or 10W output transceivers, as the amp automatically selects the incoming drive level.

\*LED Power Level Indicator

You can monitor the output power level at all times. The output power is detected with the built in precision microstripline type directional coupler, and then fed to monolithic IC LED driver.

\*Protection Circuit

When the connector at the RF output side is open or shorted, or when the supply voltage gets over the rating, protection circuits will operate to prevent the power amplifier from reaching full output and thus prevents the expensive RF power transistors from being damaged.

\*All Mode Compatibility(SSB/FM/CW)

In the SSB mode, the time constant of the COX(automatic send receive switch) is set to be approximately one second. Consequently, the relay rarely chatters during conversation, and smooth SSB operation is the result.

\*Remote Send-Receive Control

Ⓐ "+DC or SHORT" remote control lead wires are incorporated.

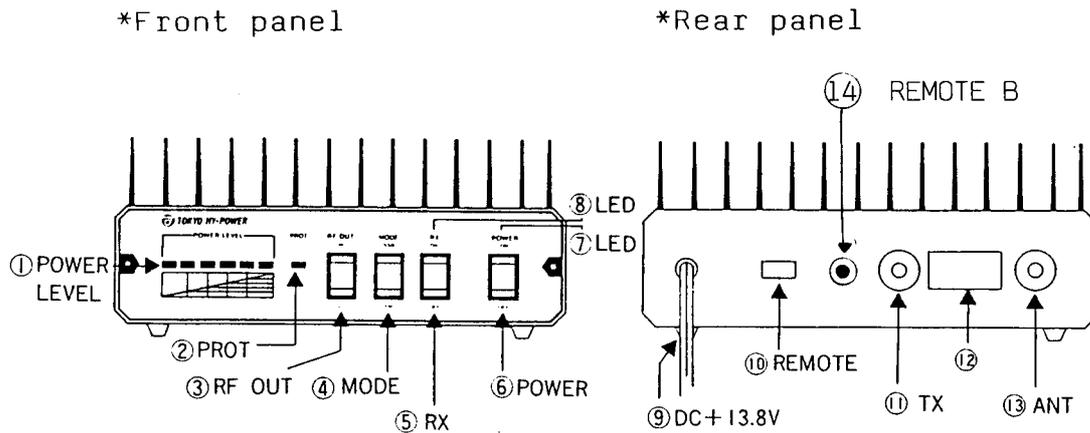
This enables a smooth and instant changeover especially on SSB mode and CW mode when two leads are properly wired to the remote control terminals of the transceiver.

Ⓑ Another terminal is installed on the rear panel to control other accessories.

## SPECIFICATIONS

|                        |   |
|------------------------|---|
| Frequency              | : 50MHz Band  |
| Mode                   | : FM/SSB/CW/(AM)  |
| DC Power               | : DC 13.8V(negative ground)   |
| Power Consumption      | : 25A (max)   |
| Output Power           | : HI = 160W<br>LO = 70 - 80W(AM: HI 80W, LO 40W)  |
| RF Input Power         | : 3W/10W, Automatic Select(AM: 3W max)  |
| Input/Output Impedance | : 50 ohm  |
| Input/Output Connector | : SO-239  |
| Accessory Circuit      | : COX(Carrier Operated T/R switch),<br>Remote control terminal(A , B two<br>systems), LED power level indicator,<br>Mode select switch, Output power level<br>select(HI/LO), Driving power auto-select,<br>select, Load open/short protection,<br>Reverse DC power polarity protection,<br>DC power overvoltage protection,<br>Remote controller terminal, JFET low<br>noise RX pre-amp Gain 14db(2SK152) |
| Semiconductors         | : RF Power Transistor x 3, IC x 2,<br>FET x 1, Transistor x 15,<br>Diode x 36, LED x 7  |
| Accessories            | : Coaxial jumper cable(M-M)<br>Ⓐ Remote terminal plug code x 1<br>Ⓑ Remote terminal plug x 1,<br>Connector with vinyl coated wires for<br>remote operation, Fuse x 2,<br>Mobile mounting bracket x 1  |
| Dimensions             | : 183(W) x 78(H) x 263(D) mm  |
| Weight                 | : 2.60 Kg (approx.), or 5.7 lbs.  |

## EXPLANATION OF FEATURES



(Figure 1)

- ① Power Level(Output power level indicator)  
Indicates output power level with 6 LEDs. With all of them lighting, it indicates 160W output.
- ② PROT.(Protection pilot lamp)  
When output of the amplifier is open or shorted or DC power voltage is more than 15V, DC power is disconnected automatically to protect the power transistors.  
At this time, this lamp lights to indicate the amplifier is off. Also this protection may function when SWR on the antenna is extremely high.
- ③ RF OUT(Output power level select switch)  
Select either high or low output level.  
At "HI", full power is delivered and at "LO", approximately half of the full output is available.
- ④ MODE(FM/SSB mode select)  
When changing from TX(send) to RX(receive) in the "SSB" mode, relay change-over is made with a delay of approximately one second. This change is made instantly at "FM".
- ⑤ RX(RX receive pre-amp switch)  
In the "ON" position, the received signal is amplified by a low noise GaAs FET device.
- ⑥ POWER(DC power switch)  
In the off position, the amp is in the "THRU" state.  
The transmitted and received signals will bypass the active internal part of the HL-180V.
- ⑦ ON pilot lamp  
Lights when DC power is supplied to TX amp and power switch is "ON".
- ⑧ pilot lamp  
Lights when ⑤ RX switch is turned on, even if DC power switch is off. The pre-amp may be used even when the power amplifier is off.

⑨ DC 13.8V  
DC power leads. Red for positive, black for negative.  
Fuse holder is built in inside of the case.

⑩ REMOTE(External remote control terminal)

Connect the connector with vinyl coated wires between Remote Control Terminal and "STAND BY" terminal (remote control) at the transceiver, and then HL-180V can be controlled remotely by the transceiver.  
(See item 2 of preparation before operation)

⑪ TX(RX input connector)  
Connects a coaxial jumper cable from ANT connector of transceiver.

⑫ Name Plate  
Layout of coaxial connectors etc. is illustrated.

⑬ ANT(output connector)  
connect a coaxial cable to antenna.

⑭ REMOTE B  
Spare terminal for controlling another accessories.  
When transmitting, this terminal is connected to the ground.

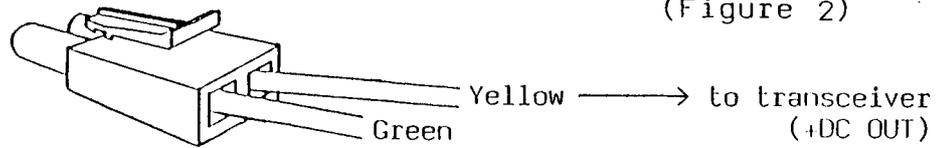
#### PREPARATION BEFORE OPERATION

1. Connect cables as required according to the installation on page 6.
2. Connect vinyl coated wires of plug for remote operation to "stand-by" terminal on transceiver.

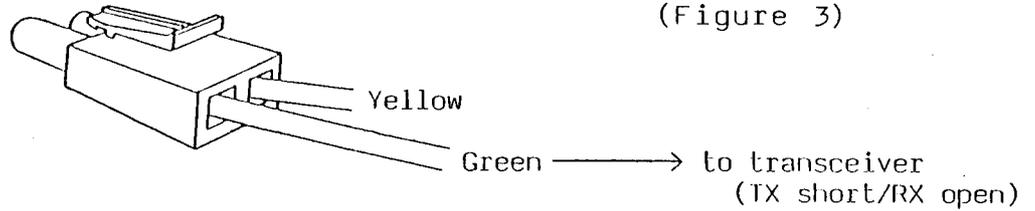
| Colour on vinyl wire | Designation     | Connecting point at the transceiver   |
|----------------------|-----------------|---|
| Yellow               | +DC             | Terminal or circuitry which comes to DC +3 - 9V on transmission at the transceiver.                 |
| Green                | SHORT<br>- OPEN | Terminal or circuitry which is made short on transmission and open on reception at the transceiver. |

**\*Connection\***

a) +DC

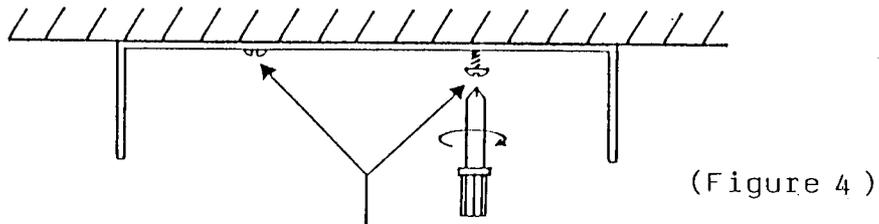


b) SHORT-OPEN



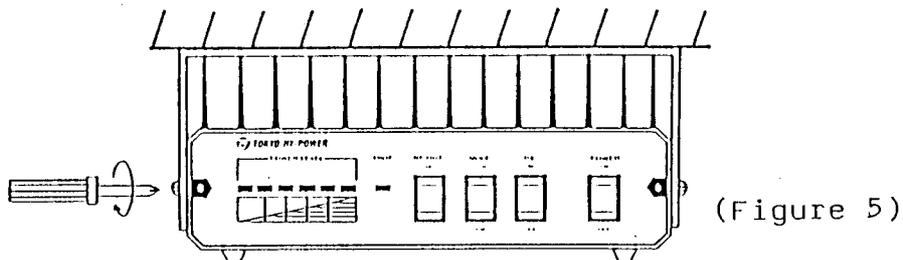
3. For setting the amp under the dash board panel of automobile with an attached mobile mounting bracket, please refer to Figure 4 and 5

① Set the bracket to the dash board panel.



Put together two points with screw  
(screws are not accessories)

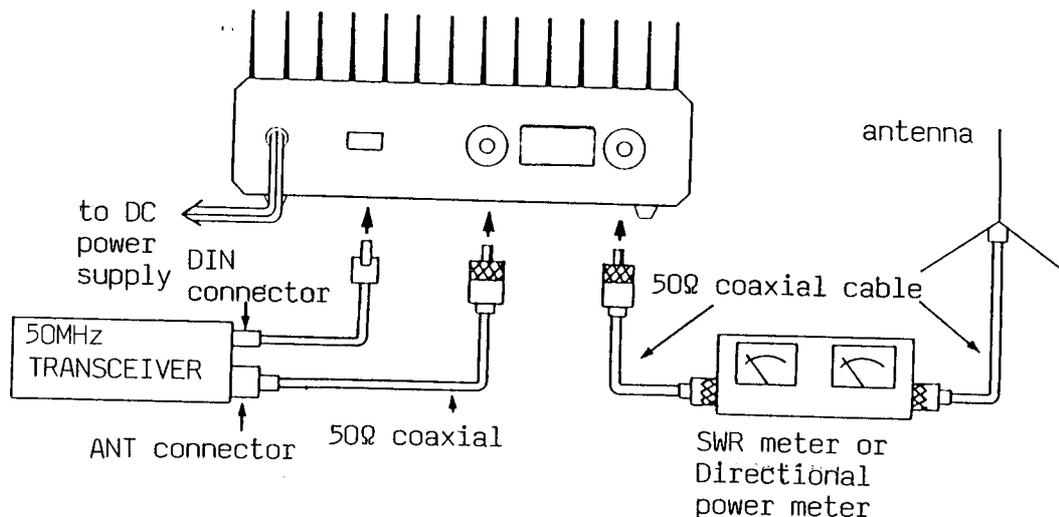
② Set the device.



Tighten the amp with spinning bolts on both sides at the suitable position on front and rear direction. And setting will be finished.

## INSTALLATION

(Figure 6)



## OPERATION

1. Before operation, keep ⑥ POWER switch and ⑤ RX AMP switch off.
2. Turn the power switch of transceiver on and receive.
3. Signals to and from the antenna will bypass the internal part of the device. In that case, you can hear signals on the transceiver.
4. Turn ⑥ POWER switch on, and ⑦ POWER ON pilot lamp lights.
5. Select ④ MODE switch to the operating mode. when you operate by remote control, this switch must be always set to "FM", not to the actual mode.
6. By making the transceiver to "transmit", the HL-166V will provide "transmitting power amplification" and a high power signal is emitted from amplifier. At the same time, ① power level indicator lamp lights to indicate that the amp is transmitting or on air.
7. Protection circuit for SHORT or OPEN state at output side and overvoltage of DC power is included. When the connector at output side is open or shorted, and DC power voltage is more than 15V, DC power disconnected automatically, and ② PROT pilot lamp lights. To release the protection, turn ⑥ POWER switch and ⑤ RX AMP switch off. Please start from the beginning after the trouble is cleared.

8. In case the receiving signals are weak, noisy and hard to copy, turn ⑤ RX AMP switch on. You can hear signals clearly with the low noise pre-amplifier, and ⑧ RX pilot lamp lights. If you use Rx preamp where the very strong signal exists nearby, the pre-amplifier FET can be destroyed.
9. If lower output power is needed or if the DC power supply cannot afford the full power output of the amp, switch to "LO" output.
10. In case of a local QSO when the amp is not needed, just set ⑥ POWER and ⑤ RX AMP switches off.
11. In case of operating RX preamp only, set ⑤ RX AMP switch on with ⑥ POWER switch off.

### CAUTION

Be careful of the following items which may become the cause of troubles.

1. Set the amp in a well ventilated place.  
DO NOT cover ventilation holes of the amp.
2. In the same way, DO NOT operate the amp at places where it is exposed to the direct heat of the sun, or near a heater.
3. Be sure to check the "Matching" or VSWR of antenna before operation. Measure the SWR value by using an SWR meter according to the installation on page 6. If SWR value is too high, adjust your antenna to obtain a lower SWR value. You should obtain an SWR of less than 1.3:1 or hopefully as low as 1.0:1.
4. Choose a good antenna which withstands high power, or the SWR will be degraded within a few minutes after starting transmission, due to the heating of the antenna. In some cases, the antenna may be damaged or destroyed. Also, the RF power transistors may be killed.
5. Be careful that the DC power voltage is kept no higher than 13.8V(12-14V). Although supplying about 15V will not kill the amp immediately, it is dangerous to the transistors if such other undesirable conditions occur, as antenna mismatch or over drive, simultaneously.
6. In case that AC to DC converter(Voltage stabilized DC power supply) is used at home station, some DC power supplies produce abnormally high output voltage due to high frequency RF intrusion, which will kill the RF power transistor of the amp. USE OVP(Over Voltage Protected) SUPPLY ONLY! Use a DC power supply fully protected against high frequency intrusion, and capable of supplying high current.
7. DO NOT open and touch the internal part of the amp.  
The device is fully adjusted at the factory.

## TROUBLESHOOTING

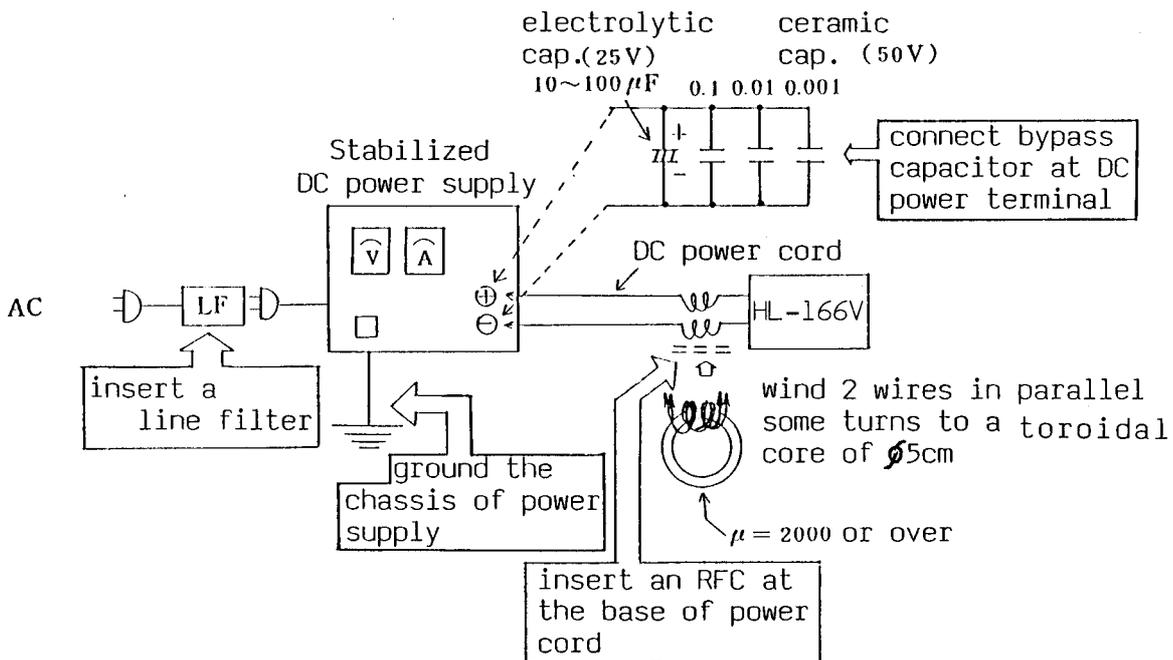
The following symptoms are minor troubles, which can be solved rather easily.

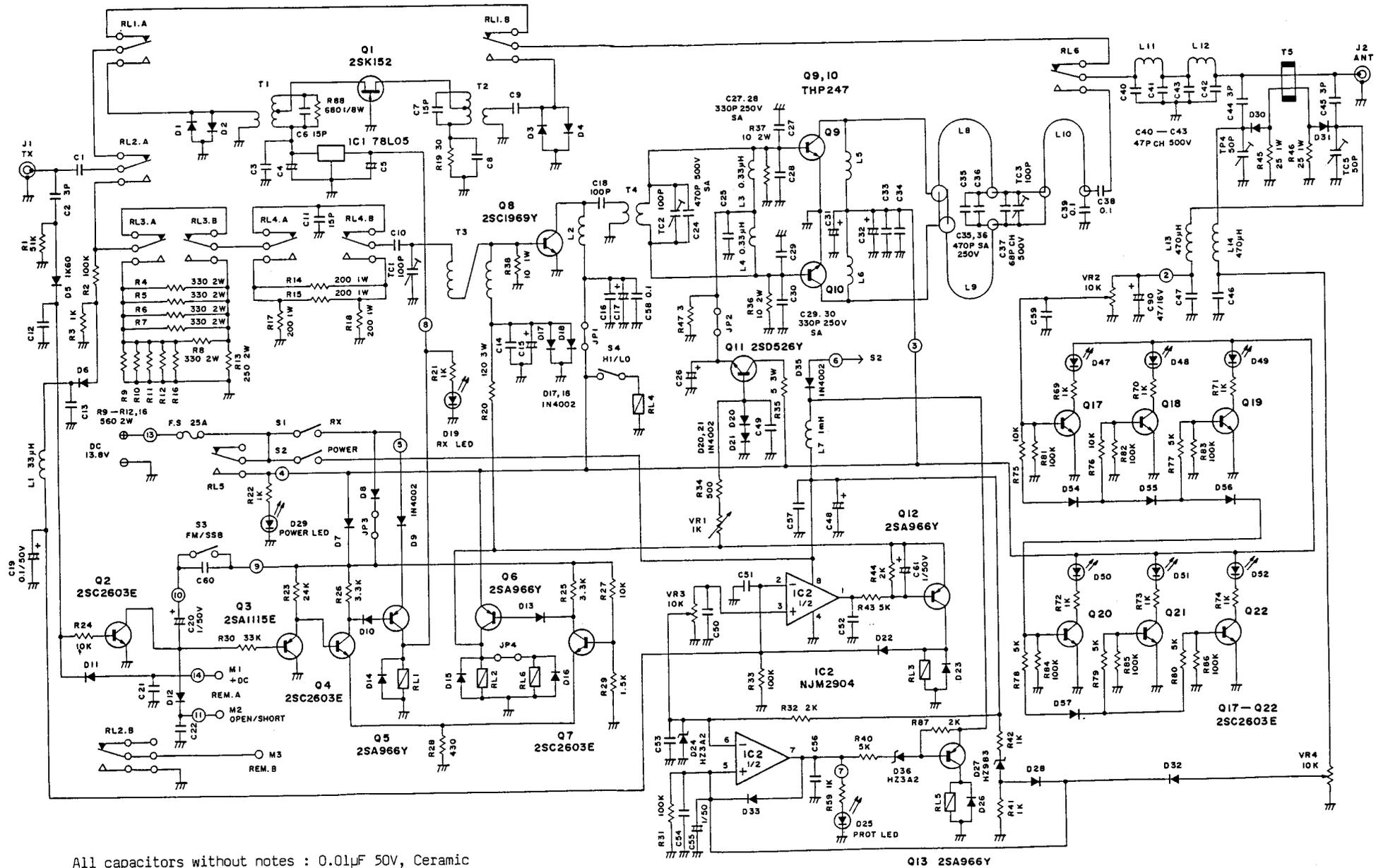
Please check each cause of trouble carefully.

| Symptoms                                   | Cause   | Treatment  |
|--|---|--|
| DC power can not be turned on.             | <ol style="list-style-type: none"> <li>1. DC power cord is not connected.</li> <li>2. Mis-wiring of the polarity(+/-).</li> <li>3. Fuse is not set, or blown.</li> <li>4. DC power voltage is more than 15V, and PROT(protection circuit) works.</li> </ol> | <ol style="list-style-type: none"> <li>1. Connect DC power cord surely.</li> <li>2. Wire correctly.</li> <li>3. Set two fuses correctly.</li> <li>4. Please refer to "operation"-7</li> </ol>        |
| Fuse blown repeatedly.                     | <ol style="list-style-type: none"> <li>1. Only one of two fuses has been set.</li> <li>2. One fuse is not proper (less than 25A).</li> </ol>  | <ol style="list-style-type: none"> <li>1. 2. Set a 25A fuses.</li> </ol>   |
| Can not transmit and receive.              | <ol style="list-style-type: none"> <li>1. Trouble of each coaxial jumper cable.</li> </ol>  | <ol style="list-style-type: none"> <li>1. Check each cable which is not connected or which has a trouble of short/open.</li> </ol>   |
| Output power is not amplified.             | <ol style="list-style-type: none"> <li>1. Connectors of input and output is connected reversely. (Relay chatters.)</li> <li>2. PROT(protection circuit) works and the amp is made into the locked state. (DC power is made into off.)</li> </ol>            | <ol style="list-style-type: none"> <li>1. Connect cables correctly.</li> <li>2. Remove the cause of PROT, and then release the protection. (Please refer to "OPERATION - 7".)</li> </ol>             |
| Output power is less than the rated level. | <ol style="list-style-type: none"> <li>1. ③ OUTPUT switch is set "LO".</li> <li>2. DC power voltage is less than the rated level. Driving power from the transceiver is less than the rated level (3W or 10W).</li> </ol>                                   | <ol style="list-style-type: none"> <li>1. Set ③ to "HI".</li> <li>2. Make the DC power voltage to the correct level.</li> <li>3. Readjust the transceiver or use it under that condition.</li> </ol> |

| Symptoms  | Cause  | Treatment  |
|---|--|--|
| Output voltage of the stabilized DC Power Supply decreases while transmitting.    | 1. Insufficient of current capacity and DC power protection is operated. | 1. Replace the DC Power Supply to a larger capacity (Ampere), or operate with "LO" output.   |
| Output voltage of the stabilized DC Power Supply is increased while transmitting. | 1. Mis-operation of DC power control circuit due to the RF intrusion.    | 1. Make a protection for DC power line referring to the following "HOW TO MAKE A PROTECTION AGAINST THE RF INTRUSION TO A STABILIZED DC POWER SUPPLY". |

HOW TO MAKE A PROTECTION AGAINST THE RF INTRUSION  
TO A STABILIZED DC POWER SUPPLY





All capacitors without notes : 0.01 $\mu$ F 50V, Ceramic  
 All capacitors without designated voltage proof : 50V, Ceramic  
 All electrolytic capacitors without notes : 10 $\mu$ F 25V  
 All diode without notes : 1S2076  
 All resistors without notes : 1/4W, Carbon

\* The diagram is subject to change without notice.

**CIRCUIT DIAGRAM HL-166V**  
**TOKYO HY-POWER**