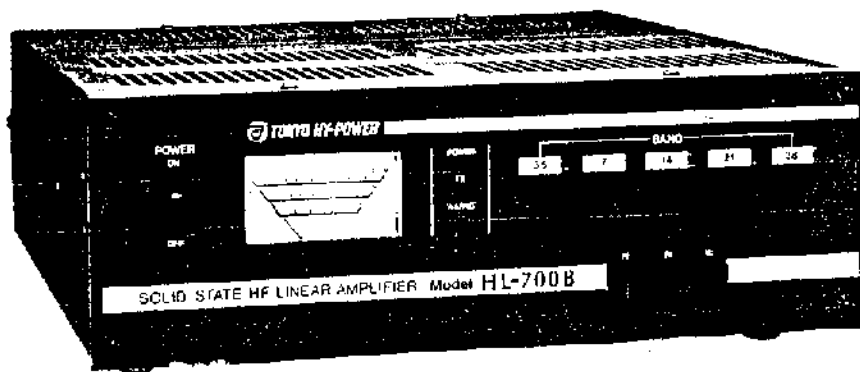


Instruction Manual

Model: HL-700B

Solidstate HF Band Linear Amplifier



TOKYO HY-POWER

Model HL - 700B
Solid - state HF - band Linear Amplifier
Operating Instructions

In order to make use of the capacity of this unit for a long time, read this booklet carefully before starting operation.

The model HL - 700B of a solid - state all HF bands linear amplifier is designed for use of senior amateurs utilizing the advantage of semi - conductors which have long life with little aging deterioration in amplification elements. In addition, it is operable and reliable with advanced techniques adopted in many parts of circuits besides forced - air cooling by the DC - DC motor fan, and the built - in cooling unit materializes high - power and high - compactness of this unit.

Regarding a regulated DC power supply unit and a DC - DC converter to be used together with this unit, it is recommended to use the HP - 700 (AC 100 V) for the former and the HDC - 70 (DC 24 V) for the latter.

Contents

Main Features	[3]
Specifications	[4]
Outline of Main Sections	[5]
1. Output lowpass filter	
2. SWR unit	
3. Final power amp. unit	
4. Driver amp. unit	
5. Semi - conductor cooling unit	
6. Control unit	
Switches and Controls	[7]
1. Front panel	
2. Rear panel	
3. Internal controls	
Before Operation	[10]
1. Power source	
2. Antenna	
3. Transceiver	

4. Setting place	
5. Remote controller	
6. Mobile operation	
Preparation	[13]
1. Cable connection	
2. Measurement of antenna VSWR	
3. hookpu	
Operation	[15]
1. Preparatory operation	
2. Transmitting operation	
3. Non – running mode	
Precautions	[17]
1. Power source	
2. Antenna	
3. Setting place	
4. Transceiver	
5. Internal parts	
Troubleshooting	[18]
Optional Accessories	[19]
Circuit Diagram	

Main Features

1. Compact design suitable for mobile use

Combination of a small - sized heat sink and a powerful DC line flow fan materializes compactness and lightweight of this unit.

2. All solid - state circuits

All solid - state circuits which are mainly composed of semi - conductors need no warm - up, which enables the set to start just after the power is turned on. Since it is a wide - band amplifier, it need not tune at last stage.

3. Built - in 10 W / 100 W input switching circuit

Switchover of input wattage changes configuration of the amplifier circuit. Namely, when the source voltage is 100 W, four amplifier units are combined in one circuit to output 600 W (PEP), while, with 10 W input, one amplifier unit operates as a drive amplifier and the other four amplifier units functions as the last stage amplifier to output 400 W. This circuit design affords output as required. (At shipment from factory, it is set to 100 W input.)

4. Multi - protection system

By originally developed advanced technique, this unit has six kinds of protection systems for high reliability with little trouble. (See page 3.)

5. Multi power meter

By switching the selector switch on the front panel, Pf (transmission power), Pr (reflected wave power), and Vc (source line voltage) can be monitored to operate this unit in the proper condition. In combination of the high performance directional coupler, the power meter reads very accurately.

6. Built - in lowpass filter

Lowpass filters built in the 3.5, 7, 14, 21 and 28 MHz amateur bands prevent generation of TVI, etc.

7. Two kinds of time lags switchable

A proper time lag can be selected in accordance with the operating mode, such as momentary for AM and FM, or one second for SSB (CW).

Specifications

- 1. Frequency : 3.5, 7, 14, 21, 28 MHz amateur bands
- 2. Receivable waveforms : SSB, CW, AM, FM
- 3. Input : 100 W/10 W selectable
- 4. Output :

	input 10 W	input 100 W
SSB	600 W (PEP)	400 W
CW, FM	500 W	400 W
AM	300 - 500 W	250 W

- 5. Undesired radiation : -40 dB or less
- 6. Third cross modulation distortion : -30 dB or less
- 7. Input/output impedance : 50 ohms
- 8. Input/output connector : M-type
- 9. Cooling system : Forced - air cooling system
- 10. Power source : DC 13.8 V
- 11. Power consumption : 70 A (at 500 W output)
- 12. Accessories :

Spare fuse : 20 A x 4 pcs. 2 A x 1 pc.

Power cable : 8SQ x 2 (black and red each)

Remote plug : 8-pin DIN plug x 1 pc

RF cable : M-M 5D2V (60 cm) x 1

- 13. Dimensions and Weight : 300 (W) x 100 (H) x 342 (D) mm, 8 kg approx.

Outline of Main Sections

1. Lowpass filter in output section

Lowpass filters to attenuate higher harmonic which causes to generate TVI etc. are built in the 3.5, 7, 14, 21 and 28 MHz amateur bands.

2. SWR unit

The SWR unit individually detects traveling wave and reflected wave, and operates the P_f (transmission power) meter with traveling wave detection signal as well as to operate the P_r (reflected wave power) meter with reflected wave detection signal. As a result the protection circuit if the occasion arrises. In combination with the high performance directional coupler which has an accurate and flat characteristic all over the wide frequency band, this unit makes the power meter read accurately and stably in every function for every band.

3. Final stage power amp unit

Thanks to the high capacity RF power transistor THP – 120 which is developed in cooperation with a domestic semi – conductor manufacturer, this unit becomes a low distortion power amplifier yielding high power of 600 W (PEP) by parallel arranged four wide – band push – pull amplifiers (400 W by three amplifiers in parallel connection). This arrangement is superb in the linearity and sound quality, so, you can particularly enjoy QSO on SSB.

4. Driver amp unit

When input is 10 W, one of the four PA units functions as a driver amplifier and the other three functions as the main amplifier to produce 400 W output. The rated specifications have the capacity enough to drive the final stage power amplifier. Accordingly, the whole unit has a superb frequency response with little difference in power gains in respective bands besides low VSWR.

5. Semi – conductors cooling unit

The cooling unit of this model is very smaller than that of any conventional model (one – fourth in volume, a half in weight). The light – weight and compactness are thanks to the design to adopt the forced – air cooling system by the DC line flow fan.

6. Control unit

(1) Carrier controller

The carrier control system automatically switches transmission and reception. By detecting the transmission output of the transceiver (or transmitter), this system operates the linear amplifier. When the transceiver is set to the reception mode, this

set also returns to the reception mode. Moreover, by the function of the control board, time lag in switching from transmission to reception and vice versa can be changed into one of two kinds according to the operating mode. (See page 6.)

When the remote control unit is used to operate transmission/reception switching by it, use the remote connector (see page 5) on the rear panel for the connection.

(2) antenna trouble protection system

When the SWR level becomes about 3 degrees, the power transistor falls into dangerous condition. At that time, the protection circuit starts to stop transmission.

(3) Overheat protection system

When the set is used in a place of extremely high temperature or under the direct sunlight, or the cooling unit is over-heated (over 80° C) by some trouble to stop operation of the fan motor, the thermosensor provided on the front of the cooling unit detects the abnormality and the protection circuit automatically functions to stop transmission in order to prevent the power transistor from thermal runaway.

(4) Band selector misset protection system

When the band selector is set to a higher band than the proper position, it is no trouble except the problem to contain many higher harmonic components. However, if it is set to a lower position than the proper setting for the frequency received, it causes overload of the output section of the last stage amplifier (to be shortcircuited). In such a case, the misset sensor detects the abnormal setting and starts the protection circuit to stop transmission for the purpose of prevention of the power transistor.

(5) Power supply misset protection system

Power ON/OFF operation is indirectly controlled by the power relay. Into the relay's coil are diodes inserted being arranged in series. When the power source is correctly connected, turning on the power switch starts the relay to supply the power, while, if the power source is incorrectly connected (in case of wrong polarity, etc.), current does not flow to the relay despite of the power switch turned on. As a result, the relay does not operate not to flow the current to the circuitry to secure the set.

(6) Power amp unbalance protection system

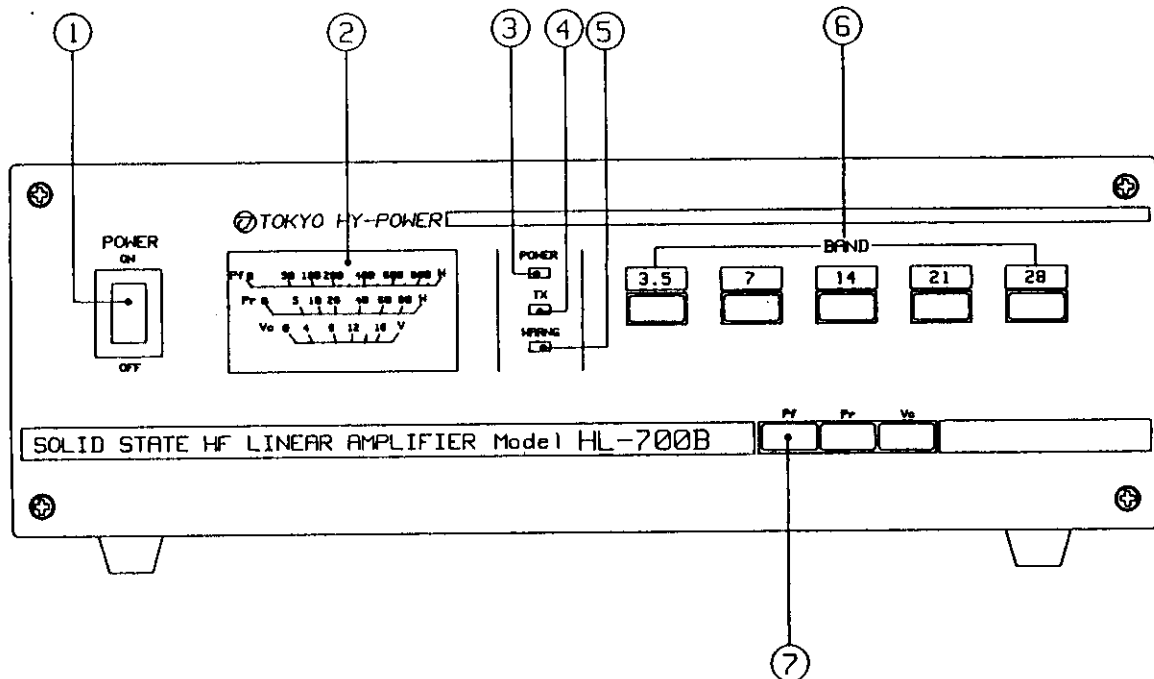
When a power amplifier is faulty because of some cause, operation of the output section is unbalanced and some component parts may also be defective. In order to avoid such a trouble, the unbalance sensor detects the abnormality and starts the protection circuit to stop transmission to check secondary troubles.

(7) Overvoltage protection system

When the power switch is turned on with power supply of 24 VDC, a zener diode checks power supply not to flow to the power relay. Accordingly, the power relay does not work and the power transistor is prevented from damage.

Switches and Controls

1. Front panel



(1) POWER

Power switch of a seesaw type. By pressing the upper part the power is turned on, while pressing the lower part turns off the power.

(2) Pf, Pr, Vc meter

By switching the meter selector switch (7) the meter indicates respective levels of Pf (transmission power), Pr (reflected wave power) and Vc (source line voltage).

(3) POWER LED

Lights during the power switch turned on.

(4) TX LED

To indicate transmission mode. Comes on in transmission and comes off in reception.

(5) WARNG (WARNING) LED

Lights when a protection circuit is in operation. In normal operation of the linear amp, it does not come on.

(6) BAND

Band selector switches which switch lowpass filters of the output section of the linear amp.

To receive new WARC band, operate switching as follows.

10 MHz band – BAND switch 14

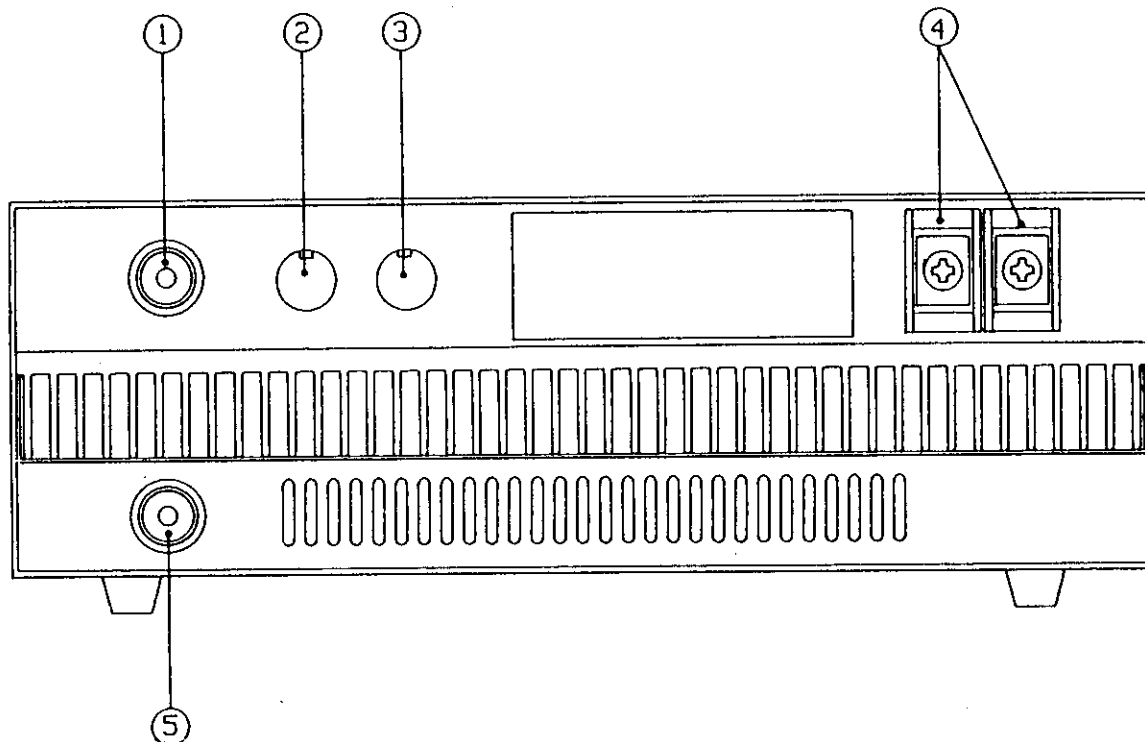
18 MHz band – BAND switch 21

24.5 MHz band – BAND switch 28

(7) Meter selector switches

Select a switch from among three of Pf, Pr and Vc to read level of transmission power (Pf), reflected wave power (Pr) and source line voltage (Vc) respectively.

2. Rear panel



(1) XCVR (IN)

Input connector to connect a coaxial cable to the transceiver's antenna connector.

(2) REMOTE

Connector for the remote control unit and ALC. Connect lead wire to the transceiver's standby terminal and ALC terminal with a provided plug.

(3) ACC

Connector to control the external power supply unit (HP – 700).

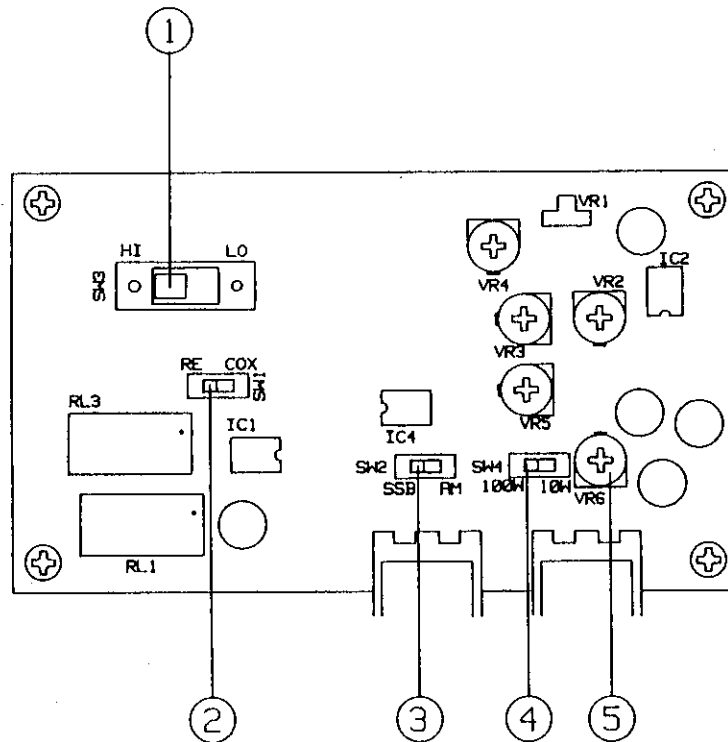
(4) DC 13.8 V (IN) Red (plus), Black (minus)

Connect the provided power cord.

(5) ANT (OUT)

Output connector to connect a coaxial cable to the antenna.

3. Internal controls



(1) SW3

Power selector switch.

In case of 10 W input (three power amps), either of two kinds of transmission powers (Lo - 250 W approx, Hi - 400 W approx.) is selectable.

When input is 100 W (four power amps), it is not switchable.

(2) SW1

To switch the transmission/reception systems of COX (carrier control) and RE (remote control).

(3) SW2

To select time lag for carrier control

For AM (FM) : momentary,

For SSB (CW) : 1 second approx.

When switching transmission and reception by the remote control unit, set to the AM side.

(4) SW4

RF input selector switch.

To change the amplifier circuit to four amps or three amps.

Configuration of four amps is for 100 W input, while three amps configuration is for 10 W input.

(5) VR6

Volume to set ALC, which can control transmission power. Set the transceiver to a mode (FM, CW, AM) to output carrier, and adjust it to produce the rated output.

Before Operation

1. Power source

The rated voltage for this set is 13.8 VDC. If it is under 12 V, it makes the set inoperable or inferior in the capacity even when the set is operable. On the other hand, 14 V or higher voltage may damage the set.

As well as the voltage, make sure of amperage of the power since the rated current capacity is 70 A or more.

As an external power supply unit for exclusive use of this set, the HP - 700 (regulated DC power supply unit for 100 VAC) is provided by the manufacturer. For users to use DC 24 V power, a DC - DC converter HDC - 70 will be provided optionally.

2. Antenna

Use an antenna durable for continuous operation with 600 W output. In addition, prepare an SWR meter to measure VSWR level.

3. Coaxial cable

To connect to the input/output connector, make sure to use a coaxial cable of 50 - ohm impedance (8D2V or equivalent). When any cable whose impedance is different (75 - ohm, 5C2V, etc.) from the rating, it is mismatched one not only bringing output loss but also causing unstable operation. When any cable other than the specified one is used in unavoidable circumstances, make sure to use an antenna coupler or impedance converter between the set and the cable in order to match the impedance.

4. Transceiver

Use a transceiver whose transmission power is 10 W or 100 W on HF SSB, CW, RTTY, FM and AM bands.

5. Setting place

This model is equipped with a forced - air cooling unit operated by a fan motor with air inlet for intake of air from the upper side of the unit and air outlet on the rear panel. If the set is placed with its upper and rear sides close to a wall or something, it disturbs air distribution and makes the unit down in cooling efficiency. This will cause not only overheat of the cooling unit but also trouble

of the system. Make sure to place the set keeping a space of at least 10 cm between the rear panel and wall, etc, as well as to place nothing on the top of the set. Also avoid a place of high temperature such as near a heater and under the direct sunlight. A place which is dusty or of high humidity causes a trouble, too.

6. Remote control unit, ALC

Transmission and reception are automatically switched by carrier control, however, if stable switching of SSB is required, switchover of transmission/reception can be controlled by interlocking the remote control unit and the transceiver. For this operation, connect the transceiver's accessory terminal which is shortcircuited in transmission and open in reception and the remote connector of this set.

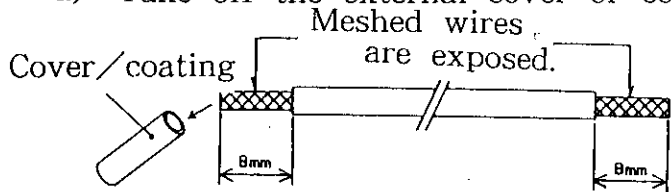
ALC controls transceiver's output level to be proper in order to transmit good radio wave in quality. Connect remote lead wire and ALC lead wire between the remote connector's terminal and the transceiver's respective terminals. For making the lead wires, refer to the steps (1) through (5) of the following item.

7. Mobile operation

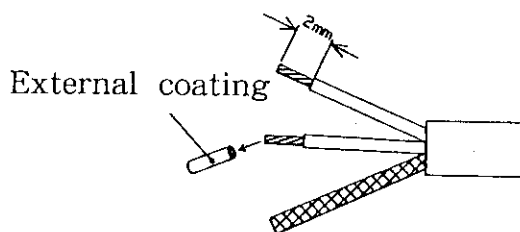
Since there is a big current flowing in transmission, make sure of the capacity of a battery and generator enough for operation. It is suggested not to turn off the engine key in order to charge the battery all the time even when the car is parking.

(1) Process the both ends of two-core lead wire.

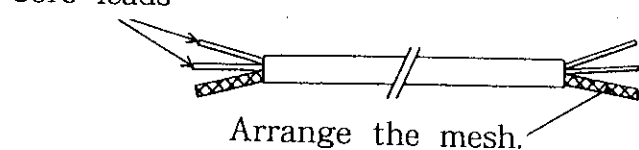
a) Take off the external cover or coating.



c) Expose each end of core lead.

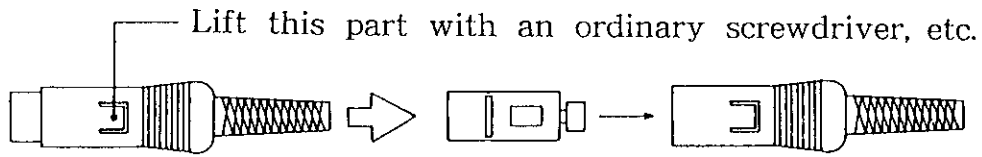


b) Pull core leads outwards.

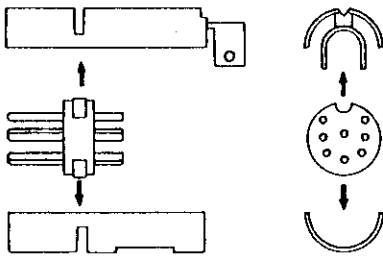


(2) Disassemble DIN plug.

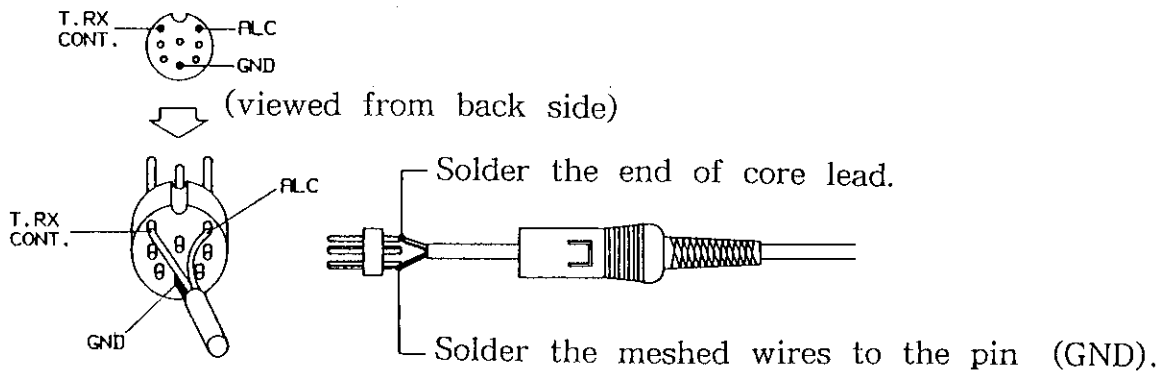
a) Draw the plastic case outwards.



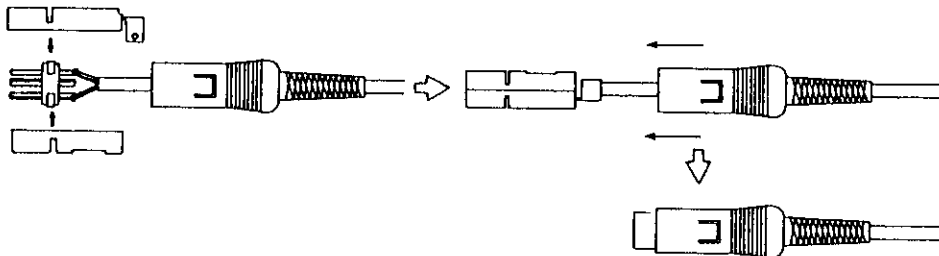
b) Remove the metallic parts.



(3) Solder the DIN plug.



(4) Reassemble the DIN plug.

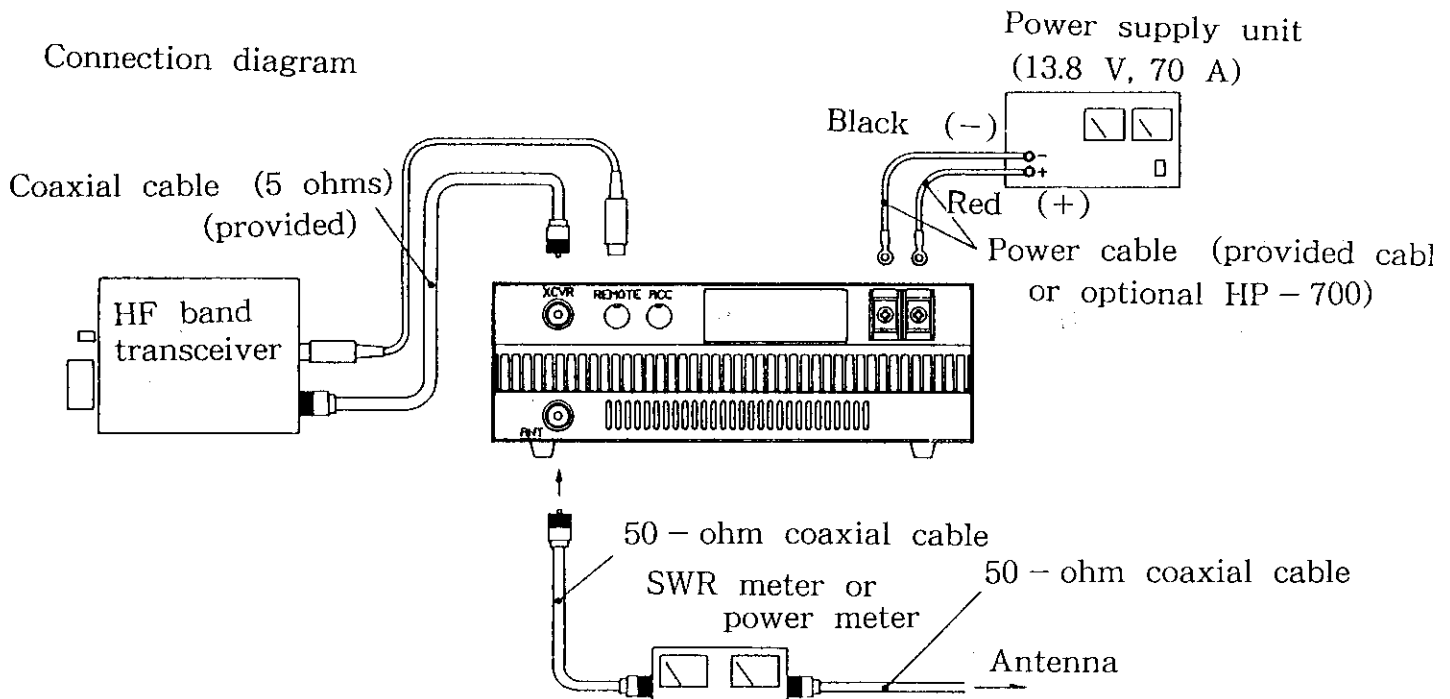


Preparation

1. Cable connection

Connect cables for hookup of the equipment referring to the connection diagram and descriptions in pages 4 through 8.

Connection diagram



2. Measurement of antenna VSWR

- (1) Connect the transceiver's power cord to the power terminal without mistake of polarity.
- (2) Set the transceiver for the frequency to be used, and send carrier (4 - 10 W) to the antenna in the transmission mode.
- (3) Measure the matching of the antenna with an SWR meter.
- (4) When the value of SWR is high (more than 1.5), effective power transmitted from the antenna drops and operation of the set may be unstable. In such a case, adjust the length of an antenna's element and insert a coupler between the antenna and the SWR meter to decrease the value.

3. Preparation before starting operation

Set all switches and controls of the front and rear panels to the following positions, and then connect the power cord to the power terminal.

- (1) POWER switch - OFF
- (2) Meter selector switch - Vc
- (3) Band selector switch - Band to be used
- (4) Mode selector switch (SW2 of the control board) - any of AM (FM) and SSB (CW) mode to use

(5) Input level selector switch (SW4)

10 W for a transceiver whose max. output is 10 W or under

100 W for a transceiver whose max. output is 10 – 100 W

(6) Output level selector switch (SW3)

Switching is available only when the switch is set to the 10 W position. HI position for 400 W, LO position for 250 W

(7) Control selector switch (SW1)

RE – for use of remote control

COX – for use of carrier control

(8) Connect the power cord to the power terminal.

(9) Confirm that the band selectors of the transceiver and HL – 700B are set to the same position (same frequency).

(10) Set the mode selector of the transceiver to CW, AM, TUNE to transmit carrier.

Operation

1. Preparatory operation

- (1) Turn on both the power switches of the transceiver and the linear amplifier, and the indicator lamp of the linear amp comes on.
- (2) Read the Vc meter and confirm that the pointer indicates 13.8 V.
- (3) Set the transceiver to the reception mode, and set the tuning dial to a vacant frequency not to make radio interference with other broadcastings.
- (4) Adjust the transceiver's output controls (carrier level control, power selector switch, etc.) to set the output without overdrive.
- (5) Set the transceiver to the transmission mode.

The TX indicator on the front panel of the linear amp lights to indicate the linear amp is in operation.

- (6) In the condition of the above step (5), read the SWR meter to confirm that SWR value is minimum. If it is higher than 1.5 (refer to the previous section of measurement of antenna VSWR), repeat the adjustment as described previously to decrease the SWR value.
- (7) Set the transceiver to a mode (FM, CW, AM) to be able to transmit carrier, and adjust the ALC volume control of the linear amp to obtain the rated output.

2. Transmitting operation

- (1) Set the transmitter's mode selector to a mode to be used.
- (2) Confirm that the linear amp's mode selector switch is set to the same position as that of the transceiver.
- (3) Set the transceiver to the transmission mode and operate in practice.
- (4) In transmitting operation, observe shake of the power meter's pointer and adjust the mic gain and the carrier level by the transceiver's controls.
- (5) In operation with coaxial cables disconnected or shortcircuited, or, when the antenna's SWR value is extremely high, the antenna trouble protection system functions to stop transmission to protect the final stage power transistor from damage. In such a case, turn off the power switch of the linear amp once and then turn it on again. Since this operation resets the protection system, continue the operation after removing the cause of the trouble.
- (6) In transmitting, observe the Pf, Pr and Vc meters alternately to check the operation in the normal condition or not.
- (7) When the ambient temperature is extremely high, if the equipment is operated

for a considerably long time, it causes overheat of the semiconductors cooling unit built in the linear amp and damage of the power transistors by thermal runaway. To prevent the units from such damages, the thermosensor set on the front of the cooling unit detects the abnormal condition, and makes the overheat protection system start to stop transmission. To proceed to operate the set after a while, reset the protection system referring to the previous item (5) and wait with the power switch turned on until the temperature of the cooling unit drops.

3. Non – running mode

When operation is only for transmitting transceiver's output, leave the coaxial cables connected as they were and turn off the power switch of the linear amp. In this condition, transmission output and received signal pass through the circuits.

Precautions

1. Power source

(1) As the rated voltage of this model is 13.8 V DC, do not connect this set to 100 V AC outlet.

(2) When the source voltage is over 14 V, it causes a trouble because of overvoltage. To avoid such a trouble, regulate the source voltage to be the rated value.

(3) Since a considerably big current flows in transmission, utilize a power source which is well-regulated and enough for the operation in capacity. Unregulated power source drops in the voltage and transmission power. For extending the power cord, use a number of thick cables of 8 scared or more by cutting them short and inserting into multiple points. Thin cable may cause dropping of voltage.

2. Antenna

(1) If the dielectric strength is short, it causes heating in transmission and change in SWR value as time elapses besides the protection system starts to stop transmission. Use an antenna durable for continuous transmission with 600 W output.

(2) Since this model is a high-gain and high-power amplifier, set the antenna apart from the linear amp and the transceiver with care of grounding in order to avoid unexpected oscillation by interrupted radio wave.

3. Setting place

(1) Don't place the equipment near a heater and under the direct sunlight as well as in other places where ambient temperature is extremely high. If it is placed, internally equipped semiconductor cooling unit is abnormally heated and troubles may occur.

(2) Keep a space between the rear panel of the linear amp and other things such as wall, etc., because air for cooling is taken in from the top and exhausted from the back. Disturbance of air distribution causes overheat and troubles of the set.

4. Transceiver

(1) When the drive power of this set exceeds 100 W, it may damage the power transistors by overdrive of them. Check the output before use.

(2) Adjust the transceiver's output to match the capacity of 100 W or less (for

4 amps) or 10 W or less (for 3 amps).

5. Internal parts

Do not disturb and modify any of internal parts since this unit is produced by high technique and shipped after strict quality check. Any modification may damage the precisely assembled internal parts.

Troubleshooting

Take note of the following symptoms, which are not troubles. Refer to the descriptions of the column of remedy, and check the trouble one more. If they are normal, but faulty symptoms still appear, consult the service section of the manufacturer.

Symptom	Cause	Remedy
No power supplied	Faulty connection of the power connector	Reconnect.
	Faulty connection of the power cord	check the connection.
	Wrong polarity	Reconnect.
	Broken fuse	replace.
No power	incorrect setting of controls (mic gain, carrier level, etc.)	Readjust controls by turning half a turn.
	Protection system functions (WARNG indicator lights)	turn off the power switch once and again turn on to reset the protection system.
	Faulty connection of input connector	Reconnect.
	No power supply to the transceiver or fault in it	check it.
Low power	dropping of voltage in transmission	check voltage
	low output level of transceiver	check output level and adjust to proper drive power.

Optional Accessories

To demonstrate the full capacity of the HL - 700B, use the following optional accessories.

1. HP - 700 regulated DC power supply unit

Input voltage : 100 VAC

Output voltage : 13.8 V

Output amperage : 70 A max.

2. HDC - 70 DC - DC converter

Input voltage : 24 VDC

Output voltage : 13.8 VDC

Output amperage : DC 70 A max.

Cooling system : forced - air cooling

Dimensions and weight : 272 (W) x 132 (H) x 368 (D) mm, 8 kg approx.

