

User Manual

# HL-1KFX

SOLID STATE 500W HF BAND LINEAR AMPLIFIER



 **TOKYO HY-POWER**

## ( 1 ) HL-1KFX /FEATURES

- HL-1KFX is a compact and light weight desktop HF linear amplifier with the maximum input power of 1.2kW. It covers all the amateur HF bands including new WARC bands. Due to its solid-state broad band design, most of HF frequency bands can also be covered as well as amateur bands.
- Four units of Motorola MOS-FET MRF150 are used in the parallel push-pull form. MRF150 is a reliable and high gain RF transistor that is best suited for a low distortion, SSB amplification service. Unlike the tube type amplifier, no tuning procedure is required ,even if the frequency band are changed. All you need is just to change the band switch.
- Duct structure is used for the cooling air flow in the power transistor heat sink. This heat sink together with the forced air cooling system makes the amplifier very compact and light weight.
- The drain current (  $I_d$  ) can be monitored all the time with the drain current meter. Also, drain voltage (  $V_d$  ), output power (PO) and reflected power (Pr) can be monitored with the multi-function meter, so that the each operating state can be always checked properly.
- HL-1KFX works with AC power of 100V to 230V by changing the AC input circuitry.
- The interlocked safety system has been built in the cabinet. When the upper cover is lifted, AC power will not be fed to the amplifier for the safety of the operator.

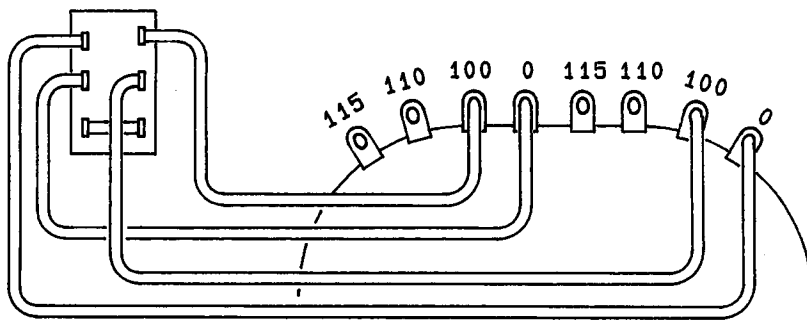
## ( 2 ) SPECIFICATIONS

Frequency	:	HF Band ( 1.9 ~ 28 MHz Band )
Mode	:	SSB , CW ( RTTY, SSTV , AM , FM )
RF Drive Power	:	50 – 100W ( 100W max. )
RF Output Power	:	500W max. ( For RTTY,SSTV, AM, FM, 250W max. )
FET Drain Voltage	:	53V ( with no RF drive )
FET Drain Current	:	25A max.
In/Out Impedance (Zin/out)	:	50 ohms ( unbalanced )
Final RF Power Transistor	:	MRF150 x 4 ( by Motorola )
Semiconductors Used	:	IC 8pcs., Tr. 3pcs., Diodes 26pcs., LED 9pcs., FET 4pcs.
Amp. Circuitry	:	Class AB Push-pull
AC Power	:	AC 100/110/115/200/220/230V ( switch selectable ) Single Phase 12A (100V) , or 6A (200V)max. (50/60Hz)
Panel Meter Scales	:	Output Power $P_f$ 500W , Reflected Power $P_r$ 50W Drain Voltage $V_d$ 53V, Drain Current $I_d$ 25A
In / Out connectors	:	Type SO – 239 ( or M – J )
Dimensions	:	232 x 142 x 350 mm ( WxHxD )
Weight	:	approx. 14 kgs.
Accessory Parts	:	AC Power Cord, Coaxial Jumper Cable, RCA Plug, Spare Fuse 8A (for 200V), 15A (for 100V) 2pcs. ea.
Cooling Method	:	Forced Air Cooling
AC Power Consumption	:	1,200W max. ( at TX )

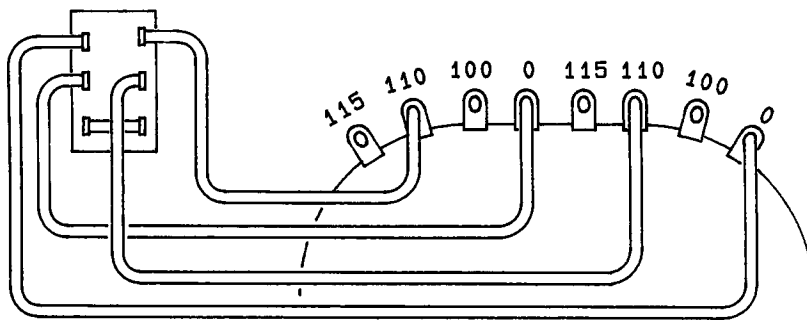
## ( 4 ) AC POWER

AC power section wiring has been made for AC115V/230V operation at time of shipment from the factory. Standard setting of AC voltage selection slide switch is at 115V position. (See ②AC , at “Explanations of Front and Rear Panels” section.) If your AC power to be used is 230V, set the ②AC slide switch at 230V position by sliding carefully the switch. If your AC power is other than 115V/230V, i.e. 110V/220V or 100V/200V , please re-wire the AC lines between power transformer and the AC select switch as below, following carefully the illustrations.

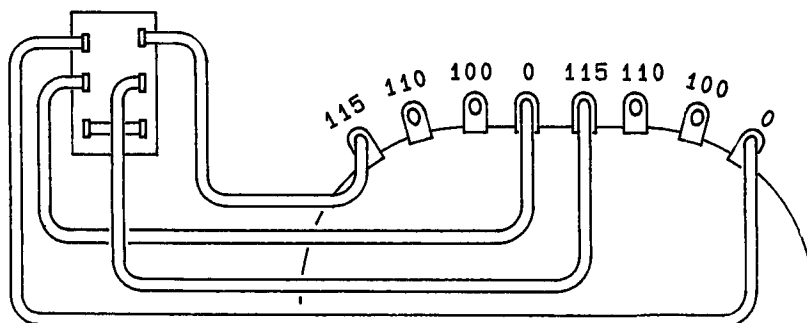
(A) 100V/200V



(B) 110V/220V

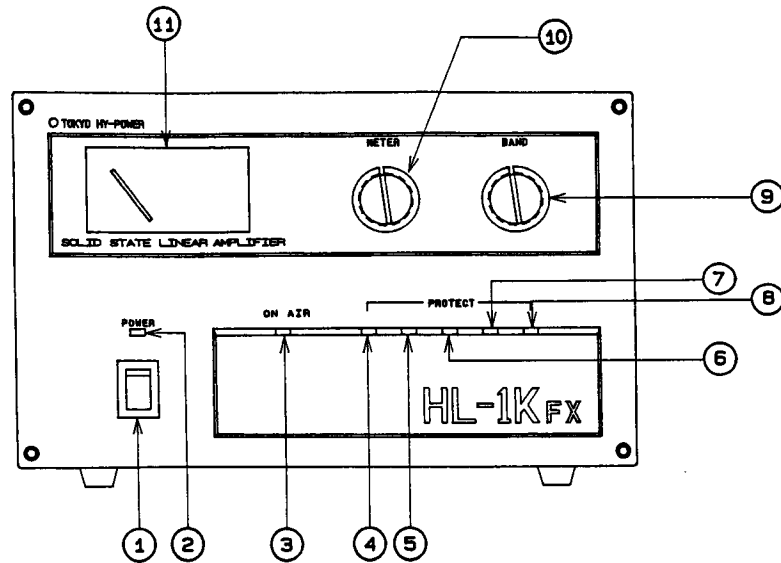


(C) 115V/230V



## ( 5 ) Explanations for Front and Rear Panels

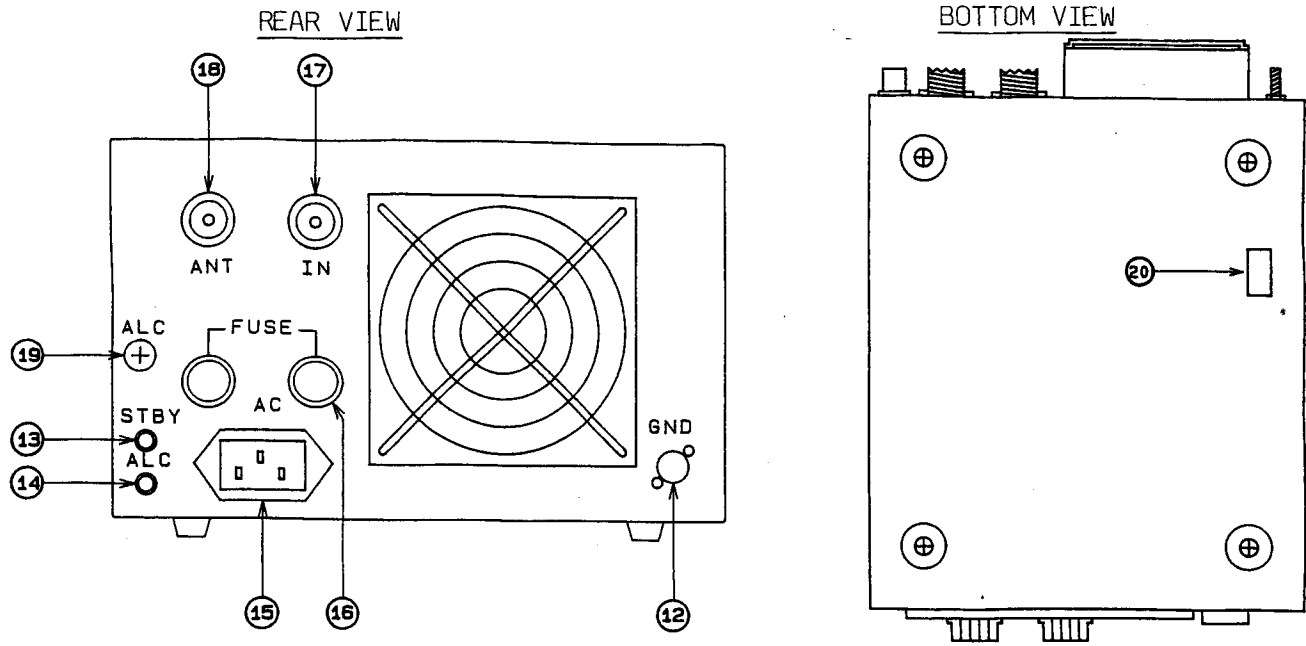
FRONT VIEW



### FRONT PANEL

- ① **POWER** : ON/OFF switch for AC power. When this switch is off, the linear amp becomes the “through” state. In other words, output power from the xceiver will go through the amp. and fed to the antenna directly.
- ② **POWER/LED** : When the AC power switch is turned on, this LED will light.
- ③ **ON AIR/LED** : When the power amp. becomes the” transmitting state”, this LED will light.
- ④ **DRIVE/LED** : When the amp is over-driven ( excessive RF drive is given ), this LED will light and mean the protection circuit has been turned on. And the amp has been made “through state”.
- ⑤ **Pr /LED** : When the reflected power from the antenna gets over 50W, the protection circuit will be turned on, and the LED will light. The amp has been made “through” state.
- ⑥ **OVER VOLT./LED** : When the drain voltage of MOS power F.E.T. is extremely high, the LED will light and mean the protection circuit has been turned on. The amp. has been made “through state”.
- ⑦ **FUSE/LED** : When the fuse in the power amp stage is blown off, the LED will light .
- ⑧ **OVER HEAT/LED** : When the internal temperature of the amp. becomes 80 degrees C, the protection circuit will be turned on and the LED will light. The amp. will be made “through state”.
- ⑨ **BAND** : This is the switch to select the operating frequency band. The proper low pass filter at output stage will be selected.
- ⑩ **METER** : Select switch for Multi Meter ⑪ . Either one of Pf, Pr, Vd, or Id will be selected.
- ⑪ **MULTI METER** : Selecting the parameter by MULTI METER ⑪, Pf(forward power), Pr(reflected power), Vd(drain voltage), and Id(drain current) can be read.

# REAR PANEL

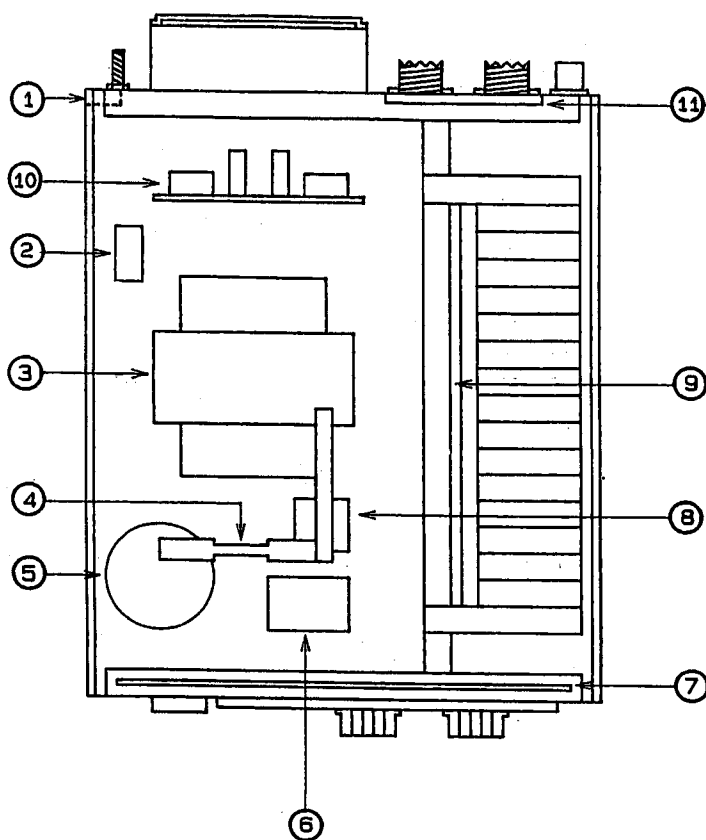


- ⑫ GND : Ground terminal.
- ⑬ STBY : Connector for enabling combined send/receive operation of xceiver and linear power amp. This terminal must be connected to "ACC terminal" pin of the xceiver, that will be grounded when xceiver is at "TX" state.
- ⑭ ALC : ALC will prevent the amp. from being over-driven by xceiver. Connect this terminal to "ALC terminal" pin of the xceiver. By choosing the control level properly, SSB signal distortion will be avoided. ( See rear panel illustration for location of ALC pot trimmer. )
- ⑮ AC POWER : Connect the AC power cord here.
- ⑯ FUSE : 15A fuses are used for AC 100V(115V) operation.  
Use 8A fuse for AC 200V(230V) operation.
- ⑰ IN(TX) : RF input terminal. Connect the coaxial cable from the (ANT) terminal of the xceiver.
- ⑱ OUTPUT : RF output terminal. Connect the antenna here.
- ⑲ ALC : Potentio-meter for adjusting the ALC level voltage , that is fed back to the xceiver. Adjust the potentio-meter adequately so that the output power from the linear amp will be limited to certain level at voice peak.

## BOTTOM

- ⑳ AC : Select switch for AC power voltages. Set the slide switch at "115V" position, when the amp is operated with AC100/110/115V. Set the switch at "220V" position, when the amp is operated with 200/220/230V. ( The switch is set at "115V", at time of shipment from factory.)

## INTERNAL LAYOUT



① インターロック用スイッチ

1. Interlock switch.

② 入力電圧切換スイッチ

2. Select switch for AC voltage.

③ 電源トランス

3. Power Transformer.

④ シャント抵抗

4. Meter shunt resistor.

⑤ 平滑用ケミコン

5. DC filtering capacitor.

⑥ SSR

6. Solid state relay.

⑦ コントロール基板

7. PC board for various controls.

⑧ ダイオードブリッジ

8. Diode bridge.(rectifier )

⑨ パワーアンプ基板

9. Power amp board.

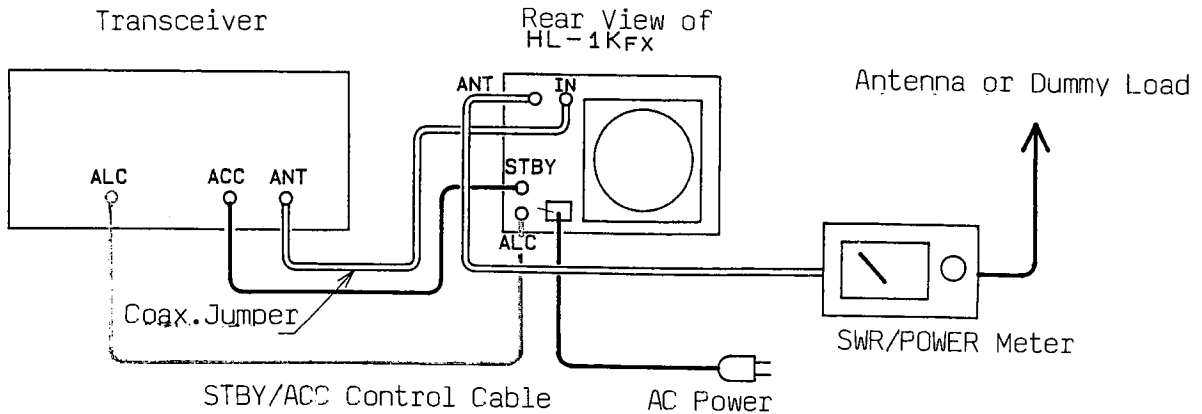
⑩ L P F 基板

10. L.P.F. board.

⑪ 高周波電力検出基板 及び  
送受信切換リレー

11. RF power detector/send-receive  
switching relay board.

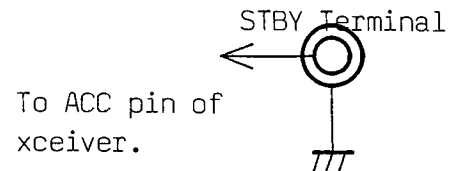
## ( 6 ) SETTING / OPERATION



( \*\* ACC may be printed as "SEND" (ICOM) or "TX-GND" (Yaesu) )

### \* Connection of STBY Terminal

The STBY terminal should be connected to such a pin of "ACC" (or "REMOTE") terminal of the transceiver(xceiver), as will be grounded when "TX (transmitting)". If this "STBY" is not properly wired, HL-1Kfx will not go into "Amplification State". To simply check the performance of the amplifier, it is possible to turn on the amp. by grounding the "STBY" terminal pin..



1. Keep the ① **POWER** switch OFF. Turning on your xceiver, incoming signal will be heard, that was caught by antenna and comes into transceiver by by-passing the amp.
2. Next please check your antenna with the xceiver, while the amp **power switch** is being kept off. Keying the xceiver into "TX" state, check the SWR of the antenna. If the SWR is as high as 2 or more, try to lower it down to 1.5 or less by adjusting antenna element and or using antenna tuner etc.
3. Turn on the ①**POWER** switch and set the ⑨**BAND** switch at the frequency band of desired operation.
4. When you key the xceiver on, the amp will also be keyed on. Amplified strong signal output will be transmitted from the HL-1Kfx. Check the antenna SWR once again to see if SWR value is around 1.5 or hopefully less.
5. For ssb and cw operation, driving power of 50 to 100W is needed to get full 500W output. However, 50 to 60W drive may sometimes be just enough to achieve 500W depending on operating frequency band. Please try not to over-drive by monitoring the output power. Excessive output power operation will lead to the killing of expensive RF power FET's.
6. For high duty operations such as AM,FM,RTTY etc., please keep the maximum output power a half of 500W or 250W so that it may not damage the amplifier.
7. When the bare foot operation is desired, or amp operation is not necessary, just turn off the **POWER switch** of linear amp., while all the cable connections are left as they are.



## ( 7 ) ABOUT THE MAJOR CIRCUITRY

### ① **Input Circuit**

RF power fed from the transceiver is applied to the attenuator pad of amp. unit through the relay contact of the RF detector unit.

### ② **RF Power Amp Section**

Rated RF drive power with the attenuator will be fed to the gates of MOS FET after passing the impedance transforming wide band RF transformer.

Power amp section consists of 4 pcs. of MRF150's in the push-pull configuration. Drain voltage is 53V with idling drain current of 0.6A when there is no drive. Gate bias circuit is independent from each other, so that the whole amplifier units will achieve stable performance.

### ③ **Output Stage Circuit**

Amplified signal will go from the drain of MOS FET to the wide band transformer. After the impedance transformation to 50 ohms, Then signal will reach the L.P.F. unit ( low-pass filter) where the harmonics and spurious signals will be removed. Further more, signals will go through the feed-thru power detector and T-R relay contacts and then reach the output terminal.

### ④ **Feed-thru Type Power Meter**

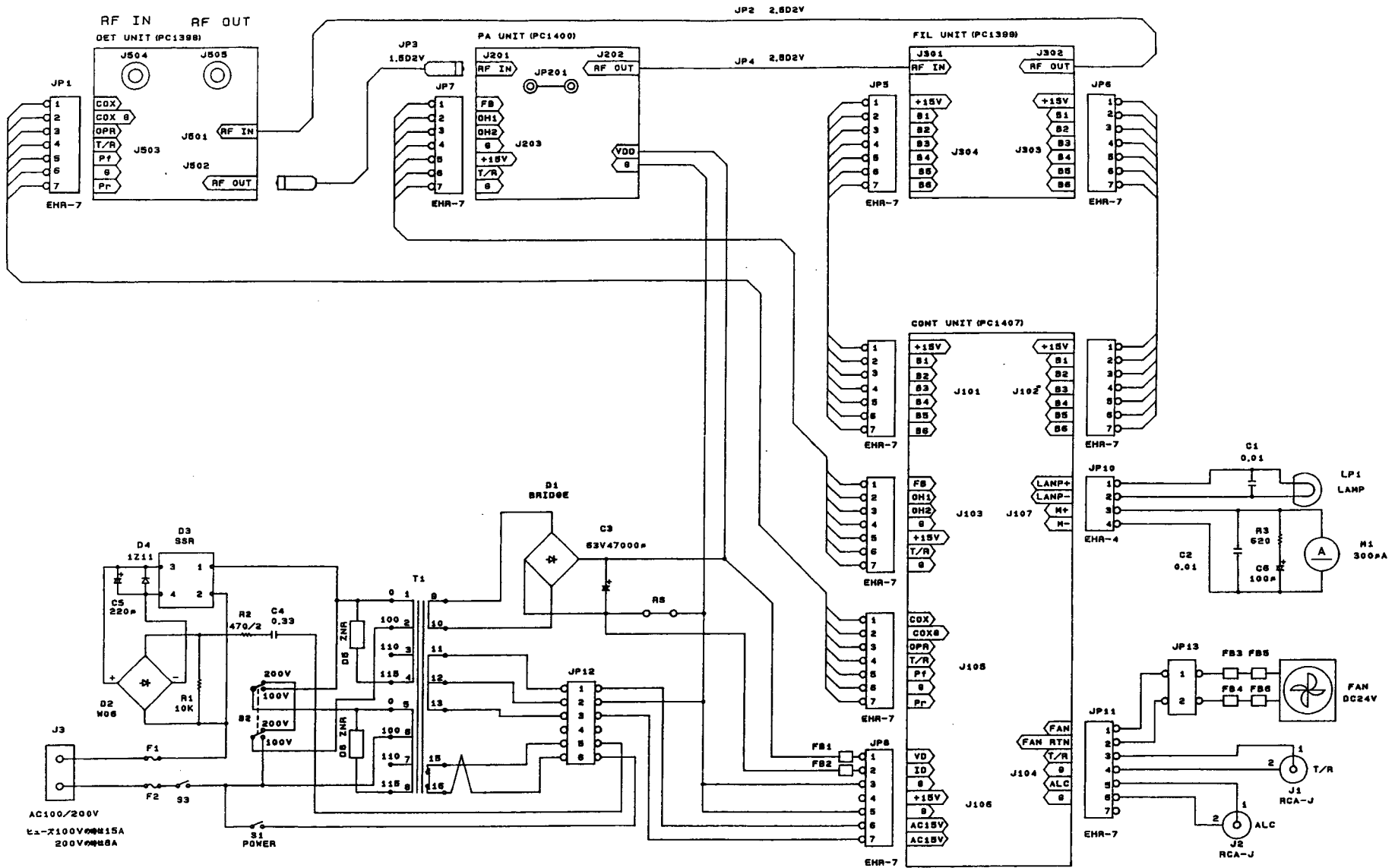
A part of the passing RF signal is detected through the toroidal core type current transformer. Detected signal will be rectified by the shottky diode and then the detected DC signal is going to be used for RF power meter circuit and protection circuit as well.

### ⑤ **ALC Circuit**

RF driving signal detected by the diode in the detector unit will be amplified by the Ope-amp and fed to the ALC terminal. This ALC voltage is negative. When this ALC voltage is properly fed back to the ALC input terminal of the transceiver, it will help amp. prevent the occurrence of distortion due to the over driving. Also, by adjusting the ALC level properly, output power can be set at free level.

### ⑥ **DC Power Supply Section**

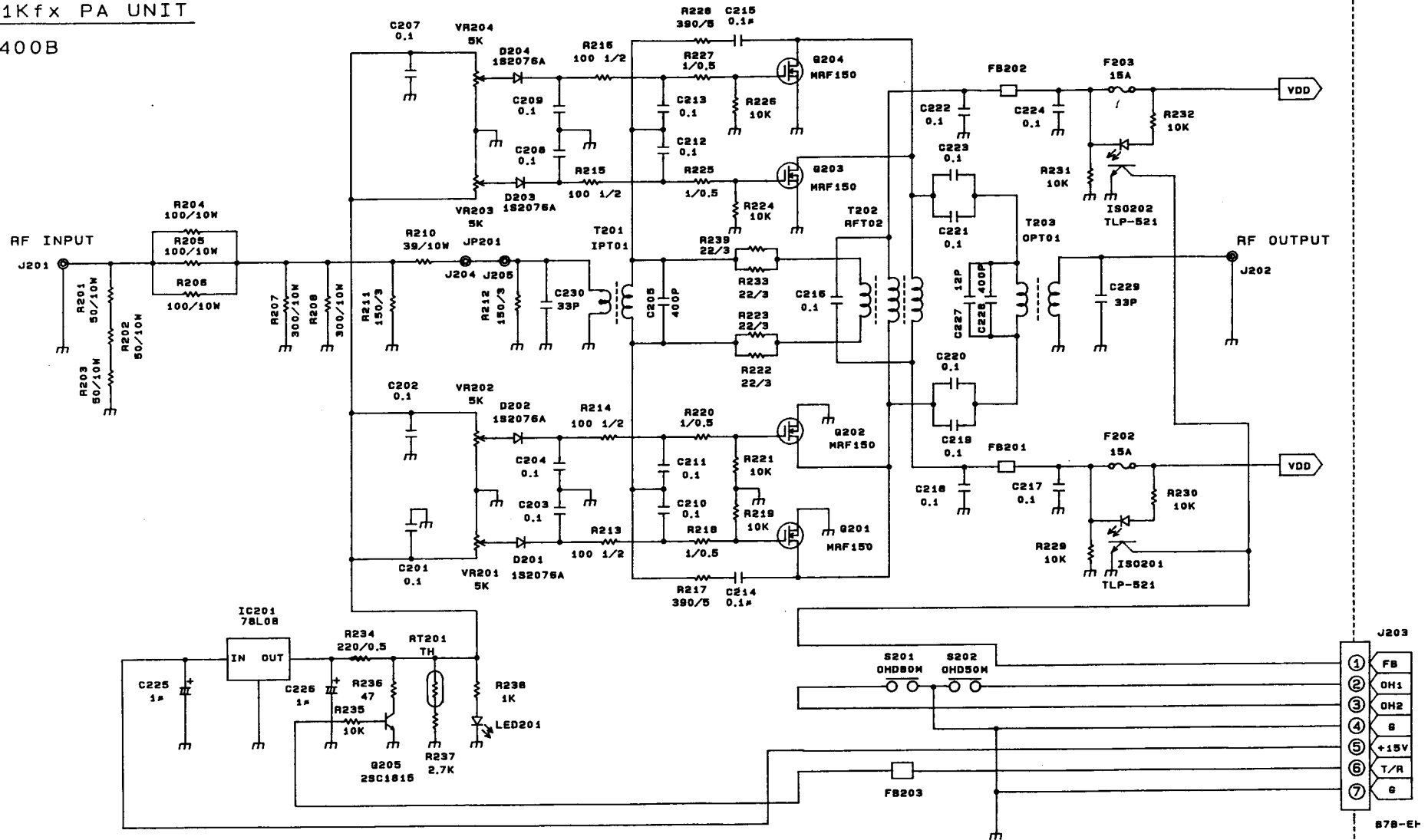
Secondary output voltage from the power transformer is fed to the full-wave rectifier circuit of the bridge diode. Rectified DC voltage will then be filtered by the electrolytic capacitor block. The DC voltage will , then, be fed to the drain of MOS FET through the choke transformer , which also works as a part of RF NFB loop.



HL-1Kfx BLOCK DIAGRAM

HL-1Kfx PA UNIT

PC1400B



878-EI