



**INSTRUCTION  
MANUAL  
FV-301**

**YAESU MUSEN CO., LTD.**

TOKYO JAPAN.

FV-301 EXTERNAL V.F.O.



GENERAL

The FV-301 External VFO has been designed to provide versatile operation of the YAESU FT-301 series.

This unit eliminates the need for a separate receiver or transmitter in order to operate cross-band. For the contest operator, DX chaser, or Net Control Manager, the FV-301 becomes an indispensable adjunct to the station.

Selectable fixed crystal positions provide the Novice with legal operating facilities even during the beginning stages of joining the Ham community. To the Net Control Manager, this feature assures exact net control frequency on any band.

Construction of the FV-301 reflects the mechanical rigidity required for long life and dependability. Instrument quality gears provide zero-backlash tuning and accurate frequency readout to less than 1 kHz. Circuit features such as transistor oscillator and buffer stages, guarantee excellent long term stability.

The FV-301 offers advantages to every operator whether Novice or Extra Class. We suggest that the following instructions be read thoroughly to attain maximum operator utilization of the FV-301.

## INSTALLATION

### POWER REQUIREMENTS

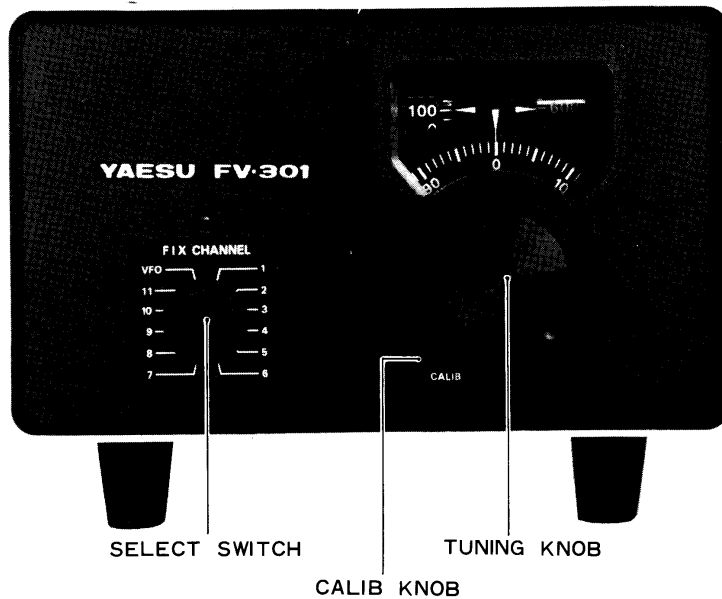
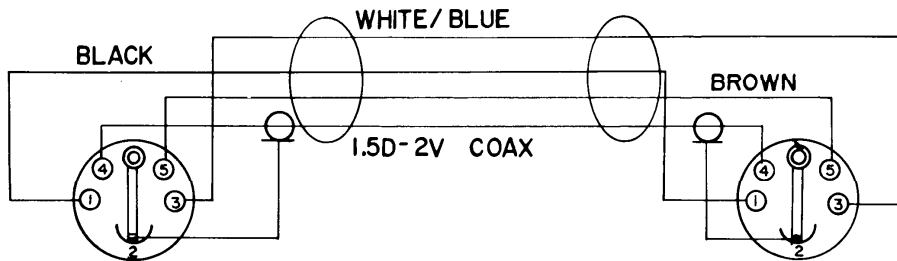
When the FV-301 is operated together with the FT-301, the power is supplied from the transceiver.

The pilot lamp uses a 13.5V DC voltage. The regulated 6V DC voltage is used for the VFO and the crystal oscillator.

### EXTERNAL CONNECTION

Connect the power cable into the plugs J1 (FV-301), or J11 (FT-301) as indicated.

Power to the FV-301 is then supplied from the transceiver, and VFO output is connected into the circuit.



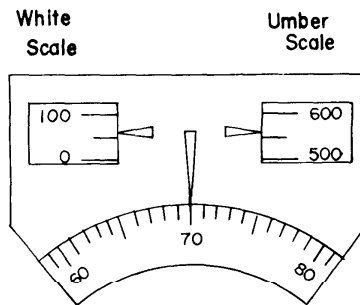
## OPERATION

### FREQUENCY SELECTION

The main tuning dial has two scales for proper frequency readout and is marked in 50 kHz increments to provide a coarse setting within a given band. The white scale is for 0 to 500 kHz and an amber scale is for 500 kHz to 1 MHz. The sub-dial in window is marked in 1 kHz increments and provides accurate settings of the received frequency.

### FREQUENCY CALIBRATION

Set the CLARIFIER to the OFF position in the transceiver, and the tuning control to the 25 kHz/100 kHz point on the dial nearest to the desired frequency. Set the MARK switch to the upper position. While pressing the CALIB knob to lock the dial, tune the tuning control for a zero beat. The transceiver must be recalibrated when changing the mode of operation: USB, LSB, AM or CW.



For bands 40-20-15-10A-10C, read white scale on main dial. Setting shown in the example would then be 070 kHz plus the starting band edge frequency in MHz. For example, on 40 meters the frequency would be 7.070 MHz. On 20 meters it would be 14.070 MHz, etc.

For bands 160-80-10B-10D, read amber scale on main dial. Settings shown in the example would then read 570 kHz. For example, on 80 meters the frequency would be 3.570 MHz, on 10B, 28.570 MHz, etc.

### SELECT SWITCH

In the VFO position, the FV-301 operates as a variable frequency oscillator. In the CH1, CH2.....CH10 and CH11 positions, the FV-301 operates as a crystal controlled oscillator on one of the eleven frequencies.

Crystals are inserted into sockets on the chassis of the FV-301 which correspond to the SELECT switch. (Please note that no crystals are supplied with the FV-301 as they are optional).

## CRYSTAL CONTROLLED OPERATION

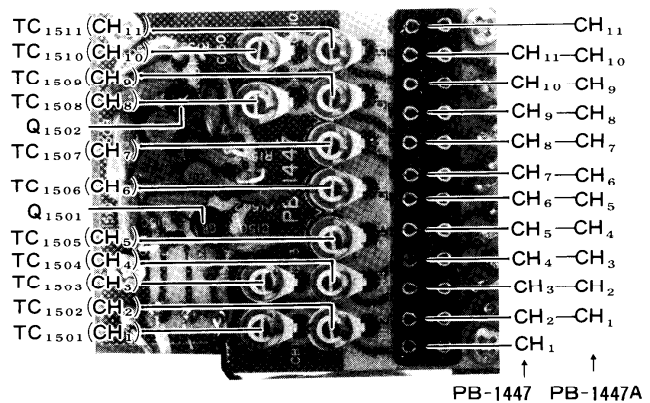
The crystal holders accept standard HC-25/U type crystals. All crystal frequencies fall between 5,000 kHz and 5,500 kHz. To permit proper frequency adjustment for SSB operation, a trimmer capacitor has been connected in series to each crystal. Adjustment of this trimmer will change the crystal frequency about 1 kHz.

The crystal frequency for any desired operating frequency may be determined by the following formula:

$$F_x = (F_1 + F_c) - F_o$$

$F_x = (F_1 + F_c) - F_o$ , where  $F_x$  is the crystal frequency,  $F_o$  is the designed operating frequency, and the constant  $(F_1 + F_c)$  is taken from the table.

BAND	USB	LSB	CW
160m	6998.5	7001.5	7000.7
80m	8998.5	9001.5	8999.3
40m	12498.5	12501.5	12500.7
20m	19498.5	19501.5	19500.7
15m	26498.5	26501.5	26500.7
10mA	33498.5	33501.5	33500.7
10mB	33998.5	34001.5	34000.7
10mC	34498.5	34501.5	34500.7
10mD	34998.5	35001.5	35000.7



NOTE: Crystal locations are different for PB-1447A.

FREQUENCY TABLE ( $F_1 + F_c$ ) Unit: kHz.

Find the proper crystal for operation at 3900 kHz LSB on the 80 meter band.

From the table find the constant  $(F_1 + F_c)$  for LSB operation on this band. The constant is 9001.5, therefore,  $F_x = 9001.5 - 3900$   
 $F_x = 5101.5$  kHz

## THEORY OF OPERATION

### VFO UNIT - (PB-1440)

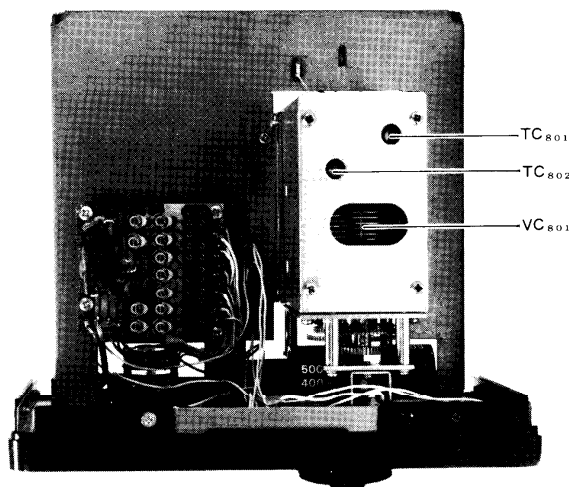
The VFO module board is installed in the VFO chassis. The VFO (variable frequency oscillator) Q801, 2SC372Y, generates a 5,000 to 5,500 kHz signal and produces a 500 kHz main tuning dial range. Frequency drift is minimized through the use of a temperature compensation circuit utilizing a differential trimmer capacitor. The signal is fed through the amplifier buffer stage Q802, 2SK19GR, and Q803, 2SC372Y. The buffer amplifier provides isolation and amplification of the VFO signal.

The VC801 consists of two sections. The sub blades compensate the capacitance variation of the main blades caused by temperature changes. Frequency drift is minimized through the use of a temperature compensation circuit utilizing a differential trimmer capacitor, TC801.

### FIX UNIT - (PB-1447)

In addition to normal VFO operation, 11 crystals may be used for crystal controlled operation. The selector switch located on the front panel selects the crystal in use. The trimmer capacitors, TC1501 - TC1511, are for fine adjustment of each crystal frequency.

The FIX channel crystal oscillator Q1501, 2SK19GR, oscillates at the frequency of the crystal selected by the FIX CHANNEL switch. The frequencies of the crystals must fall between 5.0 MHz - 5.5 MHz.



## TEST & ALIGNMENT

### EQUIPMENT REQUIRED

- (1) FT-301 Series Transceiver
- (2) Vacuum tube-volt-ohm meter
- (3) Suitable alignment tools for capacitors

The VFO linearity has been aligned in the factory and it is not recommended to align the VFO linearity yourself.

### TEMPERATURE COMPENSATING ADJUSTMENT

Since practically no heat is generated within the FV-301 cabinet, temperature compensation should not be necessary. In case of extreme ambient change, the temperature compensating capacitor may be adjusted to provide most adequate compensation.

Drift towards a lower dial reading with increasing temperature on 80 meters indicates insufficient compensation and compensating trimmer, TC801, should be rotated clockwise to increase compensation. Drift towards a higher dial reading with increasing temperature indicates excessive compensation and TC801 should be rotated counter-clockwise to decrease compensation.

