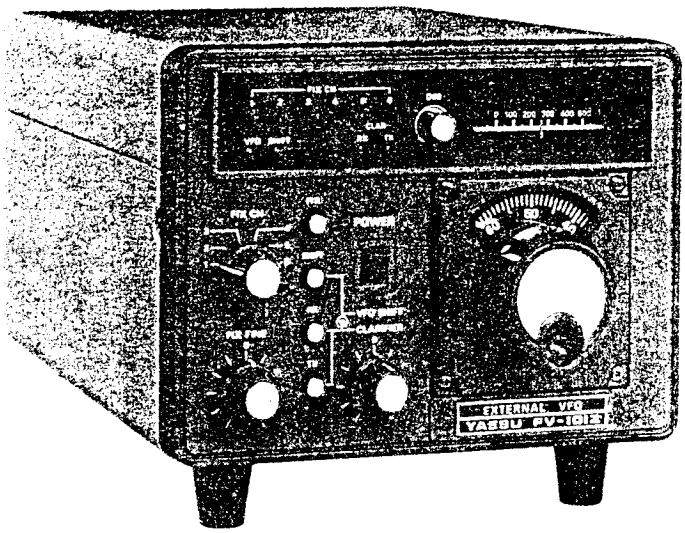
MANUAL

FV—101Z

YAESU MUSEN CO., LTD.

TOKYO JAPAN

YAESU
FV-101Z
EXTERNAL VFO



INTRODUCTION

The FV-101Z is a compact remote VFO for the FT-101ZD and FT-901DM series of transceivers. The analog frequency display is geared to a precision tuning mechanism, resulting in silky-smooth rotation of the main dial. Clarifiers for the TX, RX, or transceive frequencies are available, while a unique VFO SHIFT feature allows ±8 kHz shift of the main dial frequency, allowing you to check nearby frequencies for a clear slot.

Up to six fixed channels may be installed, for crystal controlled operation. The optional crystals required may be obtained from your Yaesu dealer.

Please read the following pages carefully, so as to derive maximum benefit from your new FV-101Z.

SPECIFCATIONS

Output frequency:
5.0–5.5 MHz

Output level:
130 mV rms @ 50Ω

Output impedance:
50Ω

Frequency stability:
After 10 minute warmup, less than ±300 Hz drift over 30 minutes; after 30 minute warm-up, less than ±100 Hz drift over 30 minutes.

Crystal controlled channels:
6 (crystals optional)

Clarifier range:
±2.5 kHz offset of transmit, receive, or transceive frequency.

FIX FINE range:
±100 Hz from crystal frequency.

VFO shift range:
±8 kHz from dial frequency

Power requirements:
AC 100/117/200/234 VAC.
50/60 Hz
VFO circuit power supplied from FT-101ZD transceiver

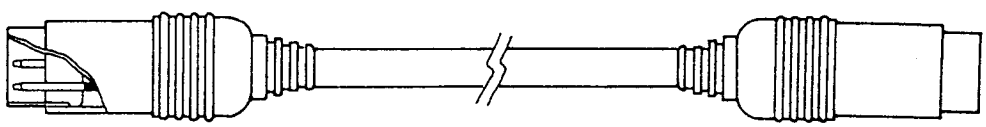
Case size:
154 (H) x 210 (W) x 325 (D) mm

Weight:
Approx. 4.5 kg

ACCESSORIES

The following accessories are packed with your FV-101Z:

POWER CABLE	1 pc.
SPARE FUSES (0.2A)	1 each



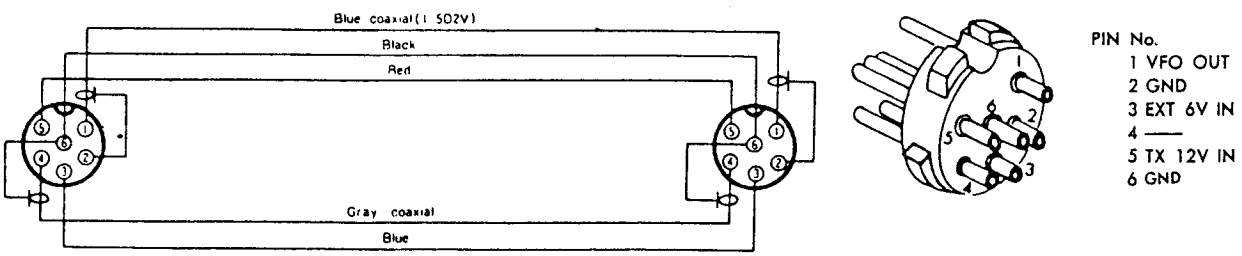
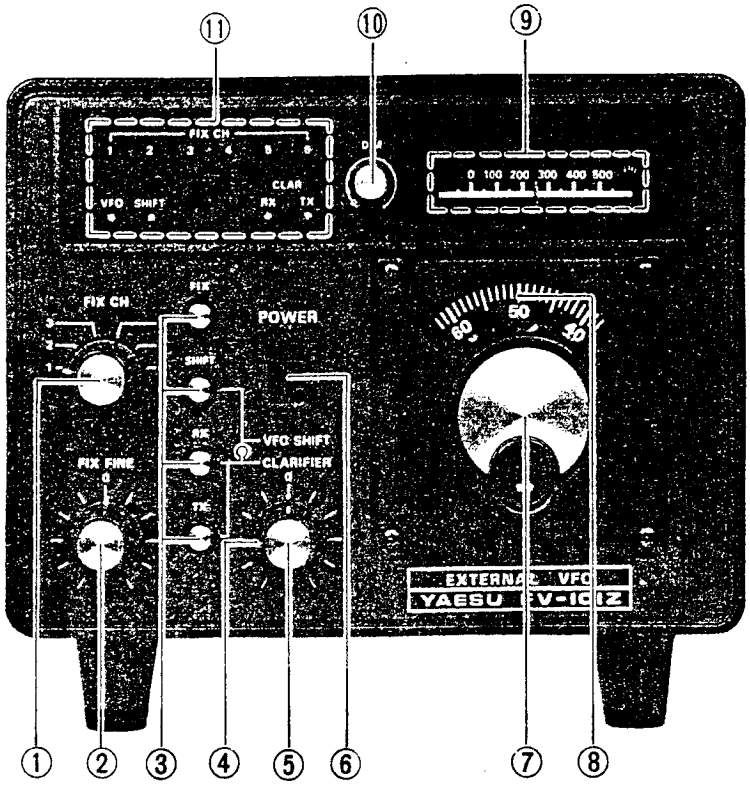


Fig. 1

FRONT PANEL CONTROLS AND SWITCHES



(1) FIX CH

This switch selects the desired fixed channel, when crystal controlled operation is desired. Crystals are optional.

(2) FIX FINE

During crystal controlled operation, this control allows ±200 Hz offset from the crystal frequency.

(3) SELECT switches

These switches control the operating mode of the VFO.

FIX When this switch is pushed, crystal controlled operation is selected. When the FIX switch is not pushed, VFO operation is selected.

SHIFT When this button is pushed, the VFO SHIFT feature is activated. See the section on Operation for details of this feature.

RX This button activates the receive frequency clarifier.

TX This button activates the transmit frequency clarifier.

(RX / TX) When both the RX and TX buttons are pushed, the transceive frequency clarifier is activated.

(4) VFO SHIFT control

This control determines the amount of offset from the VFO dial frequency when the SHIFT button is pushed.

(5) CLARIFIER control

This control determines the amount of offset during clarifier operation.

(6) POWER

This is the main power ON/OFF switch for the VFO.

(7) TUNING KNOB

This is the main tuning control for the VFO.

(8) (9) DIAL

The analog tuning knob subdial is calibrated in 1 kHz steps, with numerical calibrations every 10 kHz. The 100 kHz range being tuned is shown in the upper display window.

(10) DIM

This control allows adjustment of the brightness of the panel lamps.

(11) INDICATOR LEDs

The fixed channel in use, as well as the operating mode of the VFO (chosen by the SELECT switches), are indicated in this window.

INSTALLATION

When you first open the packing carton, inspect the FV-101Z carefully. Check the controls and switches for normal action and/or smooth rotation. If any damage has been sustained, notify the shipping company immediately, and document the damage completely. Save the carton and packing material for possible use at a later date.

Before attempting operation of the FV-101Z, check to see that the voltage specification on the rear of the VFO matches your local supply voltage. The FV-101Z is manufactured for use in many parts of the world, and for a variety of supply voltages. Therefore, this inspection is very important, and it must be performed before connecting the AC cord to the AC supply source.

WARNING

Operation of this instrument from improper supply voltages will void the warranty.

When replacing fuses, use only a fuse of the proper rating. For all voltages, use a 0.2 amp fuse. Our warranty does not cover damage caused by use of an improper fuse.

Refer to Figure 2, and connect the interconnection cable between the FV-101Z and the FT-101ZD EXT VFO jack. Connect the FV-101Z AC cord to the wall outlet. Installation is now complete.

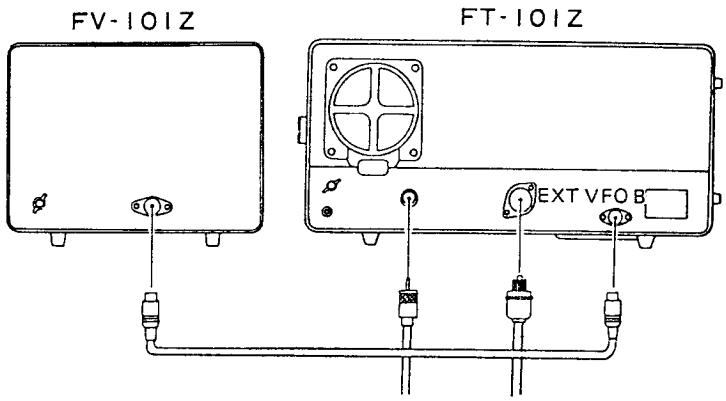


Fig.2

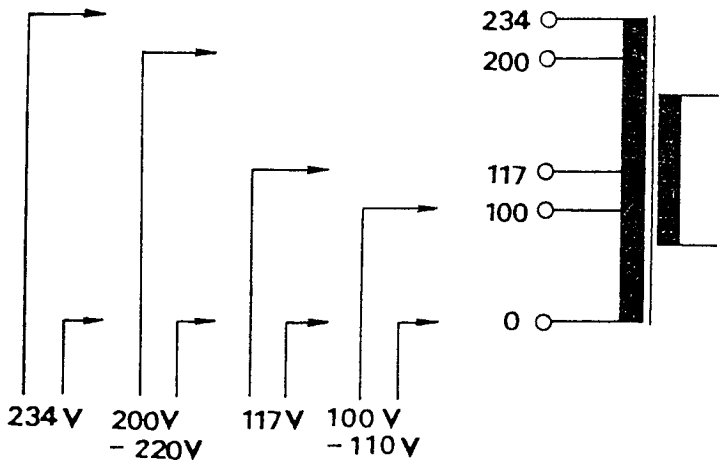


Fig.3

POWER TRANSFORMER PRIMARY CONNECTIONS

(1) Turn the POWER switch ON.

(2) VFO OPERATION USING ONLY FV-101Z FOR FREQUENCY CONTROL

Push the FT-101ZD EXT switch (located below the transceiver main tuning dial). Control of the transceive frequency will now be via the FV-101Z main dial.

(3) VFO OPERATION USING BOTH FV-101Z AND FT-101ZD FOR FREQUENCY CONTROL

For RX on the transceiver VFO, and TX on the external VFO, push the FT-101ZD TX EXT switch. The transmit frequency will be controlled by the FV-101Z, while the receive frequency will be controlled by the FT-101ZD.

For TX on the transceiver VFO, and RX on the external VFO, push the FT-101ZD RX EXT switch. The receive frequency will be controlled by the FV-101Z, while the transmit frequency will be controlled by the FT-101ZD.

To return full frequency control to the transceiver, push the FT-101ZD VFO switch.

(4) CRYSTAL CONTROLLED OPERATION

When the desired optional crystals have been properly installed, they may be activated by pushing the FIX switch, and rotating the FIX CH switch so as to select the desired channel.

Rotate the FIX FINE control to vary the frequency of the crystal controlled channel ±200 Hz.

The crystal controlled channels can be used on only TX or RX, if desired. For example, if you want to transmit on the fixed channel, but receive on the FT-101ZD VFO, press the FT-101ZD TX EXT switch and the FV-101Z FIX switch. Rotate the FIX CH switch to select the desired channel, and rotate the FT-101ZD main dial to vary the receive frequency.

(5) CLARIFIER OPERATION

The clarifier control will allow ±2.5 kHz offset of the transmit, receive, or transceive frequency.

For offset of only the receive frequency (to follow a drifting station with whom you are in QSO), push the RX switch and rotate the CLARIFIER control as needed to follow the drifting station.

To vary the transmit frequency only, press the TX switch, and rotate the CLARIFIER control as necessary. A helpful hint is to press the RX button first, set the CLARIFIER control by ear, then release the RX button and press the TX switch.

To vary the transceive frequency, press both the TX and RX switches. Both the transmit and receive frequencies will be varied in this case.

(6) VFO SHIFT OPERATION

Sometimes it is necessary to make a minor frequency change from the preset main dial frequency. For example, if you are operating at 14.225 MHz, and suddenly a very strong commercial station begins transmitting on your frequency, you may want to change frequency by 5 kHz without moving the main tuning dial. Here's how to accomplish this:

Without moving the main tuning dial, push the SHIFT switch. Now rotate the VFO SHIFT knob to find the new, clear, frequency. Leave the knob set on the new frequency, note the new frequency (as displayed on the transceiver digital display), and again push the SHIFT switch. Advise the other station of the new frequency, and push the SHIFT switch once more for instant QSY to the clear frequency.

The VFO SHIFT feature may also be used to move a few kHz in order to advise a nearby station of improper transmitter signal characteristics (e.g. splatter, etc.).

FREQUENCY DETERMINATION ON THE FV-101Z

The analog dial of the FV-101Z provides calibration usable for determination of the operating frequency with accuracy of better than 1 kHz. When the external VFO is used to drive the FT-101ZD digital display, the frequency will be shown on the digital window with accuracy to 100 Hz.

Refer to Figure 4 for a depiction of a typical setting of the FV-101Z dial. The linear dial above the main tuning dial and display indicates the Offset from the lower band edge. On the 40, 20, 15, and 10A/C bands, the lower band edge begins with 000 (e.g. 14.000 MHz). Therefore, on the 20 meter band, the calibrations on the linear scale represent 14.000 MHz, 14.100 MHz, 14.200 MHz . . . 14.500 MHz. On the 160m, 80m, and 10m B/D bands, the band edge begins at 500 (e.g. 3.500 MHz). Therefore, on the 80 meter band, the linear scale represents 3.500 MHz, 3.600 MHz, 3.700 MHz . . . 4.000 MHz.

The main tuning knob subdial is calibrated in 1 kHz increments, with numerical calibrations every 10 kHz. The setting in Figure 4 represents a frequency of 074 kHz. Therefore, keeping in mind the position of the pointer on the linear scale, it is easy to see that the drawing in Figure 4 will represent 3.574 MHz on 80 meters, 7.074 MHz on 40 meters, etc.

When using the FT-101ZD calibrator, it is important to have the clarifiers and SHIFT switches OFF. Otherwise, improper calibration of the analog display will result.

OPERATION OF THE FV-101Z WITH THE FT-901DM TRANSCEIVER

The operating levels and interconnections for the FV-101Z are entirely compatible with the FT-901DM family of transceivers. The only item of note is that the sense of the dial rotation of the FT-901DM and the FV-101Z is reversed. Otherwise, the FV-101Z will provide excellent performance with the FT-901DM.

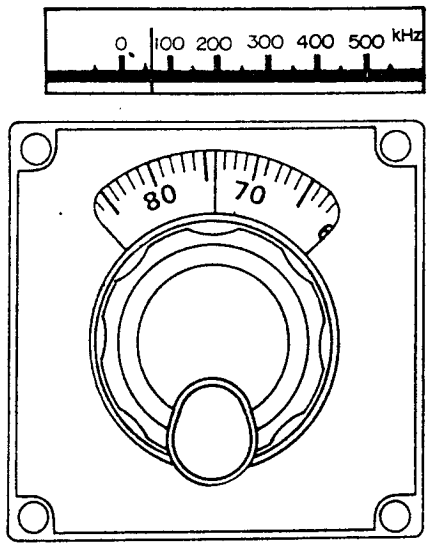
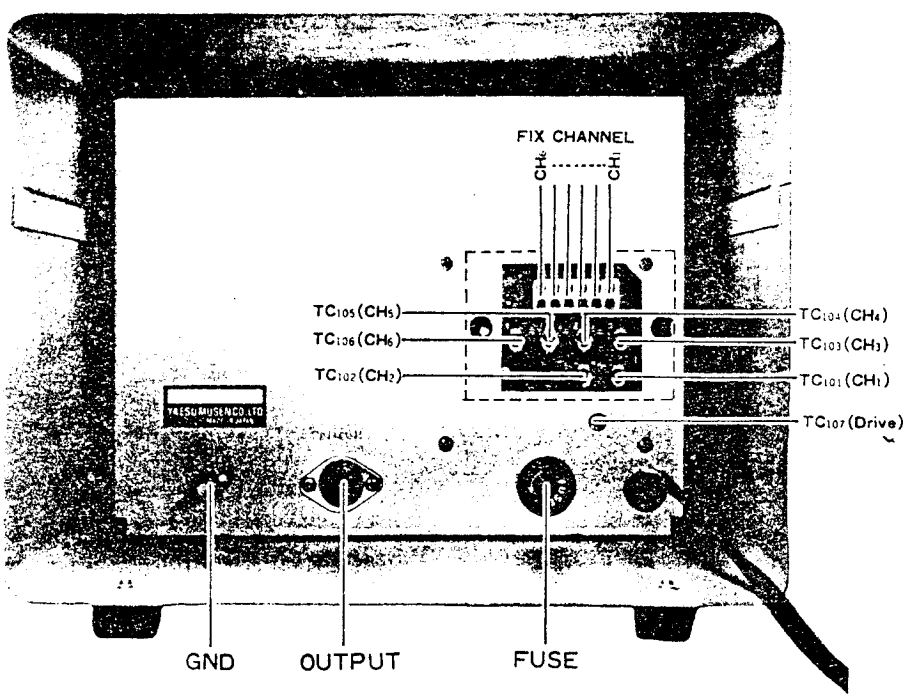


Fig.4



FIXED CHANNEL CRYSTAL INFORMATION

Fixed channels require only the installation and netting of crystals on the FIX Unit. Once the channels are installed, the front panel CHANNEL switch selects the deisred channel.

Crystals must fall within the specifications shown in Table 1, and must fall within the operating range 5.5–5.0 MHz. Frequency calculation for the crystals is made from the formula

$$F_X = F_I - F_O$$

where F_X is the crystal frequency,
F_I is a constant derived from Table 2,
and F_O is the operating frequency.

For example, let us say it is desired to operate on 7199 kHz LSB. Referring to Table 2, we see that for 40 meter LSB, F_I is 12501.5 kHz. Subtracting F_O (7199 kHz) from F_I (12501.5 kHz) yields 5302.5 kHz, the crystal frequency (F_X).

For operation on 21420 kHz USB, compute the crystal frequency as follows:

$F_X = 26498.5 - 21420 = 5078.5$ kHz.

Inspection of the values of F_I in Table 1 will reveal that the 7199 kHz crystal for LSB will work on 14199 kHz, 21199 kHz, etc. Of course, LSB is not normally used on these bands. If the operator switches to USB, the operating frequency will be moved 3 kHz (in this case, to 14196 kHz, 21196 kHz, etc.). If the move is made from LSB to CW, the frequency will move 2.3 kHz down.

To net the crystals on frequency, when using the FT-101ZD, use the transceiver digital display to adjust the trimmers for each crystal (TC_{301} for channel 1, TC_{302} for channel 2, etc.). Be sure that the FIX FINE control is set to the 12 o'clock position during trimmer adjustment.

If you are using the analog FT-101Z, connect a frequency counter to pin 1 of J_1 (VFO output jack). Adjust trimmers TC_{301} –TC_{306} as needed to set the crystals precisely on frequency.

The optional crystals are available from your Yaesu dealer.

Holder	HC-25/U
Load C	30pF
Effective R	25Ω
Drive level	5mW

Table 1

MODE / BAND	USB	LSB	CW
160m	6998.5	7001.5	6999.2
80m	8998.5	9001.5	8999.2
40m	12498.5	12501.5	12499.2
30m	15498.5	15501.5	15499.2
20m	19498.5	19501.5	19499.2
17m	23498.5	23501.5	23499.2
15m	26498.5	26501.5	26499.2
12m	29998.5	30001.5	29999.2
10mA	33498.5	33501.5	33499.2
10mB	33998.5	34001.5	33999.2
10mC	34498.5	34501.5	34499.2
10mD	34998.5	35001.5	34999.2

Table 2

CIRCUIT DESCRIPTION

VFO UNIT (PB-144B-5100)

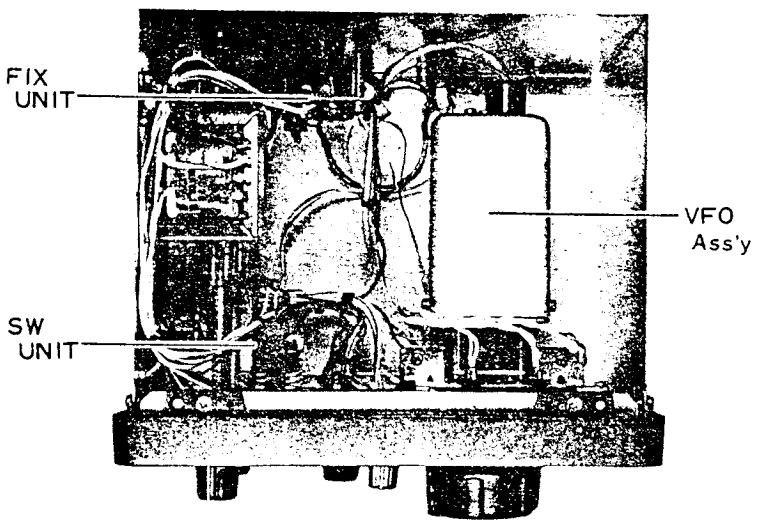
A modified Colpitts-type oscillator is used to generate a 5.0–5.5 MHz signal, thus producing a 500 kHz tuning range. The oscillator signal generated by Q_{801} (2SC372Y) is varied by VC_{801}, which is geared to a precision-built dial tuning mechanism. VC_{801} consists of two sections; the sub-blades compensate for the capacitance variation of the main blades which may result from extreme temperature change.

Varactor diode D_{801} (1S2236) is used to vary the oscillator frequency slightly, providing clarifier control of ±2.5 kHz.

The VFO signal is amplified by Q_{802} (2SK19GR) and Q_{803} (2SC372Y) for delivery via a low pass filter to the other units of the FV-101Z.

FIX UNIT (PB-2051A-5100)

The fixed channel crystals drive crystal oscillator Q_{301} (2SC380TMY). The signal is then amplified by buffer Q_{302} (2SC380TMY) and fed through a low-pass filter and diode switch D_{301} (1S1555) to pin 1 of J_1, the output jack for the VFO.



TOP VIEW

MAINTENANCE AND ALIGNMENT

This instrument has been carefully aligned and tested at the factory prior to shipment. With normal care, this equipment should require little or no adjustment for many years, because of the reliability of the solid state components incorporated in design.

VFO UNIT

The VFO Unit is very critical in its adjustment. As well, this is not an area which should ever require alignment. Questions regarding drift, etc., usually can be traced to other areas of the equipment (instability in supply voltage, etc.). For this reason, all cases regarding VFO repair should be referred to an experienced service technician.

The following components are of interest from a service standpoint:

TC_{801} is the band set trimmer.
TC_{802} is the VFO level set trimmer.

To confirm proper VFO injection, connect a VTVM to the VFO output. Adjust TC_{802} for a reading of 130 mV on the VTVM.

FIX UNIT

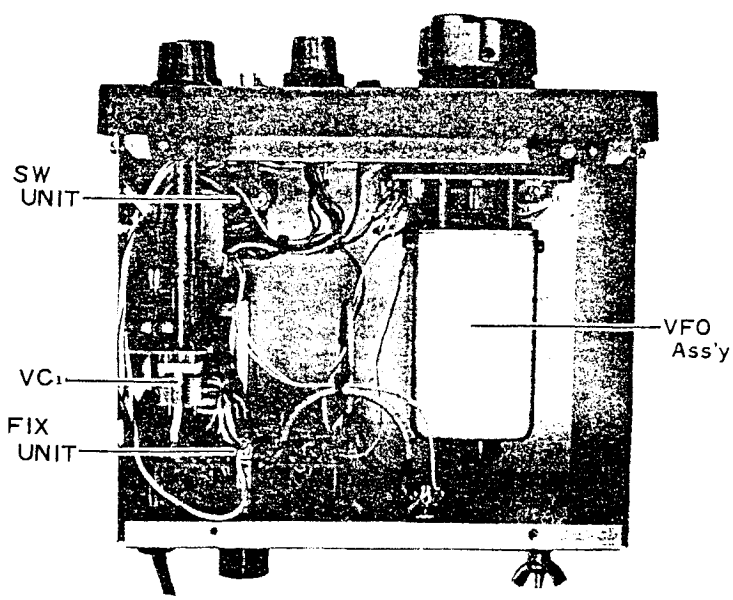
Once the crystals are properly set to the correct frequency, the only adjustment that need be performed is to check the output level of the fixed channel oscillator.

Push the FIX switch, and connect a VTVM to the output jack (pin 1 of J_1). Set the CHANNEL switch to any channel, and adjust TC_{307} for a reading of 130 mV on the VTVM. Do not exceed this reading, or spurious signals may result.

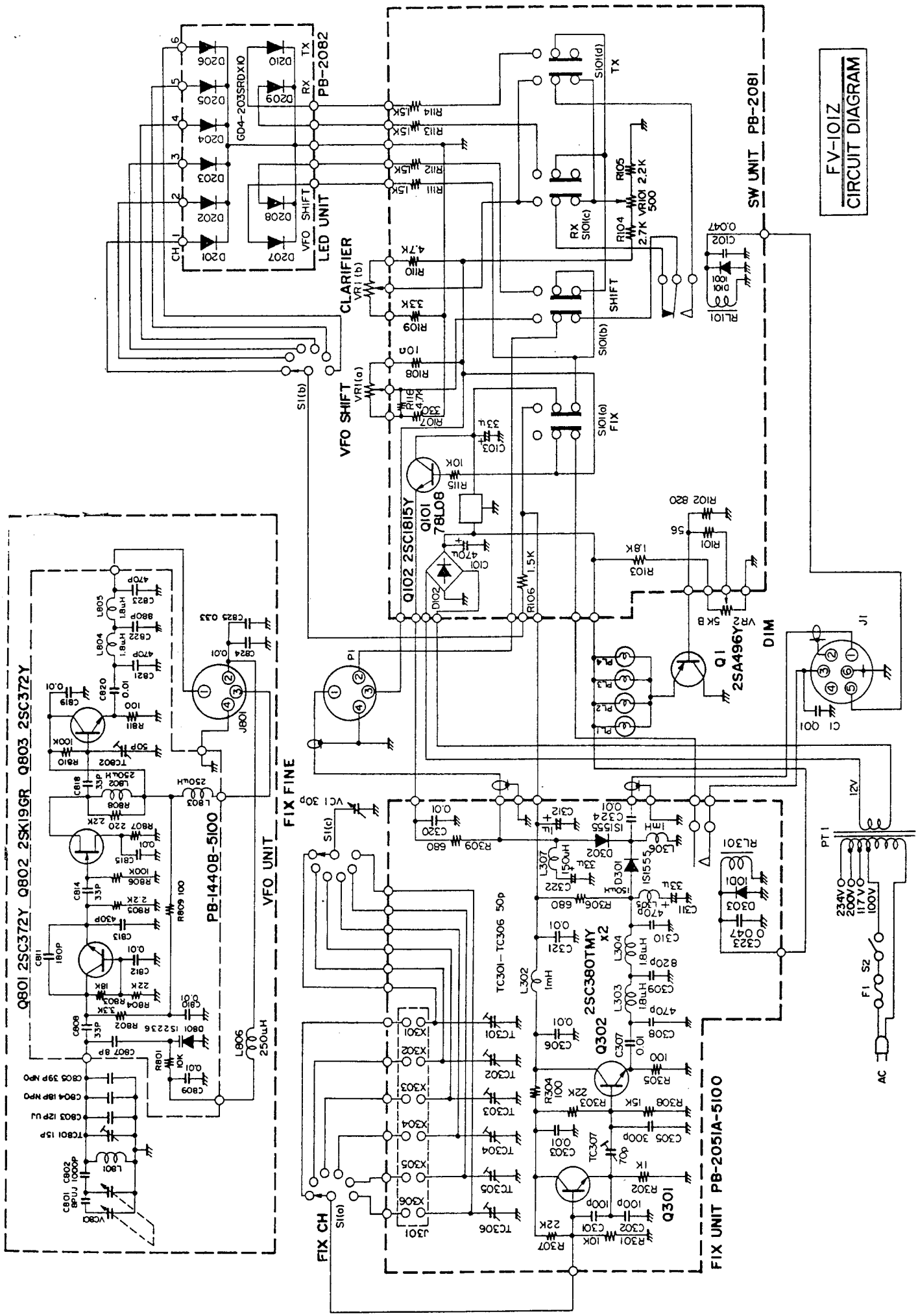
CLARIFIER ALIGNMENT

Set up the FT-101ZD and FV-101Z for reception on any band. Tune in the FT-101ZD marker signal using the FV-101Z VFO, with the RX and TX clarifiers OFF. Note the beat tone on the marker signal output from the speaker.

Set the CLARIFIER control to the 12 o'clock position, and switch the RX clarifier ON. There should be no change in the pitch of the beat note. If there is some frequency difference, adjust VR_{101} for precise alignment of the clarifier frequency with the control at the 12 o'clock position. Switch the RX clarifier on and off to confirm that the frequencies are identical.



BOTTOM VIEW


FV-101Z
CIRCUIT DIAGRAM
PB-2082
LED UNIT
CLARIFIER
VFO SHIFT
SW UNIT PB-2081
DIM
FIX FINE
VFO UNIT
PB-1440B-5100
FIX UNIT PB-2051A-5100
FIX CH
Q801 2SC372Y Q802 2SK19GR Q803 2SC372Y
Q102 2SC1815Y
Q101 78L08
Q1 2SA496Y
Q302 2SC380TMY x2
Q301
TC301 – TC306 50p
234V
200V
117V
100V
12V
AC

PARTS LIST

MAIN CHASSIS

Symbol No.	Parts No.	Description
		TRANSISTOR
Q1	G3104960Y	2SA496Y
		POTENTIOMETER
VR1	J62800020	DM10A037-5KBx2 5kΩBx2
VR2	J60800036	VM10A592A 5KB 5kΩB
		VARIABLE CAPACITOR
VC1	K90000033	TSN-150S 30pF
		SWITCH
S1	N0190042	SRN-2046N-S20
S2	N7090004	WD9216
		JACK/PLUG
J1	P1090033	D6-701B-00
P1 (with wire)	T9202490	SI-5908
		POWER TRANSFORMER
PT1	L3030073	
		PILOT LAMP
PL1~4	Q1000033	BQ054-32732B (K0252-6-8)
		FUSE HOLDER
FH1	P2000012	SN-2059
		FUSE
F1	Q0000013	0.2A
		TERMINAL BOARD
	Q6000004	1L2PS (2-0)
		POWER CORD
	T9000980	2 wire, 2 prong plug
	T9000482	3 wire, 3 prong UL plug
	T9000684	3 wire, 3 prong EU plug
	T9000680	3 wire, 3 prong Australian plug

VFO UNIT (5100)

Symbol No.	Parts No.	Description
	C0014405	VFO ASSEMBLY
	C9014405	VFO BOARD ASSEMBLY

★★★★★ VFO CHASSIS ASSEMBLY ★★★★★

		CAPACITOR
C801	K06173080	Ceramic 50WV UJ 8pF
C803	K06175120	" " " 12pF
C804	K02175180	" " CH 18pF
C805	K02179013	" " " 33pF
C824,826	K13170103	" " " 0.01μF
C802	K30209001	Dipped mica " 1000pF

C825	K70167334	Tantalum 10WV 0.33μF
		VARIABLE CAPACITOR
VC801	K90000024	C521R-112
		TRIMMER CAPACITOR
TC801	K90000001	TSN-100D15 15pF
		INDUCTOR
L801	L0020268	
L806	L1190001	FL-4H 251K 250μH
		RECEPTACLE
J802	P1090012	SI-6303-1
	Q5000005	Lighthouse type terminal
	Q5000011	Wrapping terminal C

★★★★★ VFO BOARD ASSEMBLY ★★★★★

PB-1440B	F0001440B	Printed circuit board
		FET & TRANSISTOR
Q802	G3800190G	FET 2SK19GR
Q801,803	G3303720Y	Tr 2SC372Y
		DIODE
D801	G2022360	Varactor 1S2236
		RESISTOR
R809,811	J00245101	Carbon film 1/4W VJ 100Ω
R807	J00245221	" " " " 220Ω
R805,808	J00245222	" " " " 2.2kΩ
R802	J00245332	" " " " 3.3kΩ
R801	J00245103	" " " " 10kΩ
R803	J00245183	" " " " 18kΩ
R804	J00245223	" " " " 22kΩ
R806,810	J00245104	" " " " 100kΩ
		CAPACITOR
C807	K02173080	Ceramic 50WV CH 8pF
C814	K02179013	" " " 33pF
C808,818	K02175390	" " " 39pF
C811	K02179023	" " " 180pF
C809,810,812, 815,819,820	K13170103	" " " 0.01μF
C813	K30176431	Dipped mica " 430pF
C821,823	K30176471	" " " 470pF
C822	K30209001	" " " 1000pF
		TRIMMER CAPACITOR
TC802	K91000016	ECV-1ZW 50x32 50pF
		INDUCTOR
L804,805	L1190007	FL-4H 1R8M 1.8μH
L803	L1190001	250μH
L802	L1190040	S4-102K 1mH

SWITCH UNIT

Symbol No.	Parts No.	Description
PB-2081	F0002081	Printed circuit board
	C0020810	PCB with components
		IC & TRANSISTOR
Q101	G1090123	IC 78L08
Q102	G3318150Y	Tr 2SC1815Y
		DIODE
D101	G2090001	Si 10D1
D102	G2090127	" S1RBA10
		RESISTOR
R101	J00245560	Carbon film 1/4W VJ 56Ω
R107	J00245221	" " " " 220Ω
R108	J00245561	" " " " 560Ω
R102	J00245821	" " " " 820Ω
R105,106, 111~114	J00245152	" " " " 1.5kΩ
R103	J00245182	" " " " 1.8kΩ
R104	J00245222	" " " " 2.2kΩ
R109	J00245332	" " " " 3.3kΩ
R110	J00245472	" " " " 4.7kΩ
R115	J00245103	" " " " 10kΩ
		POTENTIOMETER
VR101	J50710501	V10K8-1-2 500ΩB
		CAPACITOR
C102	K13170473	Ceramic 50WV 0.047μF
C103	K40120336	Electrolytic 16WV 33μF
C102	K40129006	" " 470μF
		SWITCH
S101	N4090027	4B-0002FC-2060 4B8UUE
		RELAY
R101	M1190002	FBR211AD012M

LED UNIT

Symbol No.	Parts No.	Description
PB-2082	F0002082	Printed circuit board
	C0020820	PCB with components
		LED
D201~210	G2090060	GD4-203SRD
	Q5000011	Wrapping terminal C

FIX UNIT (5100)

Symbol No.	Parts No.	Description
PB-2051A	F0002051A	Printed circuit board
	C0020511	PCB with components
		TRANSISTOR
Q301,302	G3303800Y	2SC380TMY

D301,302	G2015550	**DIODE** Si 1S1555
D303	G2090001	" 10D1
		RESISTOR
R304,305	J00245101	Carbon film 1/4W VJ 100Ω
R306,309	J00245681	" " " " 680Ω
R302	J00245102	" " " " 1kΩ
R301	J00245103	" " " " 10kΩ
R308	J00245153	" " " " 15kΩ
R303,307	J00245223	" " " " 22kΩ
		CAPACITOR
C305	K30176301	Dipped mica 50WV 300pF
C308,310	K30176471	" " " 470pF
C309	K30275821	" " " 820pF
C301,302	K02175101	Ceramic " CH 100pF
C303,306,307, 320,321	K13170103	" " 0.01μF
C323	K13170473	0.047μF
C312	K40170105	Electrolytic " 1μF
C311,322	K40120336	" 16WV 33μF
		TRIMMER CAPACITOR
TC301~306	K91000016	ECV-1ZW 50x32 50pF
TC307	K91000017	ECV-1ZW 70x32 70pF
		MICRO INDUCTOR
L303,304	L1190007	FL-4H 1R8M 1.8μH
L305,307	L1190020	FL-5H 151K 150μH
L302,306	L1190017	FL-5H 102K 1mH
		CRYSTAL SOCKET
XS301	P3090045	S-14 6P
		RELAY
RL301	M1190022	LA1 DC 12V

ACCESSORIES

Symbol No.	Parts No.	Description
	T9100860	Connection cable
		SPARE FUSE
	Q0000013	0.2A