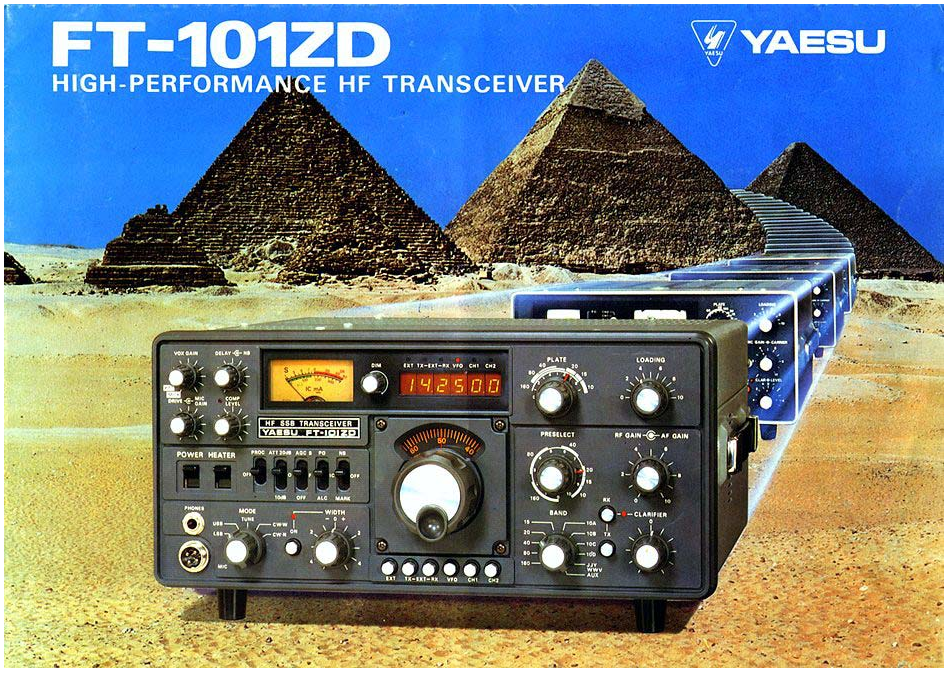


UPDATED

YAESU

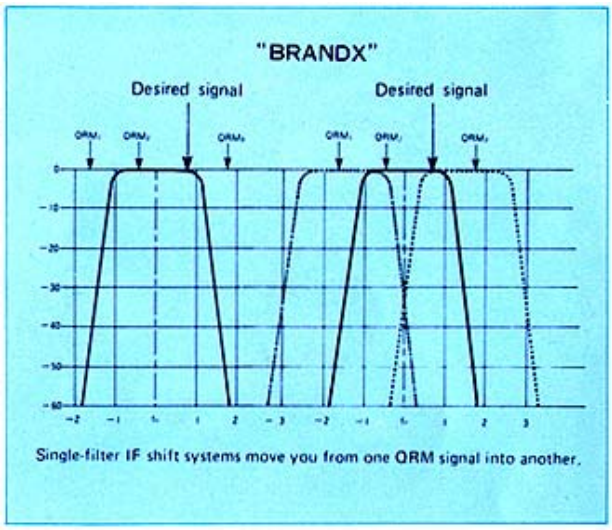
FT-101ZD

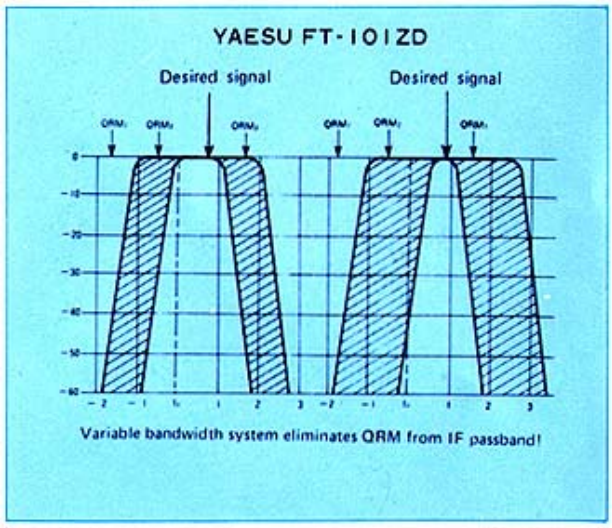
Survival Guide

Version 4 Updated spring 2016

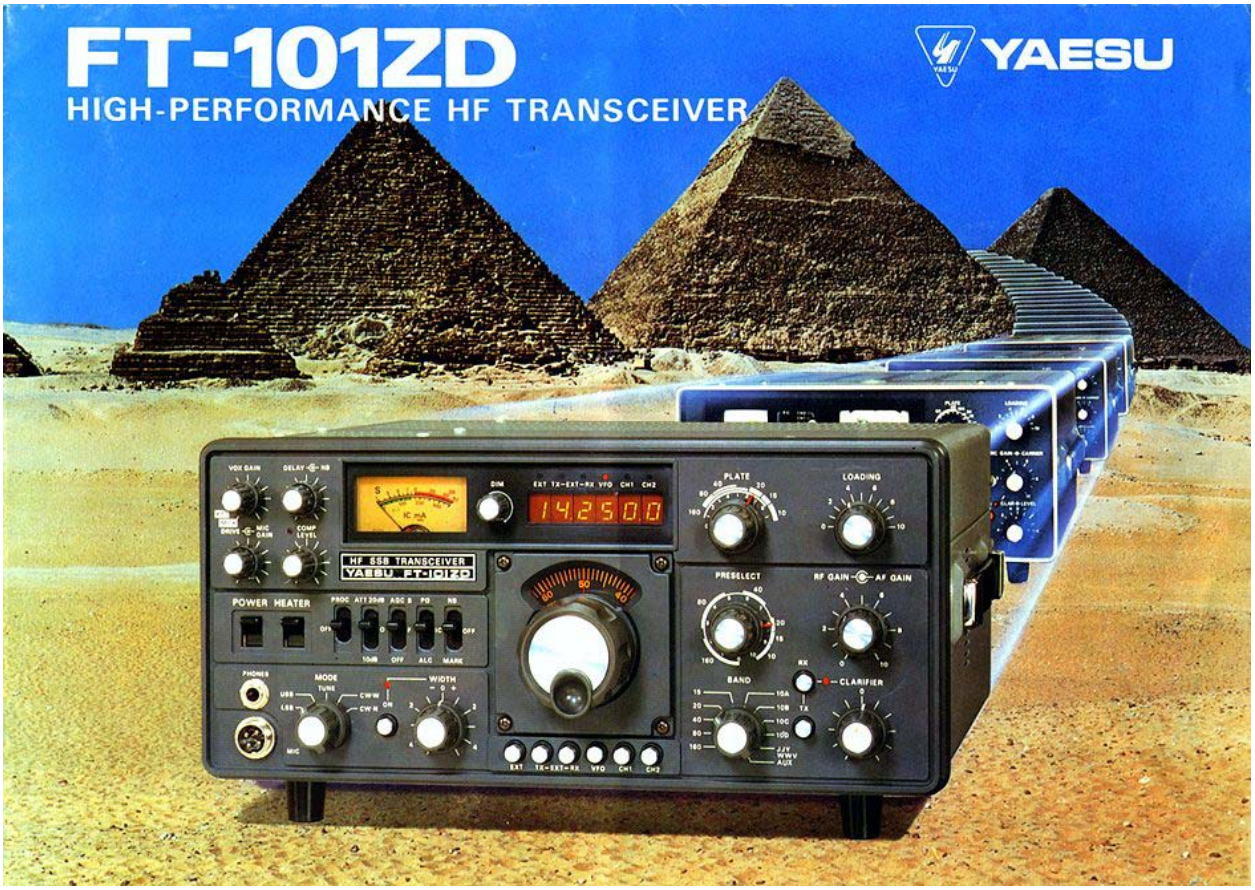
PAØPGA

FT-101Z MK0





Yaesu FT-101Z/ZD series transceiver



Yaesu FT-101ZD page

Presented by:

Fox Tango International and PAØPGA

The FT-101 history

The original Yaesu FT-101 series transceivers, produced in 1970-1978 in ever increasing numbers were a very good alternative for the very expensive American made receivers and transmitters of the time.
They were full of useful options, for which you had to pay much $$$ extra (if available) in other ham equipment.
Build like a battleship, with a modular construction, it was easy to repair, and the big numbers which are still around, prove the sound work of the Yaesu engineers at the time.
The FT-101 series was very successful, and there were many versions of it, starting with the FT-101, released in 1970 to the FT-101F, who was released in 1978. See the FT-101 page on the FoxTang website for more information for the FT-101 series of transceivers.

The Yaesu FT-101ZD was brought on the market in 1979, as a low-cost alternative for the FT-901ZD, which is the real descendant of Yaesu's famous FT-101 series of transceivers.
As Yaesu already had a very good reputation for performance and durability, it is no wonder that the new series transceivers became very popular in the ham community, special in Europe, because the high $$$ price of the available American equipment and the high import taxes on them, and the fact that there where almost no agents prohibited a broad distribution of American equipment. I still think the American industry at the time missed a chance here.
Only Heathkit had a representative over here, and was very popular at the time for their nice kits.
Yaesu had a small sales network in Europe and the Swiss firm Sommerkamp imported the same sets under their own typenumbers and under the name Sommerkamp, they were a big success in Italy and Germany.

The FT-101Z/ZD

In 1979 Yaesu announced a new version of the FT-101, called the FT-101Z (analog dial) and ZD, (with digital dial).
The FT-101ZD looked very much like the FT-901, but had a simpler internal construction with just a couple of plug-in boards for HF, premixer and oscillator. The IF and the audio board, were connected with plugs from a wire harnass, the power supply boards are soldered direct to the wire harnass, thus not the overall modular construction that made the older FT-101 and new FT-901 so popular.
Altough the construction of the FT-101ZD was simpler, the transceiver was packed with useful features, that appealed to many hams, (including myself, I bought one in 1979, and still use it almost daily,).
It had a very sensitive receiver, SSB and CW modes, a digital display, very liniair VFO, smooth tuning, a good set of filters, a PA with real transmitting tubes (6146B's), speech processor, IF shift with passbands between 300hz and 2.4khz, a clarifier, a calibrator and a noise blanker, making it a very complete package for a very reasonable price. Later models had also AF notch/peak filters, WARC bands and AM/FM capability. There were outputs for connection to a transverter and liniar amplifier, inputs for a second VFO and phone patch. It was one of the best buys you could made at the time.
The FT-901 had even more bells & whistles, but had also a $ 1000 higher pricetag.
The transceiver is very well build, with good quality components, and, if used normally, will last forever. Weight is in excess of 15 kg, due the built-in power supply, giving it the feel of a battleship.
The powersupply can be fed from 100/110/117 or 200/220/235 Volts 50/60hz, and with the optional switching unit, even from 13.8 Vdc, altough you need a heavy-duty car battery. (current in voice peaks around 20 Amps).

Analog model FT-101Z

FT-101ZD MK1

Specifications FT-101Z, FT-101ZD:

Type:	Amateur HF transceiver		
Frequency Range:	10-160m,	(early models had no WARC bands)	
Mode:	SSB/CW,	(later models also AM or FM)	
RF Power output:	SSB/CW	100W	
	AM	35W	
Sensitivity:	SSB/CW:	0.25 uV (10db S/n)	
	AM:	0.5 uV (10db S/n)	
Selectivity:	SSB/AM	2.4 khz @ -6db,	4 khz @ -60db
	CW	600 or 300 hz, (optional)	
Image rejection:		- 60 db (160-15m)	- 50 db (10m)
Display	FT-101Z	analog dial	
	FT-101ZD	analog + digital dial	
Power:	Mains,	100-235 V ac 50/60hz	13.8 Vdc option
Current drain DC:	Receive:	5.5 Amps,	1.1 Amps with heater off)
	Transmit:		Max. 21 Amps.
Impedance:	50 – 75 ohms,	SO-239 connector	
Dimensions		345 * 157 * 326 mm (W*H*D)	
Weight:	15 kilograms		
Manufactured:	1979 – 1982		
Accessoires:	FV-101Z	external VFO	
	FV-101DM	external scanning VFO (only for the Mk3)	
	FL-2100Z	Linear Amplifier 1200W SSB, 1000W CW	
	SP-901P	External Speaker/Phone Patch	
	FC-901	Antenna Coupler	

The FT-101ZD is updated several times during its lifetime, and there are in fact 4 different types, using the same designator. By the introduction in 1979, the transceiver had only SSB and CW, later there was a AM (tx/rx) option, still later the Warc bands were introduced, and the last version had it all, including a optional AM or FM board, and Audio notch/peak filter.
The later models have more features, so they are more in demand, and are normally higher priced in auctions or on the internet. It seems difficult to see what the difference is between the first and last models because there is not much changed on the front.
Fortunately there is a easy way to see at a glance the difference between the various models, the only thing you need to know is the serial number of the set.

The Yaesu serial number on the back of the set consists of a number, a letter and 6 numbers:

The first number is the year of production:	9=1979, 0=1980, 1=1981 a.s.o.
The letter is the production month:	C=jan D=feb E=march a.s.o.
The next 2 numbers are the production run:	from 01 (first series) to 30 and higher (last series)
The next 4 numbers are the serial numbers:	from 0001 to 9999

Identification of the model is easy by the use of the production run:

FT-101Z/ZD MK0 Production run: 01 – 07, all in 1979
160-10m, SSB/CW, only, WWV rx-only, aux

FT-101Z/ZD MK1 Production run: 08 – 16
160-10m, SSB/CW/AM, WWV rx-only, aux
Only Run 16 has the new type counter.

FT-101Z/ZD MK2 Production run: 17 – 23
160-10m + WARC, SSB/CW/AM

FT-101Z/ZD MK3 Production run: 24 – 30 and up.
160-10m + WARC, SSB/CW/AM **or** FM
The last serie is also easely identified by the grey and silver knobs on the front.

The **MK0** model has SSB and CW only, and covers the bands 160,80,40,20,15 and 10m.

The MK1 model has SSB, CW and AM , and covers the bands 160,80,40,20,15 and 10m.

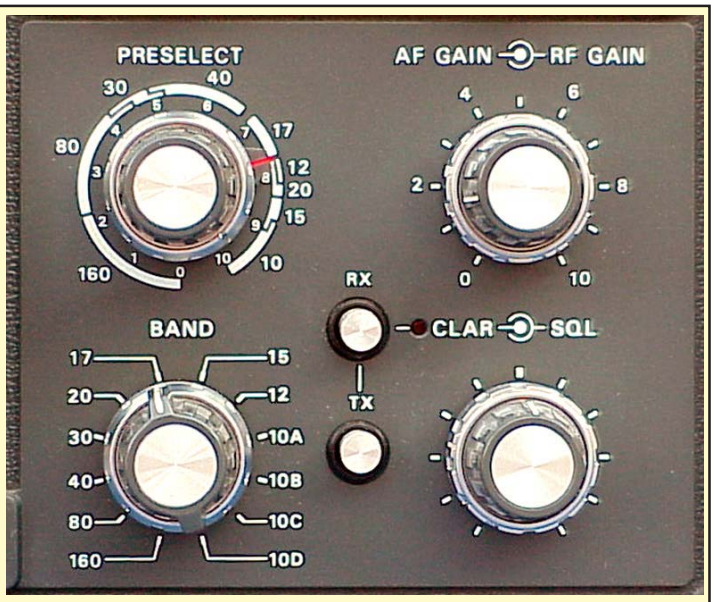
The **MK2** model has SSB, CW and AM and covers the bands 160,80,40,30,20,17,15,12 and 10m.

Differences between the Mk0/1/2/3

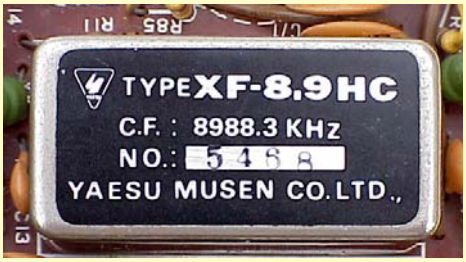
The **MK3** model has SSB, CW and AM or FM and covers the bands 160,80,40,30,20,17,15,12 and 10m.

The switchboard in all models of the FT-101ZD has the same functions, but in the MK0, MK1 and MK2 models they have black tumblers, in the Mk3 they have silver tips, fitting by the silver rings on the knobs.

All models have a width control for varying the passband of the IF filter(s), the MK3 has additional a audio APF/Notch filter.



The Bandswitch of the MK0 and MK1 have 11 positions for the standard amateurs bands 160, 80, 40, 20, 15, 10m, a receive only position for 5 - 5.500 Mhz, and a position for a optional band. The MK2 and MK3 bandswitch has 12 positions for the 160, 80, 40, 30, 20, 17, 15, 12 and 10M bands, so includes the WARC bands.
The Preselector and the Plate tuning have in the MK0 and MK1 positions for the “old” hambands, in the MK2 and MK3 they have also positions for the WARC bands that overlap here and there.
All three models have a clarifier, wich allows tuning of +/- 5 khz around the original frequency, just enough for split-frequency DX work, or for round-table QSO’s, if one of the members is not spot-on the frequency. The clarifier can be used in receive or transmit mode, or both.
In the MK3 model (here on the right) there is also a Squelch knob for use with the optional FM board.



Optional CW Filter

In the FT-101ZD, a CW filter is an option, and can easely be installed on the IF board. The normal CW filter has a bandwith of 600 hz. Later there was also a filter of 300hz, but using this filter, there is a serious loss of signal, both on receive and transmit, because the smaller bandwith.

The FT-101Z story

The FT-101Z was the budget version of the FT-101ZD, with a nice and surprisingly exact mechanical dial instead of a digital dial, but otherwise both models are the same in every way.
The FT-101Z was delivered in all the versions, from MK0 to MK3.
The digital counter module was an option and update is easy if you can find one because all wiring is available in every transceiver. Just plug it in.
For all models with a serial number under 159999 you need the early type counter module with TTL IC’s, above 16000 the newer counter with LSI chip.

PAØPGA

The various models and the used boards

	FT-101ZD MK0	FT-101ZD MK1	FT-101ZD MK2	FT-101ZD MK3
Sn#	01 – 07xxxx	08 – 16xxxx	17 – 23xxxx	24 – upxxxx
RF board	PB1960A	PB1960A	PB2154	PB2154
NB/Fix	PB1961B	PB1961B	PB1961B	PB1961B
Premix	PB1962A	PB1962A	PB2152	PB2152
IF	PB1963B	PB1963C	PB1963C	PB1963C
AF	PB1964A	PB1964A	PB1964A	PB1964A
Premix LO	PB1965	PB1965	PB2153	PB2153
Sel.switch	PB1966C	PB1966C	PB1966C	PB1966C
VFO	PB1440B-3420	PB1440B-3420	PB1440B-3420	PB1440B-3420
Rect A	PB1967	PB1967	PB1967	PB1967
Rect B	PB1968A	PB1968A	PB1968A	PB1968A
Capacitor	PB1969A	PB1969A	PB1969A	PB1969A
Trimmer A	PB1970	PB1970	PB1970	PB2193B
Trimmer B	PB1970	PB1970	PB1970	PB2192B
Trimmer C	PB1092	PB1092	PB1092	PB1092
Bandwidth	PB1972	PB1972	PB1972	-
APF	-	-	-	PB2217
Driver	PB1714A	PB1714A	PB1714A	PB1714A
Final	PB1715A	PB1715A	PB1715A	PB1715A
Clarifier	PB1973A	PB1973A	PB1973A	PB1973A
LED	PB1974A	PB1974A	PB1974A	PB1974A
Lever switch	PB1975A	PB1975A	PB1975A	PB1975A
Display	PB1978	PB1978 (*)	PB2098A	PB2098A
Decoder	PB1979	PB1979 (*)	-	-
Counter	PB1980	PB1980 (*)	PB2086A	PB2086A
AM (**)	-	PB2040	PB2040	PB2040
FM (**)	-	-	-	PB2218

(*) only production numbers starting 16xxxx had the PB2086A counter
(**) optional, the AM board, or the FM board can be installed (MK3 only).

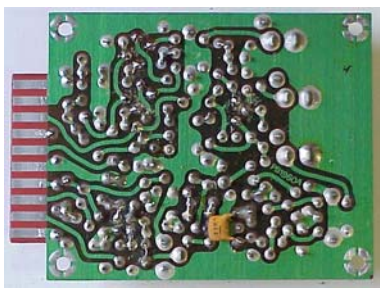
The used boards in detail:

RF boards
PB1960A and PB2154A

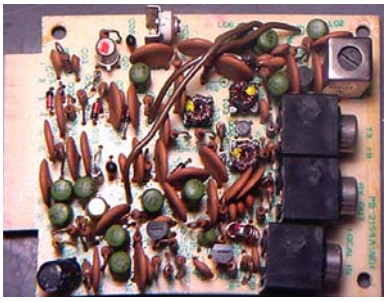
Contains the RF pre-amplifier, the receiver and transmitter mixer and a buffer stage, The mixer output of 8.9875Mhz goes to the IF board. The in and output tuning of the RF amplifier is done by permeability-tuned circuits, resulting in high sensitivity and excellent rejection of unwanted out-of-band signals.

The difference between the two boards is the mixer. The PB1960A uses a balanced mixer with 2 Fet's, the later PB2154A board uses a diode ring mixer, for a better big signal behavior.

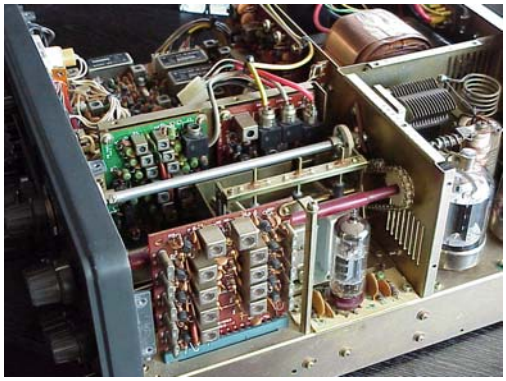
PB-9060A RF board component side

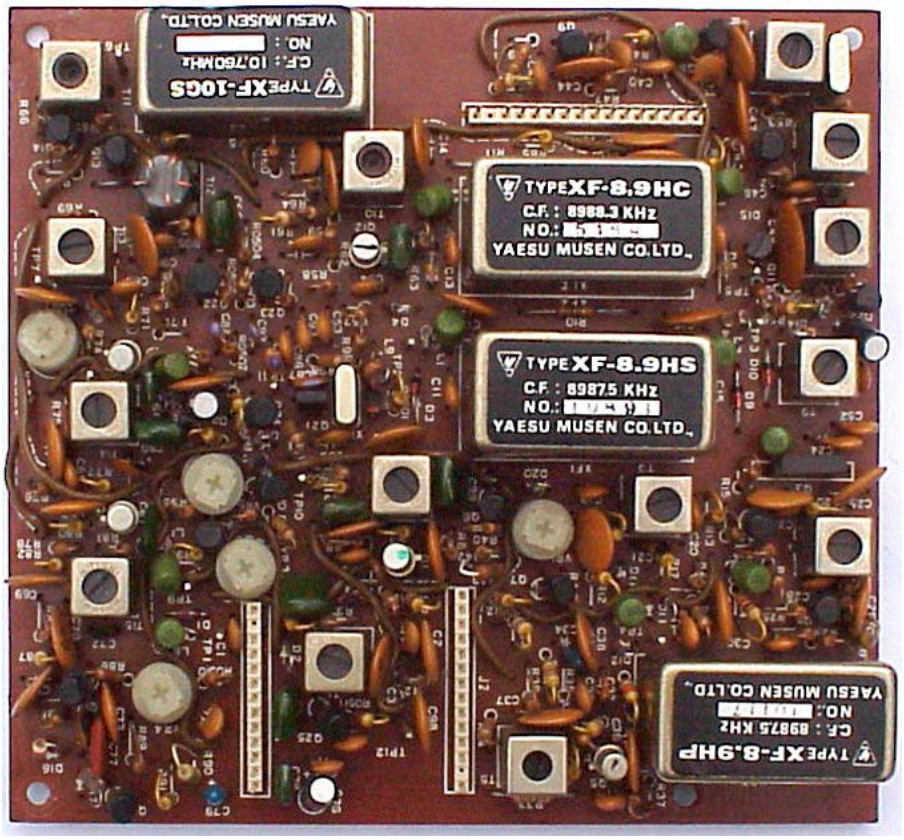


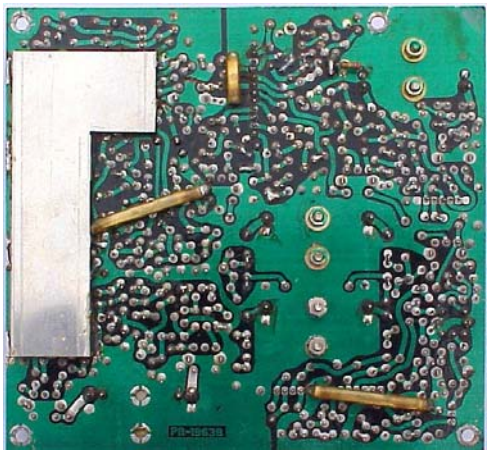
PB-9060A RF board solder side

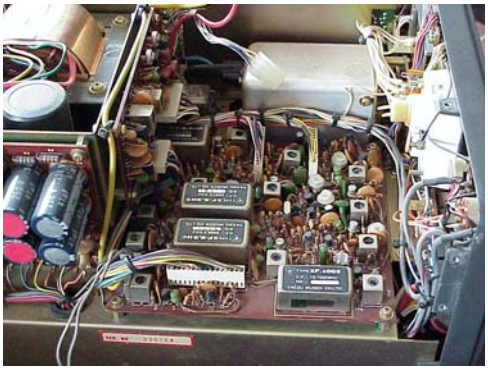


PB-2154A RF board component side



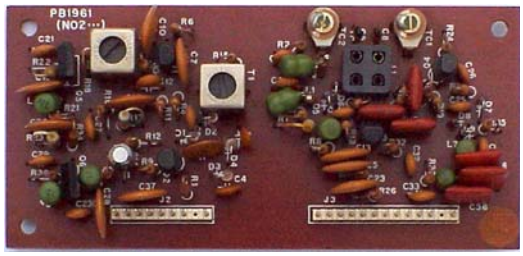






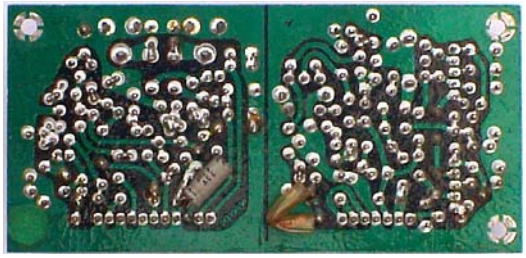
IF board
PB1963B/C

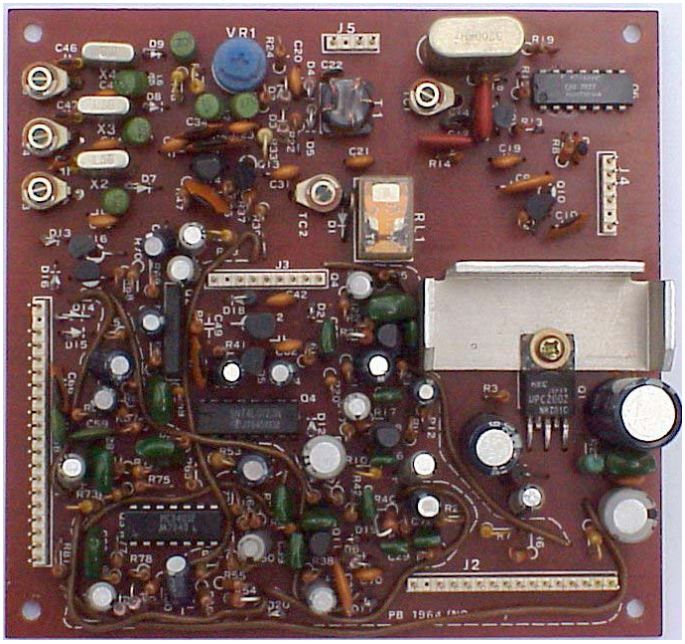
The IF board is the heart of the transceiver, and is the same in every type of FT-101ZD.
The signal is first passed trough a monolithic filter with a bandwith of 10 khz, to have a wide band point for noise blanking. The signal pass then the noise blanker gate and is fed trough the SSB filter or the optional CW filter to the IF first mixer. Here the incoming signal is heterodyned with a 19.7475 Mhz local signal. This local signal is delivered from a XCO and the resulting mixing frequency is 10.76 Mhz. This 10.76 Mhz signal is fed trough a second SSB filter, and mixes with the same 19.7475 Mhz local signal back to the original IF frequency of 8.9875 Mhz. The 19.7475 Mhz XCO is tuned with a varicap over a close range, and the result is that the passband of the first and second filter shifts along each other, so in effect making the passband smaller or broader, depending of the frequency of the XCO. It is a very useful item, you can make the band pass as low as 300 hz, and as high as the original passband of the first filter. (SSB 2.4 khz, CW 300 or 600 hz). The skirt of the filters add, so the filter passband improves too.
The output from the second IF mixer is fed to a 2-stage IF amplifier, and is delivered to the AF unit.
On the board are also a AGC amplifier and S-meter amplifier, the SSB tx IF filtering and the speech processor with filter.
The board has the SSB filter installed, and there is room for installing a 300 or 600 hz CW filter (XF-8.9HC).

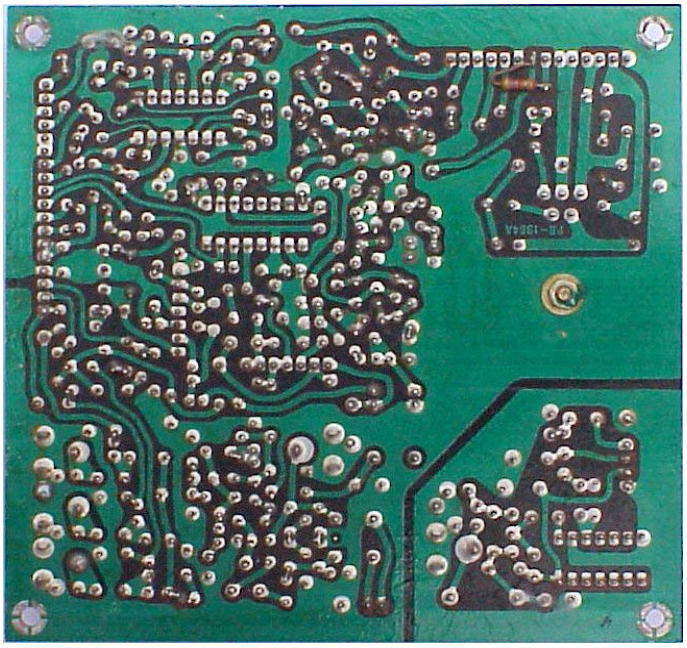


NB-Fix unit
PB1961

This board is also used in every FT-101ZD, and contains the noise blanker circuitry and a x-tal oscillator for 2 fixed frequencies. The fixed frequencies are sideband dependent, so the operating frequency is on LSB 3 khz higher than on USB at a given x-tal frequency.
The necessary x-tals have to be in the VFO (5 – 5.5 Mhz) range.





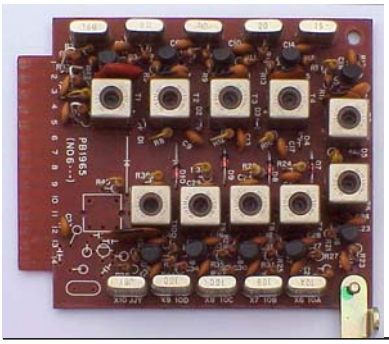


AF Unit
PB1964

The AF unit board contains the SSB/CW diode ring demodulator and the carrier oscillator:
USB, CW rx 8989 khz
LSB 8986 khz
CW tx 8988.3 Khz
The audio signal is amplified and delivered to the internal or external speaker.
On the AF board is also the marker generator, who provides a 25 khz marker signal for alignment and testing purposes.
The tx microphone amplifier with sideband generator, and a 800 hz sidetone generator for CW are also a part of the AF unit. The AF unit board is used in every model.

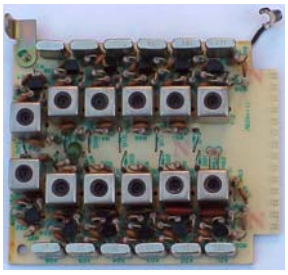
VFO Unit
PB1440B-3420

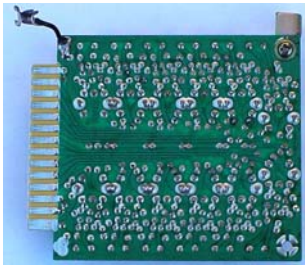
The VFO uses a modified Collpitts type oscillator to generate a 5 –5.5 Mhz VFO signal, producing a 500 khz tuning range. The VFO tuning is extremely liniair over the entire range, no small feat with the use of a “normal” tuning condenser. Stability is very good, and tuning is very exact with the smooth precision gear. The VFO is one of the reasons for the good overall stability of the transceiver.
The VFO frequency can varied by a small amount, providing a offset of +/- 5 Khz, by a varicap diode and a controlling voltage. (Clarifier), very useful when you are in a net, when all members are not exactly at the same frequency.
Can be used in TX and Rx mode, or both.
This VFO unit is used in all the FT-101ZD and FT-901DM series transceivers.



Premix Local Unit (Mk0 and Mk1)
PB1965

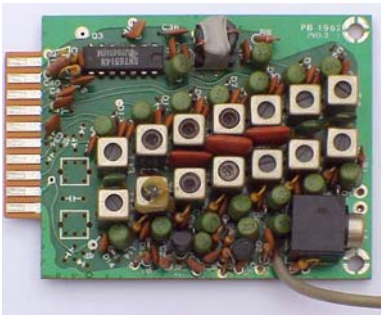
This plug-in board has 10 crystal oscillators, who are selected by diode switches, they generate the premix local signal for each of the amateur bands + WWV. It is possible to add another band on the board, by adding the neccessary components and rewire the bandswitch.
The local signal is delivered to the Premix Unit.

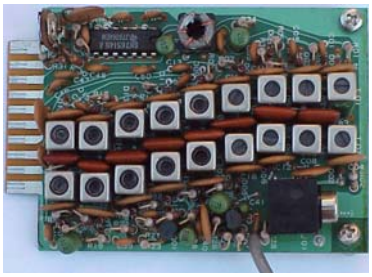




PB2153

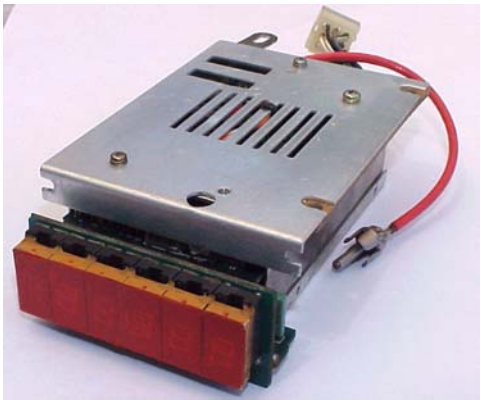
This is the newer plug-in board, used in FT-101ZD MK2 and MK3, that has all amateur bands including the WARC bands 30m, 17m, and 12m. This board has no WWV or a optional AUX band.





Premix Unit
PB1962, PB2152

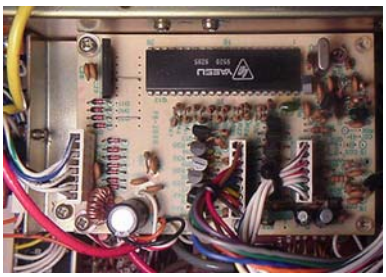
The premix unit mixes the signal from the Premix Local Unit with the VFO or crystal controlled signal in a double balanced mixer. The premix signal is passed trough a bandpass filter and delivered to the RF Unit. The older board PB1962 has 7 filters, the newer WARC board PB2152 has 9 filters, for coverage of all amateur bands, including the WARC bands in the FT-101ZD MK2 and MK3. See the table.



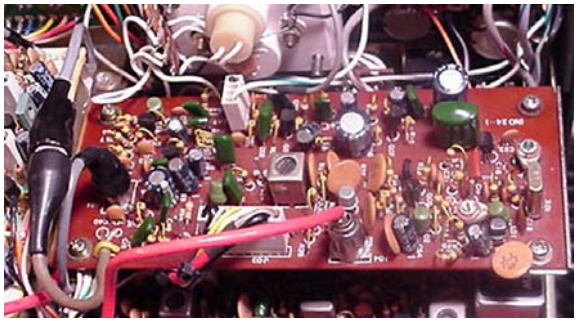
Counter Unit
PB1978, PB1979, PB1980,
Used in production runs 01 to 15 in the 101ZD
This counter is a complete enclosed unit, consisting of a display board, a counter board and a count/ decode board. The unit uses standard TTL circuits. The counter has a offset programming to display the correct frequency of the carrier in a ingenious manner. The counter is programmable for other offsets with dipswitches. The counter uses 6 HP red LED displays, for a frequency readout to 100 hz.

TIP

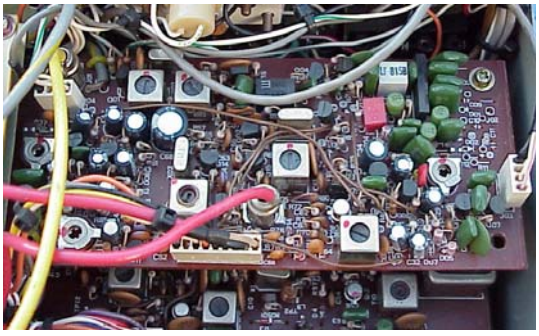
The MSM-9520RS was produced solely for Yaesu, and was never on the market. There is a kit available, with a PIC processor, wich substitutes all functions. See the page 19 or the site: http://homepage3.nifty.com/RadioGaGa/COUNTER_e/



PB2086A-3420, PB2098
Used in production runs 16- to the end in the 101ZD series This counter uses a custom LSI chip, the OKI MSM-9520RS, wich has all the possibilities of the older counter including the frequency offset in one chip. The rest of the board is used for the transistor digit and segment drivers. The yellow LED displays in this counter are multiplexed.



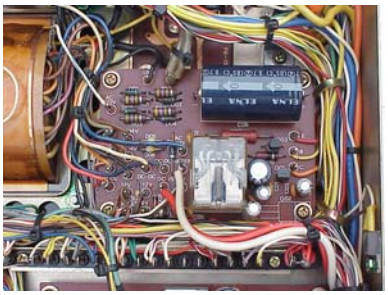
AM Unit
PB2040
The AM print has a AM detector and audio pre-amplifier, and at the transmitting side the necessary circuits for the production of a AM signal.
This board is used in the FT-101ZD MK1, MK2 and MK3. It is a optional board, so it is not used in all transceivers.



FM Unit
PB2219

This optional board is used for receiving and transmitting in FM mode. The board uses the same connections as the AM board, which must be removed (if installed) when installing the FM board. Only one board can be installed at a time, so you must make a choice. Installing is rather easy.
This board can be installed in production runs from 24 up, the FT-101ZD MK3

Power Supply



PB1967
Rectifier A board.

This board delivers all the high and low voltages used in the transceiver, so be careful, there are points with 900 Volts dc on this board, and that voltage can do serious damage to a unsuspecting Ham to say the least.
Unload always the condensors, preferabely with a resistor, before starting to work at this circuits.
The board is positioned in the underside of the transceiver and delivers the various low voltages (6, 8, 12 Volt dc) and the 900Vdc for the Power Amplifier.
This board is used in all models of the FT-101ZD.

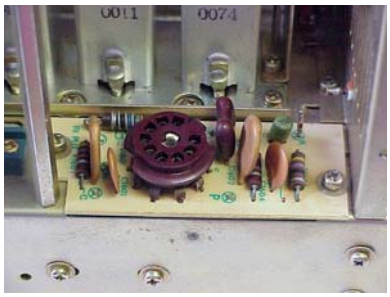
PB1968
Rectifier B board

This board delivers the bias voltages of the PA unit, the 150, 160, 200 and 300 Vdc for the driver and Power amplifier. This board is mounted at the left side of the transceiver.
On this board is also the CW keyer circuit.
The board is used in all models.

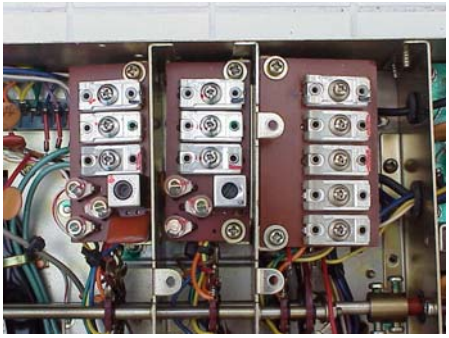
APF/NOTCH unit
PB2217

The APF unit is switched in the audio circuit by the APF/Notch switch on the frontpanel.
For APF operation it forms a selective active filter, to narrow the passband of the receiver for a better reception on a crowded band.
The notch function elimenates selective some audio frequencies, like carriers or other interfering signals.
The center frequency of the APF/Notch is adjustable from the front.
This unit is used only in the MK3 model.

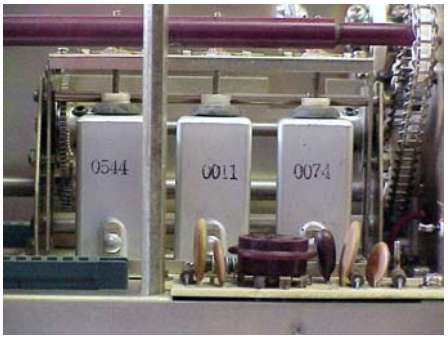
12BY7A Driver board
PB-1714A



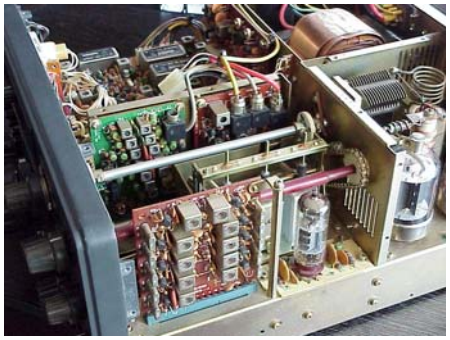
The driver board amplifies the SSB/CW signal and feeds it to the PA.
The driver uses a tube (12BY7A) for delivering the neccessary power, and the tube is also used in the automatic level control circuit (ALC).
Part of the output is available at a connector at the back, for use with transverters or other purposes. It delivers 3V RMS into 50 ohms.
Tuning is done with the same inductive tuning unit, that is used by the RF board.
The inductive tuning allows a constant output over a greater range.
The heater of the tube is switched by the heater switch on the front. Using this switch during longer receiving-only periods, the tube will last much longer, and there is less heating up. Warming up time for the tube is abouth 60 seconds.
If you have lower output from the PA, check this tube first.



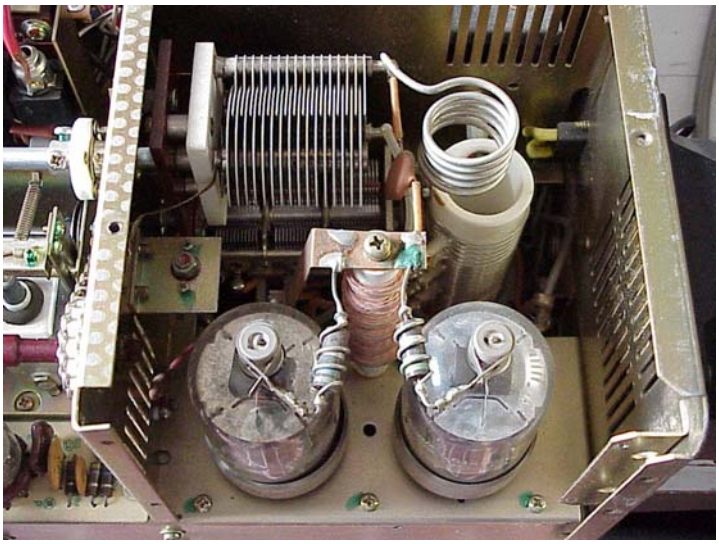
The trimmer boards (MK0/1/2)

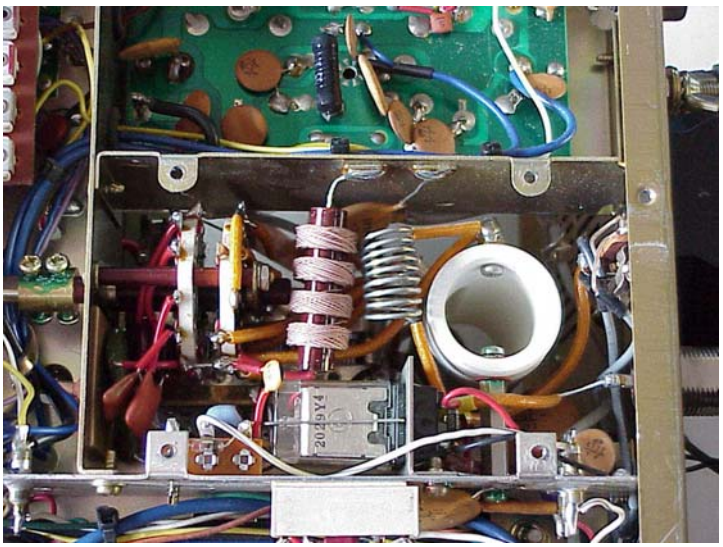


The inductive tuning unit



The Driver board position

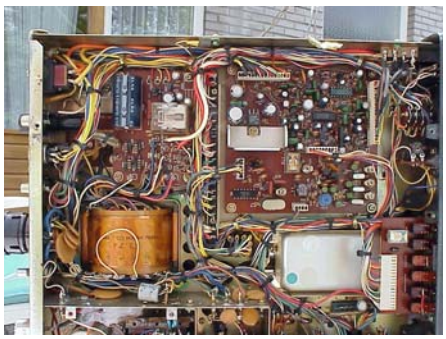




The Power Amplifier
PB-1715A

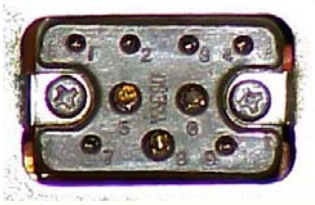
The Power Amplifier, consists of two 6146B heavy duty transmitting tubes, the input filter and the output filter.
The output filter delivers the RF signal to a suitable antenna. The impedance from the antenna has to be between 50 and 75 ohms unbalanced. A Antenna with a different impedance at the feedpoint can be used, but there must be a matching device between the transceiver and this feedpoint. The same goes for other antennas with a lower impedance such as magnetic loops and others.
The 6146B PA tubes are very rugged, and can deliver around 100 -120 Watts output depending on the band of operation, by a input of 180W in the SSB and CW mode. In AM mode the maximum input power is 45 Watt. This is due the fact that the SSB signal has just one sideband, which has only 25% of the power factor of a AM signal, so the tubes can deliver in SSB 4x the power of a AM signal, at the same dissipation.
It is never a good idea to push the PA to the limit, it is much better to run the PA with powers around 150W input in SSB/CW, the tubes will last much longer, and the difference at the receiving station is minimal. You will be surprised how many DX stations can be worked with low power. It all depends on an effective antenna, band conditions and operating skill, and not only big power: you have to double your power output to make a S-point difference at the receiving station!
A good antenna is a better investment than big power: It works 2-ways, you even hear the station coming back to you:).

6146 series tubes:
There are several different types of 6146 tubes, and, now tubes are getting scarce is it good to know what possibilities there are for replacing the tubes with others. The FT-101ZD uses the 6146B type, which has the biggest dissipation, thus the biggest output, but has a bad reputation for VHF oscillation and TVI as result. They must be very good neutralized, otherwise the PA destroys itself. The basic 6146 and 6146A (same tube, with a sturdier heater) is still around in great numbers an can be used if there are no 6146B's available. The only drawback is the lower power capacity: the anode dissipation is 25% lower and they need a new neutralization and a correction of the bias voltage.
Another tube is the 6146W, a military designation, used as a remplace for 6146, 6146A and 6146B in the forces. This tube has a rugged construction, similar to the 6146B, but the saying goes that the input power on this tube should also be reduced to ca 75% of the nominal output of the 6146B. 6146 and 6146A may be mixed, but never mix a 6146(A) with a 6146B, because you are in for very strange effects, and some fireworks.
There are other tube designations, they are put together in a small table at one of the next pages.



Accessories:

Cooler Fan
The optional cooling fan can easely installed on the FT-101ZD. If you use another fan than the original Yaesu fan, see to it that the voltage on the connector is 100 Volt ac.



DC-DC Converter
The DC-Dc converter allows the mobile use of the FT-101ZD, on a 13.8 Vdc source. The unit is installed on the back of the transceiver and uses the internal transformer to obtain the proper voltages. The power connection is made by a special DC cord, delivered together with the DC-DC converter. On the later Mk3 version this connector is not fitted and is part of the optional DC-DC converter packet.

FV-101Z external VFO
This is a compact remote VFO for the FT-101ZD. The VFO has a analog frequency display. If you use it with a FT-101ZD, the frequency is displayed on the digital display from the FT-101ZD. The VFO has a precision tuning mechanism with a silky-smooth operation. Clarifier for transmit,receive or transceive frequency is included. The VFO shift range is +/- 8khz. Up to 6 crystal-controlled channels may be installed. The necessary crystals have to be in the 5 - 5.5 Mhz range.

FV-101DM external VFO
This VFO has twelve memories, up/down scanning, keyboard frequency entry and receiver offset tuning in 10hz steps. This provides smooth and precise tuning for SSB and CW. Either the keyboard, main tuning knob or up/down scanning buttons can be used for quick QSY to you preferred operation frequency. Up to four of you most used memory channels can be protected from overwriting, when you store frequencies. The two-loop PLL circuit is designed to produce a crisp, clean output signal for a spurious-free receiver and transmitter.
This VFO can only be used with the FT-101ZD MK3, serial numbers above 240001

YR-901 CW-RTTY reader
The YR-901 is a microprocessor controlled code processor that decodes Morse and Teletype signals and displays plain text on a standard monitor, as well translating ASCII and teletype machine output into morse or teletype signals.
It displays a 5x7 dot matrix caracters in english or Japanese Kana code in Japanese characters. Instead of a noisy teletype machine it can also use the YK-901 ASCII keyboard for Morse and RTTY. For FSK, all of the common shifts may be used. 45.5 and 50 baud are standard, while a easy modification for 57 and 75 baud is possible. The CW input frequency may be varied between 600 hz and 1 Khz.

FL2100Z Linear Amplifier
The FL-2100 is special designed for the FT-101ZD transceiver. It uses two rugged 572B/T160 transmitting triodes in a class AB2 grounded grid configuration.
Power input is 1200 watts PEP on SSB and 1KW on CW, on all bands, including the WARC bands 10, 18 and 24 Mhz. The linear has 2 fans for cooling the final tubes, and special protection circuits for the output tubes and the tank circuit.
During standby is the antenne switched to the transceiver and the built-in SWR meter allows monitoring of the feedline during either amplifier or exciter-only operation.
The heavy-duty powersupply requires no warm-up time and has excellent regulation.

FT-901DM accessoires on the FT-101ZD

The FT-101ZD can use accessories of the FT-901DM, but there are some restrictions at their use.

FV-901DM external VFO

This is a external VFO that provide a synthesized control system for your FT-101ZD. It has a 3-speed scanner, which will take you instantly everywhere in the band, and the auto-scan feature sweeps the band until it finds a signal. The synthesizer has a steprate of 100 hz and is coupled to a 40-memory bank for storing the frequency. Fine tune is done with the TX/RX clarifier.
Because there is no frequency display on the FV-901DM, use of this VFO in combination with the analog FT-101Z is not possible, as the operating frequency cannot determined.

FTV-901R transverter

The FTV-901R is a 3-band VHF/UHF transverter, all in one compact case. The basic FTV-901R comes equipped for 144 – 148 Mhz. 6 meter and 70 centimeter modules may be added.
The satellite 1-3 bands provide operation on OSCAR modes A/B/J on full duplex, when a external receiver is used. Repeater split is provided on 6 and 2 meters.

YO-901 Multicscope

The YO-901 Multiscope provides superb monitoring capability, with a instant interface to the FT-101ZD and can be used to monitor the output signal with trapezoidal and two-tone tests, general oscilloscope measurements are also possible. A panoramic adapter is a available option for a quick band activity examination. IF rx and tx monitoring is not possible with the FT-101ZD combination.

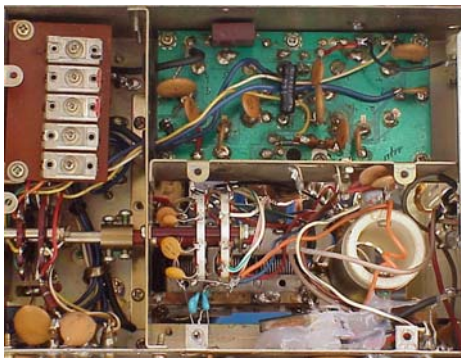
SP-901P speaker/hybrid phone patch

The SP-901P features a shaped-response loudspeaker and a hybrid phone patch, allowing efficient operation during patches. Styling and size match the FT-101ZD and FT-901DM series.

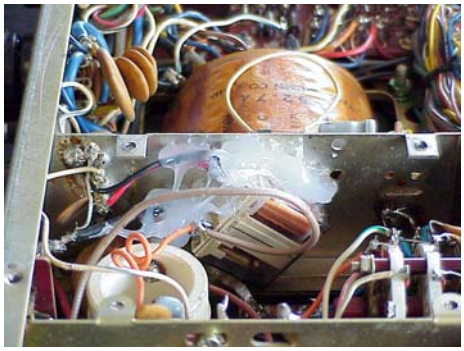
FC-901or FC-902 Antenne coupler

The FC-901 antenna coupler presents a 50 ohm load to your FT-101ZD transceiver, all across the band. 3 coax-fed and one random-wire antenna may be accomodated.
The SWR and Power metering allow quick determination of proper matching conditions.
The FC-901 has the Classic Ham-Bands, The FC-902 has the Warc Bands included. Max power is 400 Watts.

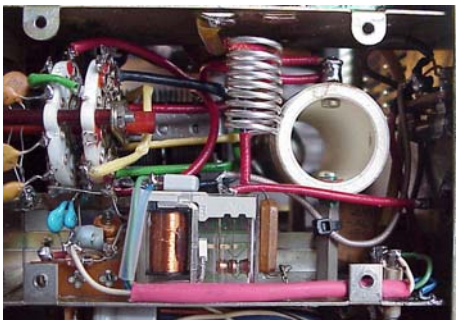
The PA with 6146A and 6146B tube



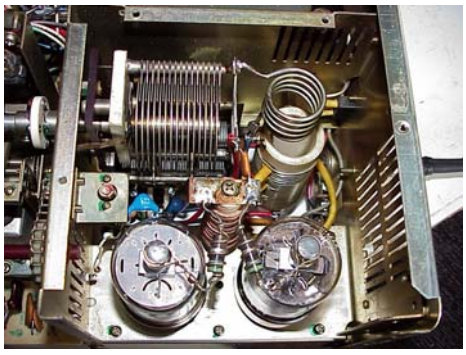
The “skilfully repaired” PA



The creative relay solution and choke



The PA now, after reconstruction



The rebuilt PA with 6146A tubes

A Internet buy

Recently I bougt a FT-101Z on the Internet for a reasonable price, intended more or less as spare for my FT-101ZD, that I own for almost 36 years now, obtained new in 1979, one of the first production runs. The normal asking price overhere is around 350 Euro’s, depending on condition. The price at 175 Euro (around $200) was good. The distance to the owner was under 100 Km, making collecting possible. That way I could see what I got, (it is not the first time that the pictures used by the auction have nothing to do with the actual set). Well, the set was also a early version from 1979, so in view of spares for my own transceiver it was ok. It looked nice enough, some scratches on the top and sides, but a nice front. After removing the cover, I saw that the cover of the PA was missing and that the neutralizing condenser was not connected. The receiver worked ok, I could test that with the griddipper that I always take with me for this purpose. The Ham was using it for the reception of weather cards at the time, but had now a transceiver with a general coverage receiver, for a better coverage. The FT-101Z had of course a analog display, and was with the optional CW filter. The overall sight of the interior was very nice, and at first sight I saw no modifications. The original crystals were there for all amateurbands, the first thing to look for, because many sets are converted to 11 metres and have had a life of hard labour. Only the PA was a mess, it had been repaired, but in a very crummy way, so I had to restore it back to the original form. Some wires were half molten and the original wiring was changed. I could not test the set on the air or at a dummy, because the seller had only a piece of wire as antenne. The tubes were glowing, so I took the set at home. Altough it was bought for spares, I could not resist the challenge to make it working again.

Pulling it apart for a box of maybe never used parts was not in the book. Besides: you can better have it in one piece, that takes less room then putting the innards in boxes is my experience. And.. You find the part when you need it, instead of rummaging in several junk boxes. Then, the set looked very nice after some cleaning and inspecting. I could always use it as receiver when the PArestauration failed.

There were no further surprises, only a rewired mike connector, and some scratchy switches and potmeters. The components, including power supply condensers and solder joints were OK. However, when I pulled the PA tubes, I saw to my surprise that they had put in a 6146A along a 6146B tube, one of the most serious mistakes you can make with this tubes. You have to have 2x 6146(A), or 2x 6146B, and preferabely a matched pair for optimal use. The input relay was changed in a very crude way, glued to the chassis with a blob of silicone and the output lowpass filter was removed. Here had someone very hard worked with a Golden screwdriver..

I have all wiring redone with 0.8mm silvered wire, isolated with the original oil tubing, repaired the coil connections, rewired the neutalizing parts and the output power meter. A new coil for the output lowpass filter was made from 1.2mm silvered wire and I put in a new antenna relay with 16A silver contacts. I think the PA looks a lot better now.

I have used a couple of 6146A tubes in this set, because they were at hand, and to test the possibility for using that kind of tubes in this PA. They work fine. The power output is not important for me, 100 Watts does everything I need, and the output tubes will last forever. In my first FT-101ZD I have still the original General Electric 6146B final tubes, and they look and work as new.

After all was said and done, I ended thus with 2 working transceivers and still no spares. :)

Now, in 2016, I can say that there is no need to keep spares, this transceivers will outlive us easely when carefully used and maybe a little TLC (Tender Loving Care)

73 Wim PAØPGA

Modifications to the FT-101ZD RF board:

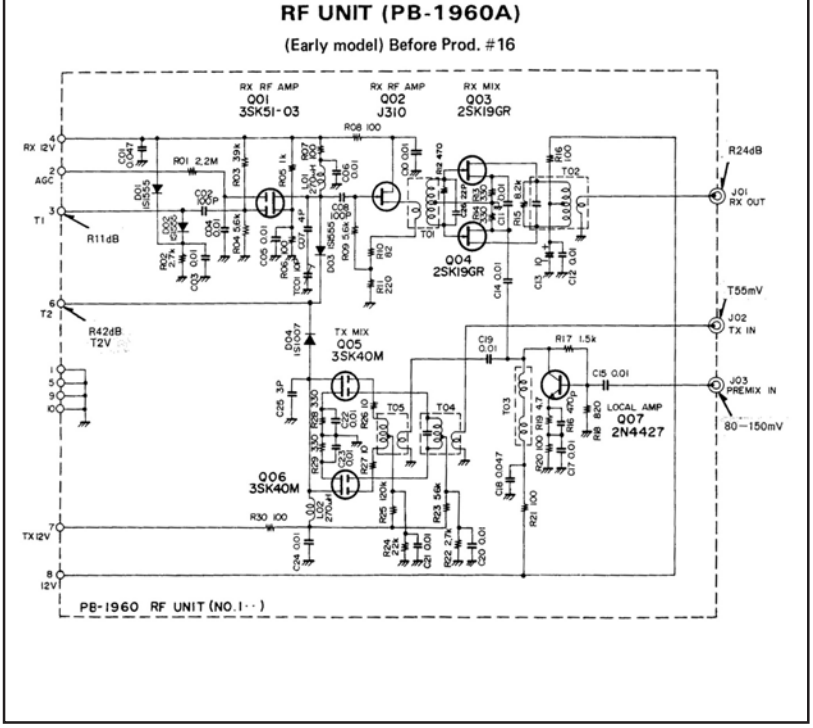
RF Board PB 1960A

This board is used in the first series (0-15xxx)and has a RF amplifier, a dual Fet buffer/amplifier and a balanced Fet mixer. Altough this board works good and is sensitive as it is, it had for me a big disadvantage:
I have in my neighbourhood a very strong “telex?” type station that is operating exact on 8987 khz, right in the middle of the IF of the FT-101ZD and FT-901/902. This signal is so strong that it goes clean trough the mixer, so I had a constant, annoying signal, anywhere I tuned when this station was active. I have already tried to null the signal out with the IF traps in the receiver front-end, it worked to a degree, but now and then this was signal still strong enough to interfere.

In the last versions of the 101ZD and 901/902 Yeasu uses a different board (PB-2154) with a double balanced ringmixer, and I tought that it could be the solution for me, because a DBM has a maximal isolation between in and output that can be as much as 60db. Maybe good enough for getting rid of this very cumbersome 8987khz signal.

After a study of the differences of the boards, I decided to give it a try to wire the 1960 board as the 2154, using a commercial DBM module.
I got a PB2154 board for a test, and this test showed that the interfering signal now was so low, it did not bother me anymore. I could have leaved it at that, but decided to change a existing 1960A board with a DBM, as a test and for the benefit of other users with the same problem. First I modified the board of my FT-901D, it uses a PB-1702B board, which is almost the same as the 1960A board. It had the same problems with IF signals getting trough the mixer.

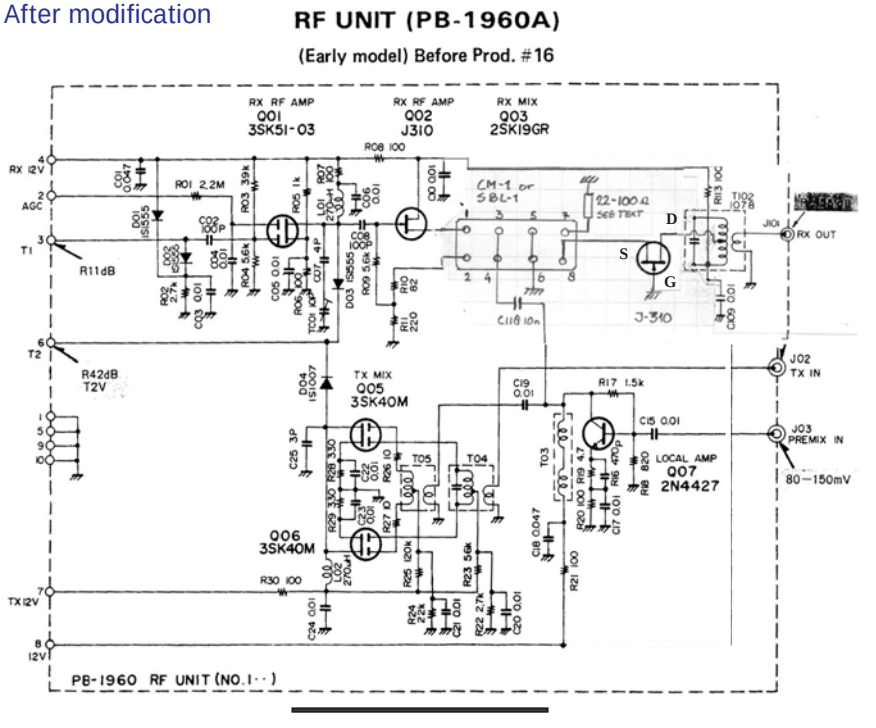
Before modification



Modification:

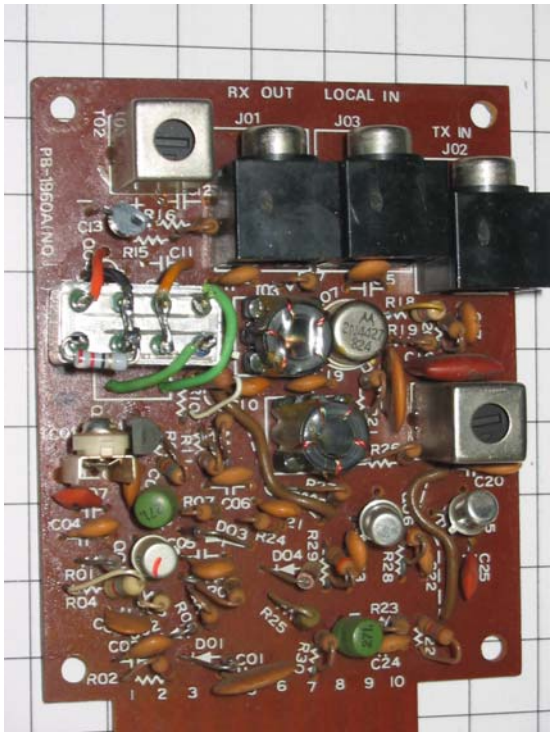
As DBM I used a standard CM-1 Double Balanced Mixer from the junkbox, but a SBL-1 or HPF-505 should work also.
The only problem was the conversion loss of the mixer, and too low signal level output to the filter. There had to be some amplification after the mixer, as on the 2154 board. I decided to use a J310 as a impedance converter and amplifier, as on the 2154 board. First I removed all unneccessary components on the board: T-101, R111, R112, R114, R-115, C111, C113, C126, Q103 and Q104.
Be careful, the print traces are easely lifted. Reconnect R116 from the midtap of T102 to the left pin (bottomside) of T102 and connect C112 direct from the same pin to ground at the foil side of the board.
Place J-310 at the right side, drain to the middle connection of T102, gate to ground, source to the previous gate point for connection to the mixer.
Place the mixer as shown in the pictures with a piece of dual sided tape, upside down and wire to the existing print traces:

After modification



1 and 2 are connected to the 2 holes of the removed T101, pins 3 + 4 go to C114 (VCO)
Pins 5 + 6 are grounded (do not ground the case, it is connected to pin 2, and carries some DC).
Pin 8 goes to the drain of the J-310, and a resistor of 22 ohm is connected between pin 7 and ground.

The connections of a DBM is rather standard, the input is at pin 1 and 2, (here it replaces the input coil of T101, which is removed from the board, along with the mixer components).
The output is normally on pin 3+4, but I used them for injection of the VCO signal. That way I could use the low impedance output pins 8+7 for connection to the J310 in grounded gate. Pins 5+6 are grounded.
The amplification can be adjusted by the Drain resistor of the output J-310, it should be adjusted to a drain current of maximal 20mA. I have used a 22 ohm resistor.
I first tested several other configurations with the 2SK19 as buffer, but they lacked gain. With the J-310 the signal output level is a somewhat higher than the 2154 board, adjustment is possible with the choice of the drain resistor (18-100 ohm, not lower).



The results:
What is immediately apparent is that the noise level is lower than of the unchanged print, lower than the atmospheric noise. A test signal of 0.05uV/50 ohm from my HP606 signal generator is easely heard, a signal of 0.5uV is good for a comfortable QSO, if the QRM is low.
I have the luck to live in rather noise-free surroundings, and even on 40 sometimes the noise level is so low that I can hear all stations in a roundtable, with a simple dipole.
I measured a sensitivity 0.1uV/50 ohm with both the 1702 and 2154 boards I swapped/tested.
The received signals with the changed board has better audio and there is less “splatter” from other stations, but I think the ringmixer modification on the AF board is responsible for that (see the other mods.)
My greatest satisfaction of this modification is that I now got rid of this “telex” station on 8987khz, I have to peak the preselector now at the IF frequency to find a very faint signal.
Under normal operating conditions that signal is unaudible, even when it was S9 before.
This modification is easely reversable. Save the original components if you feel the need for that.

Questions: Drop me a E-mail or put a posting to the FoxTango group.

Success, 73, Wim PA0PGA

FT-901DM RF board Mod.

Modification of the PB1702B RF Board from the FT-901D goes more or less along the same lines.
Here a picture of the modified PB-1702 board.
On this I used a HPF-500 DBM from my junkbox, but every other standard DBM will do. Works like a charm.
All in all, a modification that takes only a hour or so to do.
Recommended for European stations that have the same problems as I with this on the IF operating station.
Transceivers that are using a PB-2154 board, have no problem, so there is no modification necessary.

PAØPGA

Other modifications to the FT-101ZD by Wim Penders PA0PGA

FT-101ZD AF Unit PB1964A

Carrier adjustments: The most complaints for bad audio quality are coming from unadjusted carrier frequencies in your transceiver; after some 35 years they have to be adjusted for optimal audio in receive and transmit.

To calibrate the carrier frequencies: Connect a counter to the middle of pot VR-501

Adjust in receive mode:
USB: 8989.000 khz (trimmer C503)
LSB: 8986.000 khz (trimmer C504)

Adjust in transmit mode (PA heater switch OFF)
CW: 8988.295 khz (trimmer C505)
Repeat several times, until you get the exact values.

Output to the mixer:
USB/LSB: tx/rx about 2Vpp at the middle of VR-501 (measured with a scope)
CW: tx ca. 3Vpp at the middle of VR-501

Modification of the diode ring mixer:

Yaesu used here 4x 1S1007 silicon diodes, in a ring-mixer configuration. They are not bad but the performance can easely improved, by using Schottky Barrier diodes such as the HP 5082-2800 or BAV types.
If you have the possibility, select them for equal forward current from a batch at the suppliers place, or order a special quad.
Selecting is an easy affair:
Use your multimeter in the diode range and connect to the diodes with a resistor of 4.7 K-ohm in series (value is not important). You now measure the forward current.
Select 4 diodes that have the same value on the meter or as close as possible. In a normal batch is it rather easy to find 4 diodes with the same value.
When you use one of this new and cheap LCD component testers from China, it is even easier to match a quad.
Now, remove diodes D502 to D505 from the board and replace them with the schottky barrier diodes in the same configuration, the ring end is the cathode.

After replacing, the bridge has to be aligned for maximal carrier suppression with VR-501 and TC-502.
Alignment is done in tx mode (Heater switch OFF) because it is most important to have a good carrier null for a clean output SSB signal.
Connect a oscilloscope to pin 2 of the print (SSB out), and null the oscillator signal with VR-501 and TC-502, repeat several times in USB and LSB mode for the lowest output. (I had a value of less than 5mV.)
When you have selected equal diodes, both the pot and potmeter are near the middle of their range.

I measured the old 1S-1007 diodes, they were close but not as equal to each other as the schottkys.

Tests on 40 and 20 meters showed a audible lower noise level and much improved received signals, because the schottky diodes handle bigger signals more better.
There is also less “splatter” from other stations (exept the ones with their overdriven kilowatts and compressors), so it seems that not all splatter is generated on the band but also for a part in the receivers by overloading the first mixer.
Listening on 40 and 20 shows that the average signal levels not much differ from before the mod, but the signals are much cleaner and the noise level is lower, ideal for DXing.
The noise level on the higher bands is lower than the atmospheric noise from the antenna, I can even hear a difference on 80m.
Signal comparations have been done with another trusty FT-101ZD, on the same antenna and time.

The tx has now a much cleaner signal on the oscilloscope, with no flat topping, even when the mike level is fully up.
I use a standard Yaesu low-impedance handmike and receive good modulation reports.

All in all is it a easy job, that results in a real improvement on both rx and tx side. I have done this mod too on my FT-901DM, with equally good results.

RF in the audio stage:

Some sets have problems with a distorted audio due the RF that reaches the microphone stage. The real fault here is a bad ground connection or a ground loop.
A 10nF condenser between every microphone pin and a common earth is in most cases enough to eleminate this, but proper grounding on one point, preferably at the antenne tuner, if used, is better. Try always to keep the RF out of your shack, It will give some very weird problems with your equipment.

To be continued.....

73, Wim PA0PGA

Cold Neutralizing The FT-101ZD

by Peter Roberts, G4DJB

The standard neutralisation method used by FT-101 owners suffers from a couple of major drawbacks – the finals are producing RF (i.e. are 'hot') and the method requires a lot of 'tweak and try'.
This results in a lengthy process during which the finals may get very hot, or may even be destroyed if they should go into oscillation and the operator is not quick with the OFF switch.
The method described here is not new, but may be new to some FT-101 owners.
It allows the neutralisation of the finals whilst they are 'cold' (not actively producing RF). The operator may therefore take their time and there is no chance of the finals being damaged.
As pointed out, this method is not new.
Please refer to an excellent website by Tom, W8JI
(www.w8ji.com/neutralizing__amplifier.htm)
in which he discusses the need for neutralisation and ways it may be achieved.
The cold neutralisation method works as it takes advantage of the fact that inter-electrode capacitances are present whether the device is 'hot' or 'cold'.

In a 'cold' device, the grid-plate capacitance acts as a path through the circuit, and so a proportion of the drive signal will appear at the output. The purpose of neutralisation is to couple an amount of signal back to the driver equal in amplitude and in antiphase to the finals' grid-plate coupled signal.
So, the net effect should be to cancel out any signal feedthrough. In practice, cancellation will not be complete, but it is possible to adjust for minimum feedthrough.

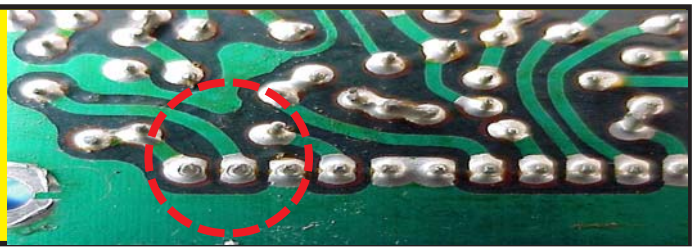
In the FT-101ZD, 'cold neutralisation' is achieved as follows:

1. Make sure that the transceiver has the PA compartment covers fitted (top and bottom).
2. Remove the "Accessory" plug from the rear panel.
This opens the heaters in the finals, but keeps the heater active in the driver.
3. Connect the transceiver RF output (ANT connector) to a detector of some sort. (I use an oscilloscope with a BNC "T" piece adaptor, the third arm of which has a 50-ohm termination directly mounted to it. A standard communications receiver will probably be too sensitive, may suffer damage, and may not give accurate results)
4. Switch on the transceiver, and switch on the Heaters.
Make sure that the finals are not lit, but that the driver is!
5. Set frequency to 29.0 MHz and set the mode switch to TUNE.
6. Set the carrier level control to about 3 and set the MOX/PTT/VOX switch to MOX.
7. Adjust the Preselector, Plate and Load controls for MAXIMUM signal on the detector. Adjust the carrier level as needed to get a suitable level.
8. Adjust the neutralisation capacitor TC01 (using a non-metallic trimming tool) for MINIMUM signal on the detector.
Re-peak the Plate and Load controls for MAXIMUM and re-adjust TC01 for MINIMUM.
9. Repeat step 8 as necessary to find the best setting for TC01.
10. You will now find that the Preselector can be adjusted for more signal output.
- DO NOT ADJUST THIS FOR MAXIMUM. -
If you do, you will find that TC01 needs to be moved again by some distance and you will enter an infinite loop of adjusting Preselector and TC01.
These interact, and so proceed as follows.
11. After step 9, adjust Preselector so that the output signal increases just a small amount.
Re-peak the Plate and Load controls for MAXIMUM and re-adjust TC01 for MINIMUM.
12. Repeat step 11 until no further adjustment is required – TC01 MINIMUM occurs at Preselector MAXIMUM.
At this point stop – you are done.
13. Set the MOX/PTT/VOX switch to MOX, the heater switch to off and the radio power switch to off.
Remove the detector from the ANT connector and re-fit the Accessory plug.

NOTES.
The choice of 'detector' is entirely up to you.
There may be up to 1-Watt RF present during this process, so you will need to act accordingly.
As stated above, a communications receiver is probably not a good idea.
I found that a lot of attenuation was required between the FT-101 ANT connector and the radios' antenna terminal and that RF was leaking around the attenuators making accurate adjustment impossible.
As an alternative to an oscilloscope, a simple detector (perhaps following a 50-ohm attenuator) using a diode and multimeter should be adequate.
For making adjustments, an analogue meter is preferable to a digital one. **73, Peter G4DJB**

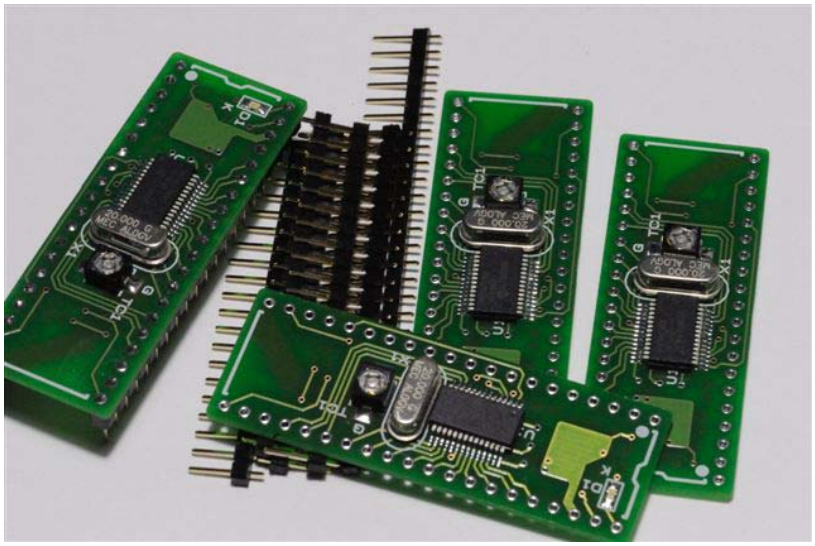
Dry joints are difficult to find, but are a common source of curious troubles in the cable connectors and boardpins. Here you see several pins with craters around. See picture. Resoldering is the cure.

Source: **PAØPGA**

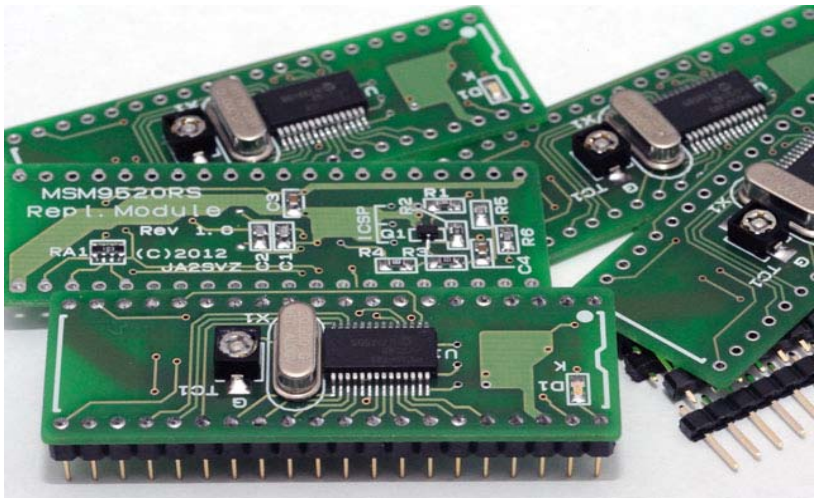


Counter MSM-9520RS Replacement Module

The new version of replacement module for MSM9520RS is available. The module is now offered as a completed and tested module and there is no need to modify the counter mother-board: PB-2086A, so the installation is much simpler and easier. A 20MHz-clock PIC MPU still guarantees fast-responding frequency readout, which results in very comfortable and smooth operation of your favorite YAESU.



"Pre-DSP/MPU era FT transceivers" from YAESU often depend on a custom integrated circuit (IC), MSM9520RS for their frequency display function. For reason unknown, MSM9520RSs from early production lots definitively fail after certain period of operation. It has been almost 35 years since these FTs left the YAESU factory, many of existing FTs have to retire only because of their frequency display failure.



This replacement module takes advantages of the flexibilities of MPU (PIC 16F883) to simulate the exact functionalities of MSM9520RS and extends the life of FTs, great masterpieces of analog circuit technology.

Applicable Models

The replacement module can be used for the following YAESU FT models. (Please note: Some early FT-101Z, FT-901 use a TTL-based frequency counter; MSM9520RS is not used. Check with your display board before ordering.) For FT-77, please contact me for applicability.

FT-101Z (MK1:16xxxx-, MK2, MK3)
FT-107
FT-707
FT-901/FT-902 (with PB-2086A board)

Font Option

There are 2 possible character shapes for displaying "7" depending on the use of segment "f" in 7 segments of the LED. MSM9520RS original display is shown in the right photo, whereas the left photo is the default for the replacement module. If you like to have the right, MSM9520RS original font shape, please tell me so, I will ship a special version to you then, otherwise, the left, "smart" shape version will be shipped.

Ordering

Price: ask for quote: (3460 JPY nov 2015)(Shipping anywhere on the globe included).
USD/EUR payment is possible through PayPal or Western Union.

3 possible payment methods:

1) PayPal (http://www.paypal.com/ : Credit Card payment is acceptable through PayPal.)
2) Western Union Money Transfer
3) International Postal Money Order

The module is shipped via registered airmail (in padded envelope) with header-pins for installation.

Support: Please contact Teruhiko Hayashi (JA2SVZ) by e-mail: thayashi@ta2.so-net.ne.jp to place order and for technical support.

Gear cleaning/lubricating on the FT series.

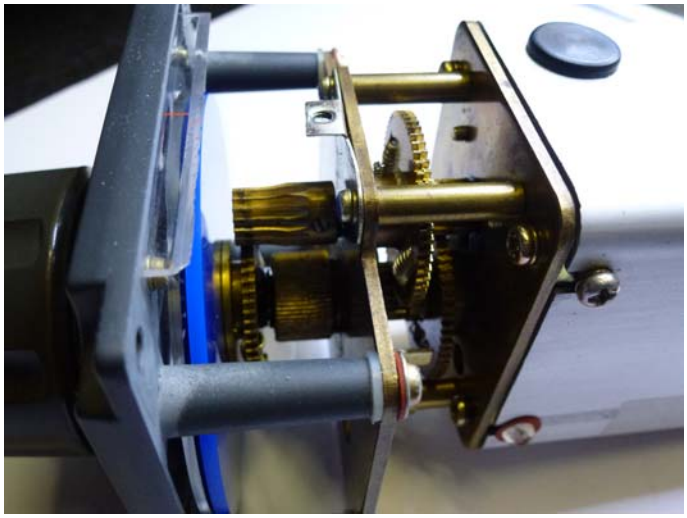
The following article describes the dismantling and relubrication of Yaesu and Kenwood reduction drives used on the VFO. By Wim Penders PA0PGA

As an example I used the drive of a FT-901DM. The eighties Kenwoods used a similar reduction.

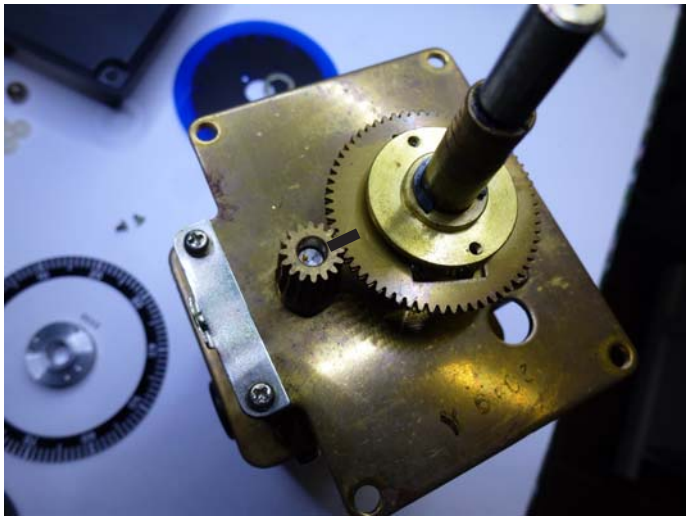
The reason for a drifting VFO is not always found in the changing in electrical parts, but can also be caused by mechanical problems.
One is the oxidized earth connection of the VFO tuning condenser, easely to repair by using some Deoxit or similar contact cleaner.
The other source is the the reduction gear of the VFO. Some develop a sluggish feeling when tuned, or after setting to a frequency it creeps away of the set frequency mechanically, if only a small amount.
The reason for this behaviour is the lubricant in the first reduction gear, that over the years is hardened to a sticky mass that has the tendency to pull back on the movement of the gear.
Then it is time to clean the gear and relubricate with new grease.
To do that you have to dismantle the first reduction gear and for that you have to take the VFO out of the transceiver, wich is a relative simple operation in the FT-101ZD and FT-901/902. The VFO is a selfcontained unit that can be taken out trough the front of the transceiver by loosing the 4 screws on the front, removing the counter unit and disconnecting the VFO plug and light bulbs. In some transceivers is it necessary to remove the PLL and VCO unit to get to a earth connection on the VFO.
To disassemble the vernier drive to clean and lubricate, use a clean workbench and a room with a hard floor where you can find the small parts when they get a life of their own (balls of the bearing, springs in the cog wheels a.s.o.).
Work at your leisure, this is not done by rushing things. Keep all small parts in a small box, and have cleaning tissues handy. As always: proceed on your own risk, if you are in doubt, don't do it, it is a job that needs patience and affinity for mechanical things.

DISASSEMBLING:

- Turn the gear towards one of the end points.
- Take off the tuning knob by loosing the 2 screws.
- Take off the khz correction knob (3 small screws)
- Take off the frontframe, notice the position of the fiber rings.
- Pull off the khz scala and the ring in front of the 100khz scala.
- Take off the 100khz scala by removing the 2 small screws
- Put both scala's on a safe place, they are easely scratched.
- Mark the position of the cogwheel and gear with a marker, for later assembling in the same position.
- Take the cogwheel off after removing the security clip.
- Be careful to keep the 2 small springs in the cogwheel in position.



- Remove the security clip in front of the big knurled bushing of the ball drive reduction.
- Remove the knurled bushing, take it off the main axis together with the 3 or 4 pressure rings and the ball bearing that is inside the bushing.
- Pull now the main axis 2mm out. In some drives this disengages one of the 2 wheelparts on the reduction gear inside the big gear housing.
Before mounting the axis again, you have to load the spring in such a way that there is some tension on the gear spring before you are able to get the axis on the cogwheel again. Be careful to keep the small springs in place, otherwise you have to fumble a lot to get them in again.
- Gently pull the insert from the main axis to remove the sticky grease. When the insert comes out, there is almost always a small ball attached to it, make sure that you don't loose it, it is a crucial part of the reduction.
Take out the 3 balls of the bearing and clean them too.
- Now remove the old grease from the ball bearing, use a small brush and kerosene or white spirit, no hard tools!!.
- Clean also the other small parts, and the knurled bushing.



VFO UNIT EXPLODED VIEW

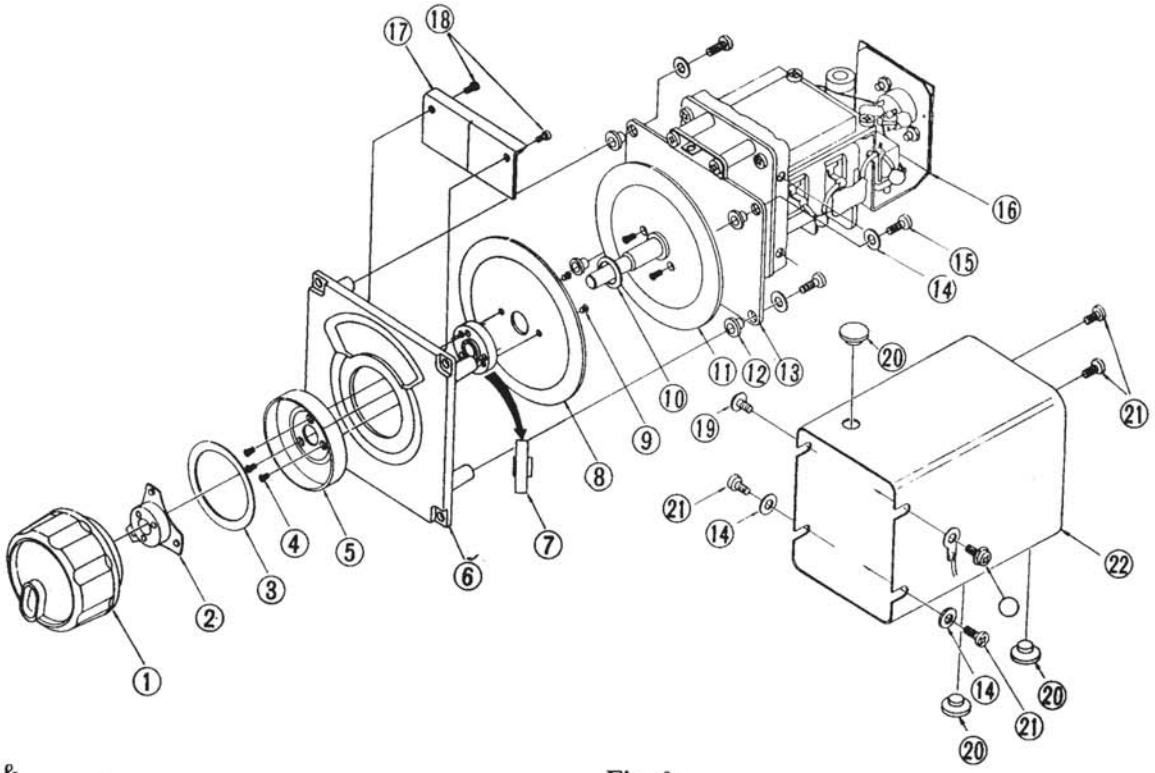


Fig. & Index No.	Q'ty	Name & Description
1-1	1	Knob : Tuning
		Set Screw: M4 x 6, mm, Steel
1-2	1	
1-3	1	Washer:
1-4	3	Screw: Flat Head, M2 x 4, mm, Steel
1-5	1	Calibration Ring
1-6	1	Escutcheon
1-7	1	Holder: Aluminum
1-8	1	Sub Dial
1-9	2	Screw: Flat Head, M2 x 4, mm, Steel
1-10	1	Washer: Flat, Steel
1-11	1	Main Dial

Fig. & Index No.	Q'ty	Name & Description
1-12	4	Bushing: Sleeve
1-13	1	Gear Assembly
1-14	6	Fiber Washer: Flat
1-15	4	Screw: Pan Head with washer, M3 x 6, mm, Steel
1-16	1	Insulator: Sheet
1-17	1	Cursol
1-18	2	Screw: Pan Head, M2 x 4, mm Steel
1-19	2	Screw: Pan Head with spring washer and flat washer, Steel
1-20	3	Grommet: Rubber
1-21	4	Screw: Pan Head, M3 x 6, mm, Plastic

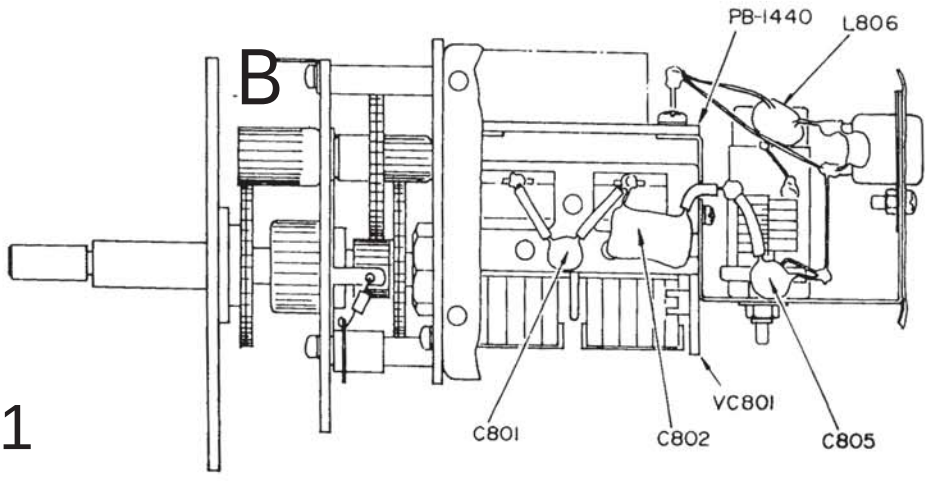
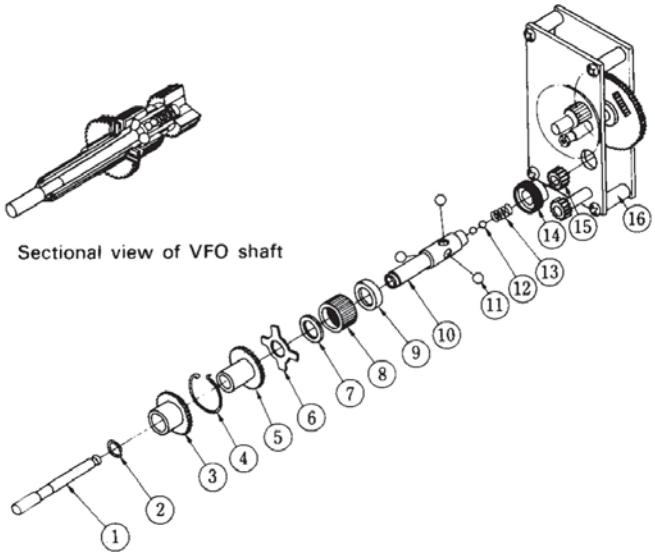


Fig 1

- After cleaning and drying, you can relubricate the gear with a good ball-bearing grease. I used a grease with lithium, got this stuff from a local bike shop that sells it in 110gr boxes.
- Fill the bearing with the new grease, use enough to keep the ball bearing from running dry, fill also the hollow axis and insert before putting it back, with the small bearing ball first. The small ball is necessary for a silk-smooth operation of the bearing.

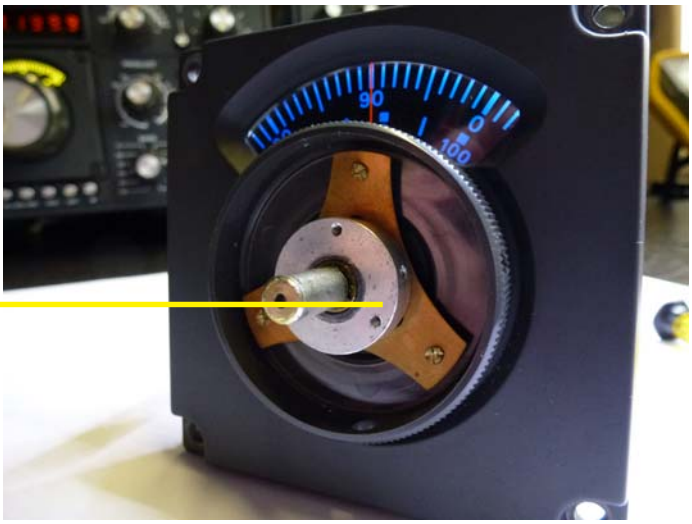
After putting the insert axis and the small ball in push the main axis back on the cog gear. If there was one of the cogwheel half disengaged, when the insert was pulled, you need to load the springs by pushing the last wheelpart 1 teeth in the good direction, not more, (when more power is used on the back half of the cogwheel, is it possible to lose the small springs, they will jump out), Been there.....

Close the ball bearing by putting the gear ring in first with the hollow side towards the ball bearing. Then put in the 3 or 4 wobbly tension rings, a eventually (not all gears have it), a normal ring. Now make sure that the whole room beside the 3 ball bearings is filled with grease, then close the ball bearing with the knurled bushing.
Wipe off the excess grease and push the security clip on again.
The rest of the assembly is in reverse order as the disassembling above.
The 100 khz cogwheel is set with the help of the marker, that you put on. Is there no marker, you can do it in this way:
Turn the VFO to one of the endstops, push the cogwheel over the axis and engage the second wheelpart also with one teeth pressure.
Mount the cogwheel in such a way that the the 2 screwholes are in a horizontal direction. Secure it with the second security clip.
Now turn the assembled gear several times from end to end and make sure that it is running smoothly.
If you feel some “rough” spots, loosen the knurled bushing somewhat, if the bearing slips, increase the tension.
A good assembled reduction drive will turn silky-smooth.
Re-assemble then the 100khz scala then the khz scala.
It is possible to make small corrections in the 100khz scala position by changing the position of the small cogwheel B on the previous page, by loosing the 2 small screws on them and turn the scala B until the scala is on the right position, you can check with a strong signal of a calibrated signal generator.
Dont forget the separation ring between the two scalas.
Mount the front panel, the khz corrector knob, and the pressure ring with the plastic ring.
The khz corrector must have a certain pressure, push the top side in such a way that the top of the plate is flush with the end of the main axis. Give the rest of the reduction gear and the bearing of the variable condensor a drop of silicon oil, and put the VFO back in the transceiver. Enjoy the real smooth operation of the tuning now.
Good Luck, 73, Wim **PAØPGA**



Sectional view of VFO shaft

The exploded view of the gear displayed above is similar in build as the FT- series VFO gear.
Clear to see is the construction of the balldrive.
Pos 2, 3, 4, 5 and 6 are different in the FT gear.



Kill The Killer Condenser !!!

One of the most common reasons why a Yaesu tube transceiver is discarded or stripped in parts is a small part in the PA cage: the notorious Killer Condenser C01, (FT-101ZD 1000pf, 901DM 100pf).

If you have not already changed this part, check if the original Yaesu part is still there and change it. It is the coupling condenser between the 12BY7 anode and the grid of the PA tubes. The condenser that Yaesu fitted here is a mica condenser.
This part **will** fail in time and puts then 300V on the grid of the 6146B's, who in turn pull all the current they can get, destroying the tubes and the power transformer if you are not nearby, rendering the transceiver useless.
I have seen 6146B's that got so hot that there was a hole melted in the envelope, looked if shot by a .22.
This can happen too when the set is in receive mode with the heaters on, in many cases the unsuspecting Ham was not in the shack, and by returning there was greeted by a waft of very expensive smoke.

The Killer Condenser is located on the PA board (PB1715). For the older FT-101ZD's you have to remove the PA board, To get to it, you have to pull the tubes out, loosen the 6 screws and desolder one or two wires.
For the FT-101ZDmk3, this condenser is located on the top of the board, so you just cut the wires and solder the new one in.
Replace the condenser with the same value (100pf for the FT-901DM, 1000pf for the FT-101ZD. Use a 2-4 Kv ceramic condenser here, there is no need to use mica , mica has a higher ESR value, and that is part of the problem.
The new condenser can be mounted on the topside of the board, there is room enough.
Check also the mains fuse for the correct value: 5Amp fast blow for 110V operation and 3Amps fast blow for 230V.

Yaesu FT Line in station PA0PGA

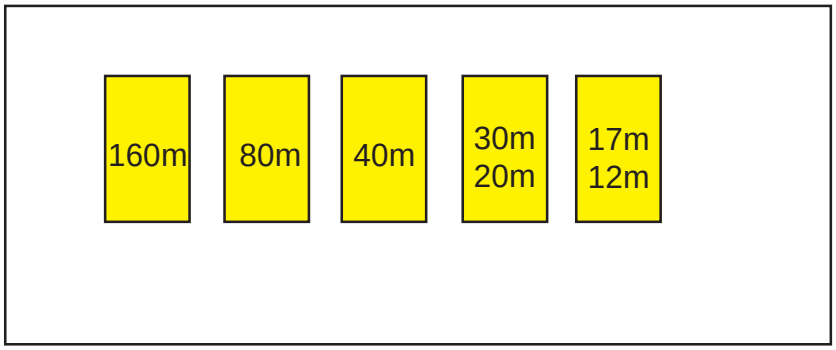
The FT-101ZD Mk3 story

The FT-101ZD Mk3 is the newest in the FT ZD line and is one of the last transceivers with a tube type final.
It differs in several ways a bit from the earlier FT-101ZD's in that it has all the bells and whistles of the previous series, but has also several new features such as the possibility to use the FV-101DM scanning Digital VFO, a choice between a AM or FM board, audio peak filter and notch, and a squelch knob for the FM board.
The possibility of using FM was not really new, but in combination with the FTV-901 transverter, you can work on 50Mhz, 144-148 Mhz and 430-440 Mhz. This transverter has the possibility to use up to 3 modules. Together with the FT-901 and the ft-101ZD, you have a complete station on HF and VHF/UHF.
The FV-101DM is a Digital VFO, a VFO that was special developed for the FT-101ZD Mk3, it has 12 memory channels that can be used as the starting point for 12 different frequencies, in fact you have 12 extra VFO's, ideal for spot listening and working splits. It has scanning capability.
It enhances the capability of the FT-101ZD Mk3 in a great way. To be able to use all the features, there was a second cable necessary to the transceiver for communication between the two, the reason it not works on the earlier ones.
Another difference is the omitted connector for the 12V DC-DC inverter, wich was now a optional unit that contained not only the Power inverter, but also the special connector that must be installed in the set. The cabling is already done so far, you only need to mount the connector.
There are more differences: the trimmerboards have another arrangement of the trimmers. (see page 26)
New was also the combined width knop, a audio passband filter tuning knob combined with a notch filter a welcome addition for fishing small signals out of the crud.
The performance of the Mk3 was now nearly as good as her big brother, the FT-902DM. Both were soon replaced by newer designs that were completely solid-state.
En era had ended..... **PA0PGA**

TRIMMER POSITIONS

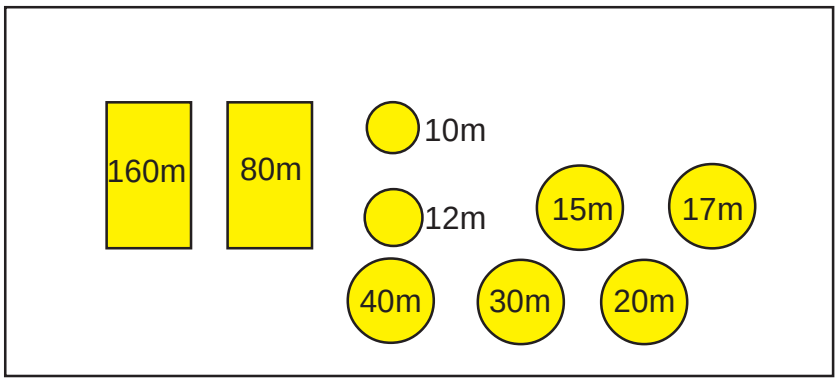
FT-101ZD Mark3

(serial 240000 and up) Trimmer positions

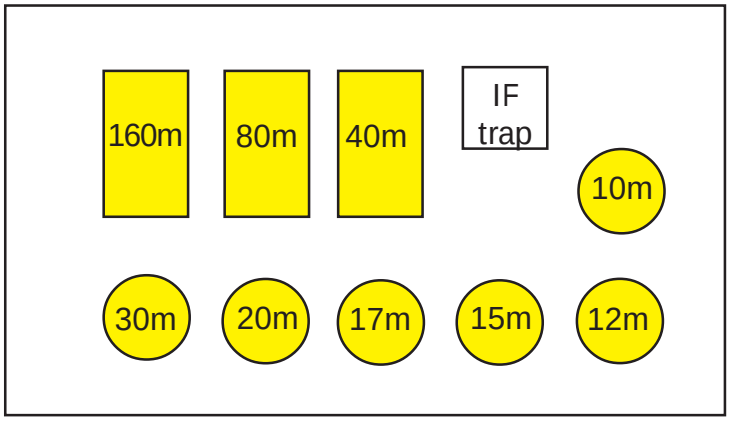


C trimmerboard

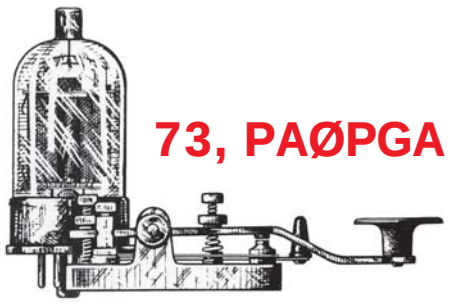
Start the alignment on 10M, and only by changing the T3 preselectorcoil.+



B trimmerboard



A trimmerboard

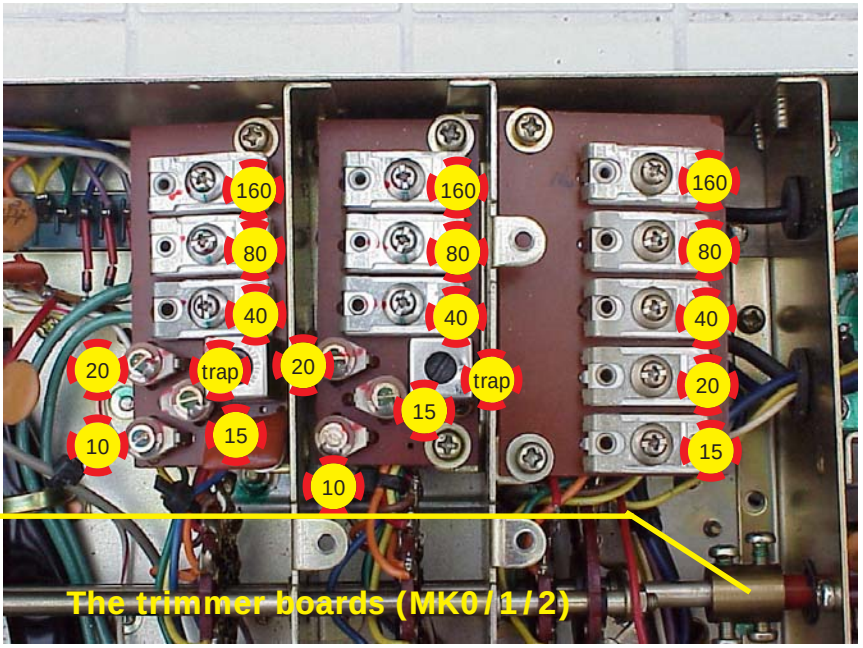


73, PAØPGA

PAØPGA

Mark 0 and 1 pre-WARC

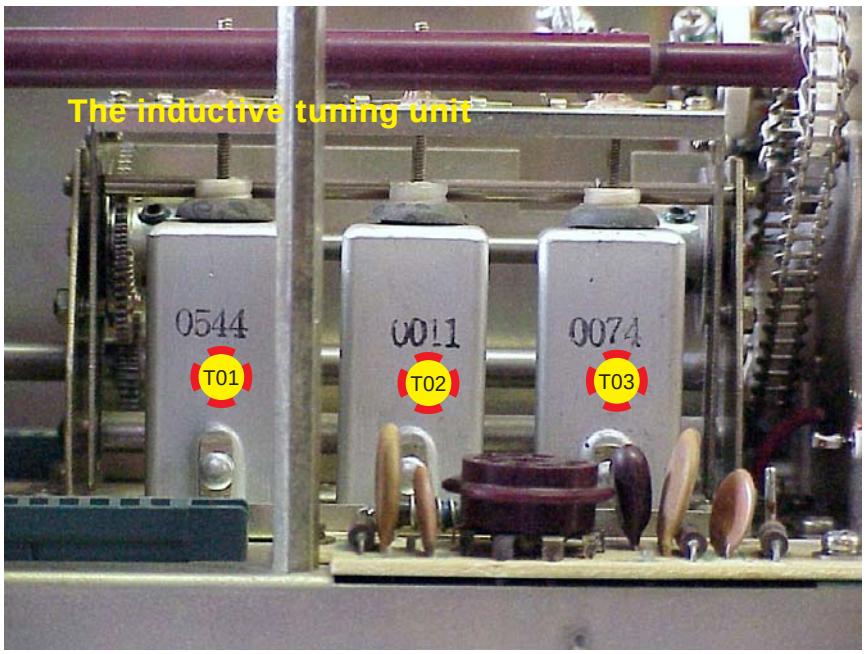
Because our FT-101ZD's are getting older they may profit from a re-alignment. Many Hams are unsure of the positions of the trimmers, maybe this pages brings light in the darkness.....



The trimmer boards (MK0 / 1 / 2)

Something you have to check: the coupling between the 2 switches.
More than once Hams have searched to solve a strange fault in the TX behavior of the FT-101ZD, and found at last this coupling loose .....

Many Hams search for the T1, T2 and T3 transformers when aligning a set, Here they are.



The inductive tuning unit

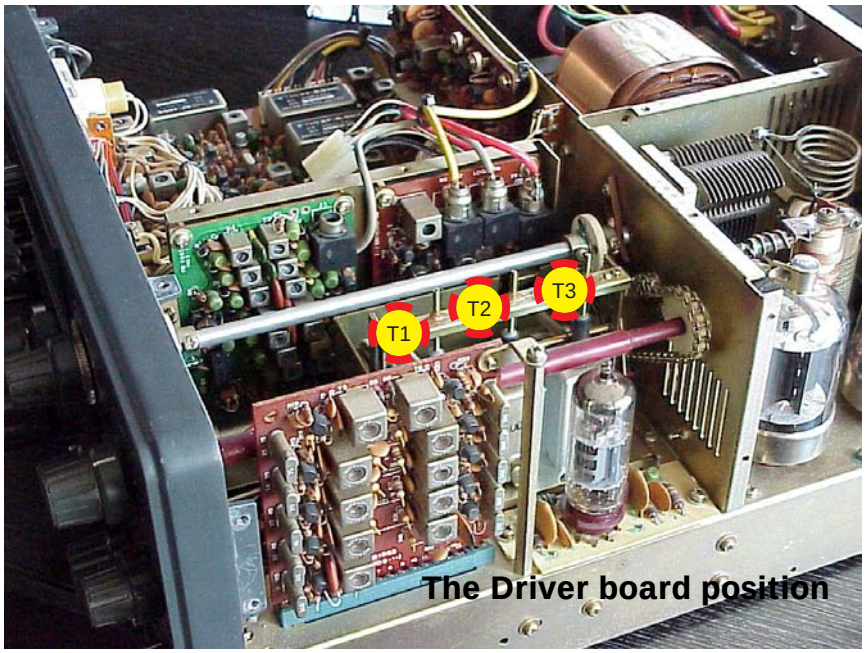
Mark 2 WARC

The trimmerboards of the FT-101ZD from serial 010001 to 079999, 08001 until serial 169999 are the same as the later series 170000 to 239999, the Mark2.

No new band trimmers for the WARC bands in the Mk2, they use the same ones as in the above picture, but were combined with the next higher band. ie:

20m trimmer aligns 30 + 20m
17m trimmer aligns 17 + 15m
12m trimmer aligns 12 + 10m

Serial numbers above 240001 are used for the FT-101ZD Mk3, and have dedicated trimmers for all bands.
Because there was no info that I could find on the net, I measured them out and the result is on the previous page.



The Driver board position

PAØPGA

A FT-101ZD Mk3 rescue story,

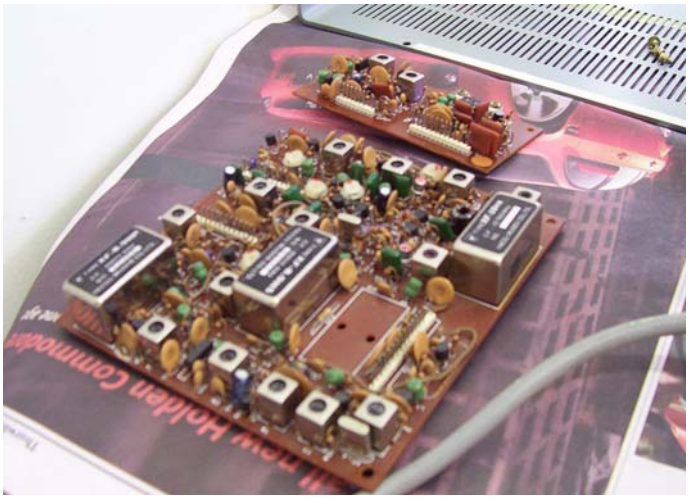
by Murray, ZL3MH

This is my blog of my new but old FT101zd MK3 to run the FTV650b on 6m and a FTV250 of repairs and mod's.

Today my old but new FT101zd MK3 arrived from the North Island of ZL. The Cosmetic condition of the front panel has almost no marks (most important). The rap around covers (case) are quite marked and needs repainting. The radio seems to work ok
but the band switch needs cleaning (On 40m the switch needs tweaking to make the radio work) The same trouble with the CW-W position mode switch.

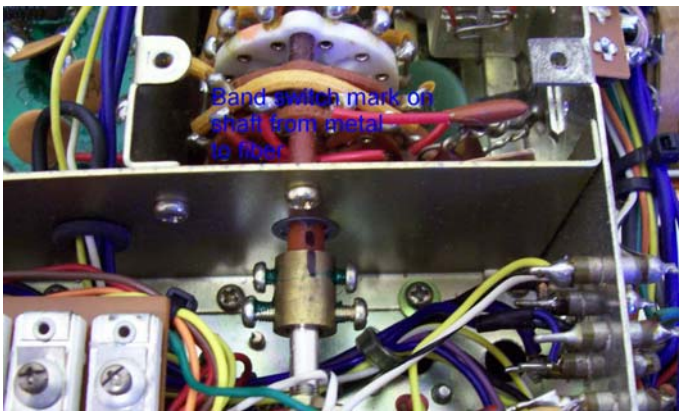
The radio is a cut down version , no CW filter and no mobile power supply. There is no FM or AM board fitted either but it has a fan unit. There were very few cut down units imported to ZL land. May be it came from VK.
I have a FT101zd MK2 in a battered state but is now going after 40 hrs of repairs. I have already swapped the mobile power unit from the MK2 to the new MK3

The second night of the repairs and modifications. I swapped the CW narrow crystal across to the MK3 from the MK2. This is a major job removing the Crystal / Noise Blanker board and the IF board.

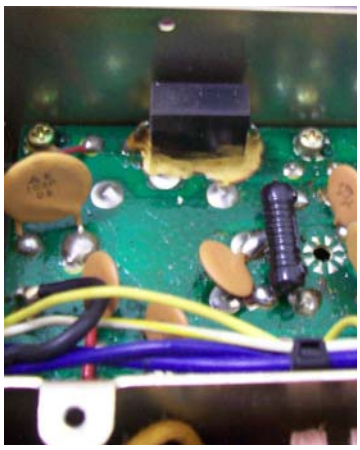


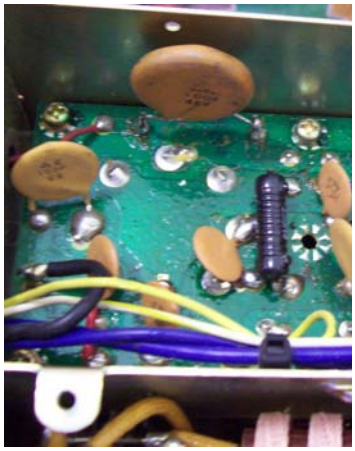
I also did a modification by adding two 10uf 35v Tantalum capacitors to earth on PB-1967 from terminals B and C to stop regulator Q901 taking off when it gets hot. This is a common problem that can cause poor voltage regulation to the VFO that will cause a FM effect on Transmit on SSB peaks. Q901 can oscillate at 20Kc

The third night I marked the Band Switch where it converts from metal to fiber and checking the tightness of the screws. I also cleaned the contacts on the switch so 40m now works ok. I also cleaned the CW Narrow contacts on the Mode Switch.



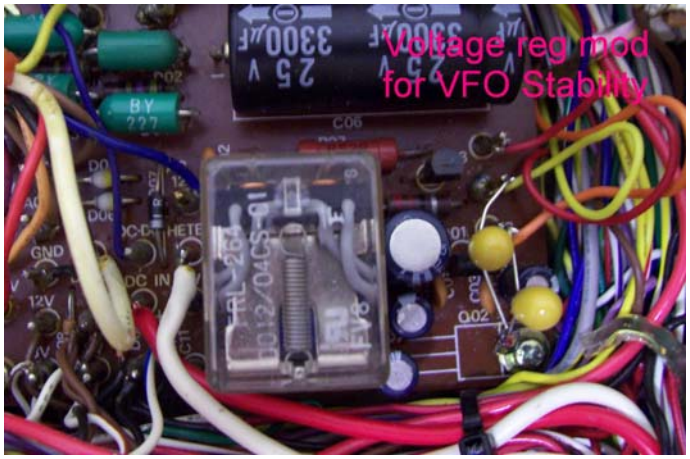
I also changed the Plate to Grid capacitor that gave so much trouble in the FT101 (.001 at 4kv). See pictures below.





I ran the +800, +300, +160.-100 supplies to the ACC plug for the FTV650b as per the MK2.
Please be very careful of the Plate Supply as the capacitors can remain charged for over 24 hours.
After 24 hours (still 400v).

----NOTE up to 900v DC no load----



The forth night I ran the rig up on 80m, 40m, 20m and worked a few stations. I noticed the IC idle current was around 75-90 ma so I adjusted it back to 50 ma. I worked a few more stations. Then I hooked up the Microwave Modules Converter 28MHz to 435MHz and worked VK2ZAZ on FO-29. Then I turned on the FTV650b and called CQ on 50.110 but no replies.

Day five, Something very important. Check the power fuse, 3 amp for 230v and 5 amp for 110v. I am using a 2.5 amp normal blow fuse and they hold. The wrong fuse of higher capacity will do lots of damage if there is a fault inside the rig. Now I will run the rig for a while to see how it goes. I hooked up the MM converter and worked VK6AKI Ron on FO-29 . His signal was S9. Perth is over 5,000 km from Christchurch and minus 5 hrs in time. We had a good 5 minute contact.

Day 6 , I use the Clarifier a lot on FO-29 doppler and sometimes it does not work then it moves like a capacitor is charging up. It has only happened twice. I hope its not in the VFO board PB-1440b and in the Clarifier unit PB-1973A. I will clean the two push button switches and the pot first. Had a good contact on FO-29 worked ZL3DW, VK2TXT, VK2ZAZ and VK6AKI in Perth. I listened a bit on 80m tonight and tried out the Width Filter to narrow the SSB signal down and it works great on the noisy band.

Day 7 Tonight I pulled the Clarifier board out. Their are two screws to pull out, one that can be done from the bottom and one by removing the plug in board PB1965 from the top. I resoldered the PCboard PB1973 (Clarifier unit) and removed the top of the relay and tried to clean it with contact cleaner . The relay top said 211A DO12-M and F SV3. I also cleaned the switches. I do suspect the relay contact being faulty. All this has taken an hour and time will tell if the problem comes back again.

Day 8 Today is Sunday. I am running the ZD all day. It was open on 6m to VK2+3 but I worked nothing but I was talking to Rod ZL3NW about 25 km away using the FT101zd MK3 to the FTV650b Transverter. The FT101 only has 650 volts on the transverter but
the FT101zd series has 800 volts on the single 12v 6146 which really makes it go (about 50w on 6m) The Clarifier seems ok. There is a contest on 20m but I did decode a bit of SSTV and PSK31.

5 days later . The ZD is still going great. The Clarifier it still working ok and the rigs
Running good.

Overall I am very pleased with want I got as MK3's are quite hard to find. The front panel is in good condition and all FT101s cases mark very easy as the paint is not very durable.

Remember this rig is 25 years old but it will still give a Non DSP rig a run for its money.

73 Murray ZL3MH

dB conversion table as used by Yaesu for alignment of their equipment.
0 dBu = 0.5uV/50 ohm

Yaesu used in manuals	HP 606A signal generator		
dBu	**Volts**	**dBm**	
-6	0.25uV	-119	
0	0.5uV	-113	
6	1uV	-107	
12	2uV	-101	
24	8uV	-88.9	
30	15.8uV	-83	
40	50uV	-73	S-9
50	158uV	-63	
60	500uV	-53	
70	1.58mV	-43	
80	5mV	-33	
90	15.8mV	-23	
100	50mV	-13	
	224mV	0	
120	500mV	7	

(dB table courtesy of Jerry Becker)

Hints and Kinks

by PAØPGA and others

In this section I will give facts and thoughts, that I have collected from all over the net.
When sources are known, I will mention them, because to hold your FT-101ZD in an excellent condition is only possible when all real amateurs, share their knowledge and experiences.
That's still the first rule for a Ham in my opinion.
Of course are all tips free to use, but using them is always at your own risk. If you don't have the knowledge or technical skill, then please let the lids of your set closed, it is always better to have a good working transceiver then a perfect heap of junk. Never try to be smarter than the HF engineers of the design Lab, there is almost always a good reason that things are done the way it is.
Most modifications are small, and are additions for a specific reason, not a complete rebuild of the set.

So have said that, we start with a collection of tips:

First of all:
Get the proper user and service manuals for the equipment that you have, and make yourself familiar with the working of the circuits. The manuals for the FT-101Z and ZD, and other Yaesu communication equipment are on the FoxTango site, in PDF format, free to download, ***(well, a small donation the club is very much appreciated, to keep things rolling)***, so there is no reason to start without them.
Special recommended is the very extensive Maintenance Service Manual, with around 200 pages, which is not only very interesting, but gives all information on boards, voltages, trouble shooting lists and in general all information to keep your FT-101ZD in a first class condition.

Switching the fan:
When the rig is mostly used on receive, there is no need to let the PA cooling fan run continuous.
I switch the fan with the heaters On/Off switch:
Pick up the 12V of the heater circuit at the accessory socket at the rear of the transceiver and rectify it with a diode and a suitable elco. Use the DC voltage to switch a small relay. I used a small 12V reed relay with 1 contact. Use a suitable series resistor to limit the current. With the relaycontact you can now switch one 100 Volt connection to the fan socket.
I made this modification 25 years ago, and it works still as a charm. There is room enough in the back of the transceiver to mount the relay and the couple of small parts you need in a neat manner.
Source: PAØPGA

Improving second Double Balanced Mixer:
On the AF board is the double balanced mixer, D02 to D05, they are 4x 1S4007.
Replace these with 4x Motorola MBD-702 diodes and the adjust VR01 and TC02 for the best carrier balance. It should be possible to null the carrier almost completely.
Source: G3TJP

No or low Calibrator signal:
Replace Q10 on Audio board 2SC1815.
Source PA0PGA

First mixer overload
(only FT-101ZD MK2 and MK3, board PB-2154, used after run 17xxxx,)
RF board: Improve the dynamic range of the first mixer by modifying the T-Pad attenuator on the input as follows: Change R8 (120R) to 36R, change R9 and R10 (10R) to 27R.
Reset overall gain on IF board using VR02, which is the source load of Q15.
Source: G3TJP

Improved Fine-tuning:
Shunt the clarifier control with a 4k7 or 5k6 resistor, then recentre its action by adjusting VR01.
This mod reduces the control's range to +/- 2,5 Khz.
Source: G3TJP

Tips from Kiwi land
On 10 meters the transmitter **takes off** on HF or with the transverter beiing used. The problem is dry joints or earthing points around the 12BY7. Resolder all connections on and around the 12BY7 board.
Source: ZL3MH
Low sensitivity rx :
If the marker can be received at the normal level then suspect the aerial fuse. If the marker signal is low as well then suspect the PA driver 12BY7A - this shares a signal frequency tuned circuit with the RF stage. Q8 on the IF board also causes this problem sometimes.

PA tuning incorrect :
If the PA won't tune correctly on some of the bands then check for short circuits on the output tank coil and the nearby wiring.

No rx :
Check the width control is not set at one end (surprisingly common).
No tx and no bias :
Check accessory plug is in octal socket at back. Check the PA screen grid voltage - if it is missing check D1002, D1012, and R1006 on Rect.B unit.

No CW tx :
Check Q1003 on Rect.B unit (possibly Q1001 and Q1002 as well). I have had failure of the CW carrier osc xtal on a couple of occasions.

No tx 28-30mhz only :
Check R8 which is mounted on the band switch assembly near the driver.

RF feedback on 21/28mhz :
Some units had a four way tag strip near the mic. i/p socket - the two centre earth connections should be connected together.

Incorrect frequency display on one band only :
Suspect the local osc xtal for that band.

Poor rx/tx on one band only : Local osc xtal as above.

11m reconversion :
These rigs were sometimes converted for illegal CB use. This usually involved replacing 28.5-30 MHz with 26.5 to 28 MHz. A few rigs are still around in this state, and will require re-converting back to 10
metres. This will require the replacement of the local oscillator crystals, and re-alignment. Realignment should not be omitted, as the rigs may intermittently fail to operate correctly if it is. Change required local osc xtals for the original types and the local osc **must** be re-aligned to ensure continued reliable operation.

Hum on rx when volume control at min :
This is usually caused by a hum loop. If there are two earth braids connected to the v/c then cut one of these.

Hum on tx :
Same as above but on mic gain control.

One segment of display does not light :
LED U/S. Note these are usually in sockets and are easily swapped for checking.

Incorrect segment illumination on one digit :
Digit driver IC U/S.

Intermittent incorrect frequency display :
If on one band only, suspect the local osc xtal on that band - check alignment of osc before ordering crystal, especially if fault is on 10m (because it may have beiing used for illegal CB and not realigned). If on all bands suspect Q04 or Q05 in the counter (later models) - note that Q04 must be the S version.

Intermittent rolling frequency/panel lights dim :
Suspect a dry joint on the LT smoothing cap. Also suspect the cap itself.

Fault blows main fuse every 0.5 to up to 6 hours and is not the 6146's flashing over.
There are vertical type caps in PB-1968 and the internal fluid runs down and arc across the narrow gap in the caps (300 Volt screen supply, a common problem in TV sets).
Replace caps C1001, C1002, C1003 and C1004, they are all 10uF/450 Volts.
Source: ZL3MH

The Noise Blanker stops working sometimes.
It appears to be a dry joint on plug pins of the Noise Blanker/ Fixed channel board.
The fix is to solder around the connections of the board.
Source: ZL3MH

The transmitter stops working:
The band change switch is in two parts. It is joined where it goes to the 6146B compartiment from a steel shaft to a fiber shaft. This connection comes loose, and the bands do not line up properly.
It is a good precaution to mark the shafts with a markerpen and tighten the screws on the band switch extension. I heard from a FT-101ZD repairer spending days to track this one down.
Source: ZL3MH

FTV-250 and FTV-650B on the FT-101ZD.
The FT-101ZD is designed for the FTV-901 series of transverter via the 11-pin accessory socket.
The Plate, screen and bias voltages are not always wired to the accessory socket. This is needed if you want to run the FTV-650B 6-meter transverter that is designed for the earlier FT-101 series.
Especially the MK3 model did not have the above wiring.
Both the FTV-250 and FTV-650B can be used with this mod on all FT-101ZD's.
Source: ZL3MH

Help notes on the FT101Z/FT101ZD
Collected tips from everywhere, sources unknown.
**** there are several versions of the FT-101ZD, and some of these faults do not apply to all versions. ****

Blowing mains input fuse :
Disconnect PA anode clips to see if one of the PA valves is short circuited. If not, then some of the diodes in the main bridge rectifier are probably short circuited.

Intermittent blowing of mains input fuse :
If the fuse blows every now and again, then suspect that one of the PA valves is flashing over once in a while.

Fluctuations in power output :
Check the PA valves. Check the PA anode choke.

Sizzling/arcing from PA :
Check the PA anode choke.

Low power output on some bands :
Check the PA anode choke and also the coupling capacitor from the PA to the output tank circuitry.

PA unstable on higher frequency bands :
If the neutralisation is OK, then check if the 12BY7A driver is glowing blue on transmit - replace if it is.

No receive:
Check relay 1 on the audio board,
clean the contact or replace relay.
Source PA0PGA

Helping the Helper

by John, N0BUP

This is a Short Guide to Asking for Help in Finding and Repairing Radio Faults Over the Internet

"I have an old Yaesu 101 that is not working on15 meters. What's wrong with it and how canI fix it?" or "I have a bad 15 meter crystal and I need a replacement, but I'm not certain that this is the problem. How do I tell?"
Requests
like these often go unanswered or generate just a few "Have you checked for . . . ?" kinds of answers on the Yahoo-sponsored Fox TangoGroup at

http://groups.yahoo.com/group/FoxTango

and probably on many other radio user groups as well. Poor responses are sometimes because there aren't a lot of readers familiar with that radio, or that particular kind of fault, but more often there are plenty of readers that know a lot about how to find and fix the faults asked about, it is just that they haven't been given enough information to make more than a general guess as to what could be wrong.

A radio can develop any particular fault for dozens of reasons. Some are more likely than others, but sometimes radios can fail for very odd reasons. Moreover, some of those reasons have literally nothing to do with the radio itself but are with the antenna, the external power supply or with things like connecting cables, or add-on units like power meters and amplifiers or are caused by simple operator error.
If you want help, take the time to help your helper as much as you can. It's a good investment of your time and of his or hers.

Here is a guide to help you do just that:

1) Start with a good description of the problem and the equipment being used.
"I have a Yaesu FT-101E that suddenly started putting out only 10 watts on 15 meters, but it will sometimes put out full power for a few seconds." is much more helpful than "Why does my radio have low power out?". Sometimes serial numbers help with earlier models and sometimes they don't, but always say what model you are working with. Don't let your helper guess whether the fault is also found on LSB, CW and AM. Tell him up front.

2) Tell the reader what else is not working properly on the set or what you are not sure is working even if you don't think it is important.
"On 15M the calibrator signal seems to be about 10dB lower than the other bands," or, "On-air reports tell me my audio is distorted a little as well," "My idle current keeps slowly going up," or "I think I hear a faint buzzing
sound coming from the radio on 15M," or "I'm pretty sure I smelled something burning when it happened," or "C17 seems to be leaking a little oil," or "My final tubes have different brand names on them," can be very useful clues when finding faults. If you are getting any funny meter readings at all, don't leave your helper guessing about them—let him know.
It can help to know how you know something isn't working. If you are not putting out power on the lower HF bands, but you're only using a CB wattmeter, it may well be that the meter is simply not designed to work at those frequencies.

3) Tell the reader what you are sure IS working properly on the radio.
"Ten meters puts out 80 watts and I get at least 100 watts out on the other bands," and "The receiver seems to be working normally on all the bands, but I'm not sure about 10 meters since the band hasn't been open," and "I'm getting full power out on CW and AM and on LSB on a dummy load, it's just 15M USB on the air or on the dummy load that it is weak," and "My signal reports on the other bands don't indicate any audio distortion," can all help narrow down the possible fault quite a bit.

4) Tell your helper about the history of the radio and the history of the fault.
Information such as "I just bought this radio from a CB'er at a flea market," or "I've had this radio and used it for 15 years now and I just replaced the finals a couple of months ago," or "It was my father's radio and it has been in storage for the last 15 years," or "I bought this on Ebay last week and it looks like there have been a lot of modifications done to it," or "It was doing the same thing last year, but it stopped by itself," or "It was working fine till I loaned it to the radio club for that Field Day on the beach," can often point to things to be checked first.

5) Tell your reader what you've already done to fix the radio.
"I haven't done anything yet, I'm looking for where I should start first," or "I've swapped out the driver tube for one I know is good," or "I've tested the USB carrier oscillator and it doesn't seem to be working," or "I've swapped out the 15 meter crystal from another radio that a friend has," or "I've swapped out every plug-in board with one from another working radio," or "I've cleaned every switch contact, relay and front-panel control on the rig," lets your helper know a lot about what can be eliminated as probable faults.

Since most faults on vintage radios are mechanical, not electronic, there is a lot to be said for not even asking for help on a 20 or 30-year old rig until you have cleaned every internal switch contact, every relay and panel control that you can, and you have also jiggled, wiggled, and repeatedly worked every knob and switch there is on the front and rear panels to see if the problem goes away—even a little . DeOxit is the preferred contact cleaner in the US and Canada, but any other 'tuner cleaner' designed

for electronic gear should work as well. Rough paper is the preferred cleaning tool for relay points. Don't use spray oils like WD-40 to clean electronic equipment.
Sounds like a lot of work? Well, the good news is that these faults are also the easiest things to fix.
If you haven't opened up your radio yet, maybe now is the time to do that:

Especially with older radios, you should take the time needed to thoroughly examine your radio before you post a request for help. Some faults can be quickly found by just looking at a radio. It's really worthwhile to take 15 or 20 minutes and just look carefully at your rig under a very bright light to see the obvious. You can often find burned resistors, filter caps that are leaking oil (or have even exploded), diodes that have disintegrated, bent variable capacitor plates, signs of high-voltage arcing, PC boards that are burned from overheated components, circuit board cracks, un-expected substitutions of 11 meter crystals, and tubes that are glowing with wondrous and unusual colors.

Poking and prodding can also reveal faults that can take hours to locate with test equipment. Wiggling a connector or a panel control, pulling tube and replacing it will sometimes 'fix' a broken radio. While you are at it, wiggle the patch chords and antenna connectors connected to your radio. Touching circuits can be dangerous but it can also identify faults you might not otherwise be able to find—like a hot resistor. Even banging on the side of the rig with your fist can do wonders for finding intermittent faults.

You might be amazed at what can fall out of a radio if you simply turn it upside down. Staples, paperclips, pennies, loose screws, nuts, small bolts and lots of dust can find their way inside an old radio.
Use your nose and ears, too. Sometimes, you can hear arcing that you cannot see, and you can smell a component that is overheating long before you see the damage.

Often answers to common repair and fault questions have been answered many times before. If your questions is specific enough, you can take advantage of Yahoo's archive features and enter something like "neutralizing"into the 'Search' feature option. Often you can find your answer, or at least someone who has some experience with the problem. You can also send an e-mail directly to the person that really knows the subject.

6) Tell your helpers just enough about yourself, your level of knowledge and your equipment setup to let them provide appropriate advice.

The advice given to a teenager who doesn't yet own a soldering iron will often be very different to that given to an old-timer who has a shack with a 20-year collection of test equipment. If you don't have the radio's instruction manual, let your helper know. If you are fortunate enough to maintenance service manual, let him know that as well.
If you just got the radio and you're not sure how to operate it because you don't have a manual or it's too complicated, please say so.

Tell the helper, too, if you don't have basic equipment like a dummy load, a volt-ohm meter or a standing-wave ratio meter. If you have another receiver, it can help a lot when testing transmitted signals, antennas and connecting cables. Your helper also needs to know what local support you have. Two day's overland ride to the nearest electronics store in the Australian outback? Or just down the street? Member of a local radio club? Any experienced friends to help out or who have test equipment that you don't have or can help you with on-the-air tests? A friend with an identical radio can quickly help you eliminate possible failures.

7) Communications are important.

Spelling doesn't usually matter, but just about everything else does. Start with the subject heading. Get rid of the old heading if it's not relevant. A subject heading that says "Receive Problem on FTdx570" instead of "Helppp!!!" will do a lot toward getting you to the right helper on the first try.

Most potential helpers will try to read a sentence two or three times and then move onto better things if they don't understand it. It's astonishing the number of posts that have sentences that don't form a complete thought, or whose beginning and end have to be guessed at, or are missing needed periods or capital letters or spaces between words, or are simply incomprehensible any way you try to read them. Writing like that creates the impression that you really don't care whether or not you are understood.

If English is your second language (or not your language at all), try anyway! No one will be offended if you follow your best-shot-at-it English paragraph with one saying the same thing in Spanish, German or Italian. It's amazing what you can figure out using the new on-line translators like Babelfish and radio operators often like the challenge of de-coding communications. Keep your sentence structure simple and your helper will be able to figure it out half the time—even if you do speak Hungarian.

Always give feedback on advice already given to you. Don't let your advisor guess whether or not something they recommended was done.
If you didn't have the dummy load you needed or if you're just afraid to reach into the final's cage to pull a relay because you don't know how to discharge the caps, tell your helper. For extended repairs making a list of "Here's what I've done so far: . . ." attached to posting is a big help.

For lengthy or growing problems, try to keep a tracking letter to attach to your posts. Usually, the past posts (oldest at the bottom) with the irrelevant stuff stripped off is plenty—don't make anyone go back and search the archives for your last six postings to figure out what your problem is and what you've done to fix it so far. Please!
Never attach your copy of the Yahoo 'Weekly Digest' and hope we'll somehow find what you're responding to in there! Learn to use the simple 'cut and paste' features on your browser and word processor if you haven't already.

Common courtesies are often missing on group posts. You don't have ooze Old World charm or compliment your helper on how handsome he looks on his profile page, but you should really try to use a minimum of manners when writing.
Don't be anonymous. At least write your name at the bottom of your message and your call sign if you have one. If you are writing for the first time, include a little information about yourself or fill out your Yahoo profile page. No one is going to steal your identity if you leave a photo there or list your age or other hobbies.

Your helpers are doing you a favor and they don't owe you the information you're requesting.
If you talk to them as if they do owe you an answer, you might find the help you're getting is very limited. It's easy to forget with the anonymity of internet communications, but simple things like 'please' and 'thank you' and addressing people by their names are just as important when posting to a group as when you're holding a conversation in person.

If you don't agree with what is being said, don't use it as an excuse to be impolite and attack the writer—this goes for helpers as well as 'helpees.'
Just point out your disagreement and leave the "only an idiot would suggest that" thoughts out of your posts.
Don't whine if you're not happy with the responses you're getting . If you don't get a response right away, it could be because some readers are only checking the group postings once a week or they want a little time to study a circuit diagram or find a reference they have buried away somewhere.

Request for help aren't a poll. If one person suggests one thing and the next person posting suggests something else, it's not a necessarily a disagreement. A helper doesn't usually want to take the time to repeat good advice already given by another unless he can add something to what has already been said. If you don't get a response in a couple of weeks, a gentle reminder that you're still looking for help is all you should need.

Complaining when someone asks for more information about your problem—especially if it is information you should have provided in the first place—is a pretty big turn-off for anyone reading your posts. You're far better off not responding at all if you're tempted to do that. Some problems are simple to fix, but others really require a lot of eliminating other possibilities first and that requires information that you may think is unimportant.
Not giving feedback on information already asked about is a fast way to turn your helper into a confirmed non-helper.

Unless you are just asking for a reference for a good repair service, try very hard not to give the impression you're not going to lift a finger to help yourself. Asking what you should do first with a non-working radio while saying it is full of dust or telling your reader that you haven't opened it up to see if all the tubes are there is like inviting your helper not to reply at all.

Tell your helper when you don't understand what's being said or if you don't know how to do something. If a helper suggests cleaning RL-2 before doing anything else and you don't know what RL-2 is, how to get it out, or how to take it apart to clean it, don't be too embarrassed to ask. That's a lot better than letting him think you've already cleaned that relay and it must be something else.

And a final word: Remember, you are the eyes and ears of the person helping you.
If you don't tell the helper about something then he or she won't know about it.

* * *

Helpers and 'Helpees' Comments:

Thank you John for this excellent worksheet, let me only remark one thing, because it can not be repeated often enough

cleaning cleaning cleaning

that is what I always do first and not all but most of the problems are gone. Most of these old beauties have not been used for years and in a clean and dry room, if they had the luck to be in there and not in a garage or something else, there is dust.

Nice example here on the bench, a FT-101ZD did not have any output, the problem was a dirty switch. Now it has 150 W pep, and the tubes are the first pair.

73 Kay DL5OAQ

* * *

Sure, but don't just say "check the transformer". Tell him which point to which point—from the first solder joint to ground, or whatever. Everyone is not a shop tech.
Some are just appliance operators.
Being very detailed works both ways...

Jaydee WA7PPF

[I really like this thought, Jaydee. Fixing a radio that's not if front of you takes a special knack. There's certainly room on this group for another file on 'Helping People with Radio Faults' or something similar.
Anyone want to try? —John]

* * *

[This file is not owned by anyone. Feel free to add to it and/or distribute it anywhere you please. If you want your comments added to this version, send them to jpkiljan AtSymbol yahoo.com —John (N0BUP)]

Our sincere thanks John for letting us use this file.
73, Wim PA0PGA

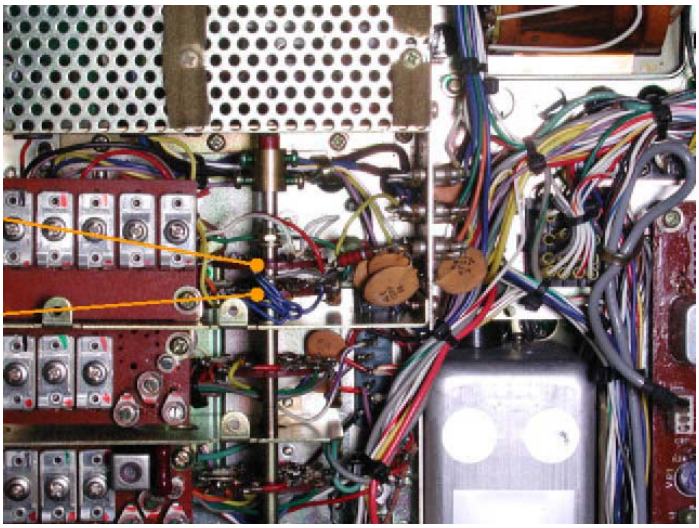
Removing the Yaesu WARC bands TX disabling modification on FT101 ZD MKII.

(N.B. The Yaesu Mod did not disable the RX for the WARC bands)

The Driver mod works by effectively adding extra capacitance from the lower bands across the coil, so that the WARC bands cannot tune to the required frequency, and no drive is therefore produced for the PA.
This Mod removes the extra capacitance and the WARC bands can then tune correctly. There are no adjustments to make after the wiring change. Takes about 15 minutes and you get three bands going.

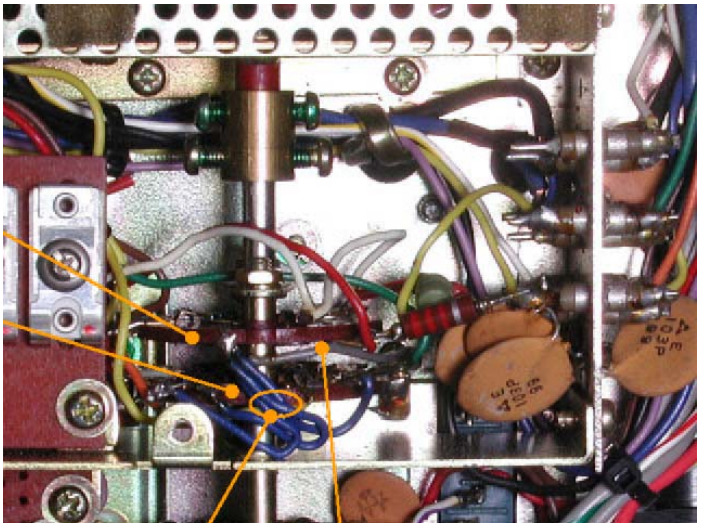
PREPARATION

a. Turn the FT101ZD over with the front panel towards you. The Driver section is on your Left hand-side half way up.
b. Remove the Driver section metal plate. Two of the lid securing screws will be hidden under some foam.
c. The S1E wafer is next to the PA section, which is at the Left hand side rear. The S1D wafer is in front of this one towards the front on the unit.
d. Identify the 3 BLUE wires and a GREY wire all joined together on a spare hole at the top of the S1E wafer. The Blue wires are connected to the S1D wafer.



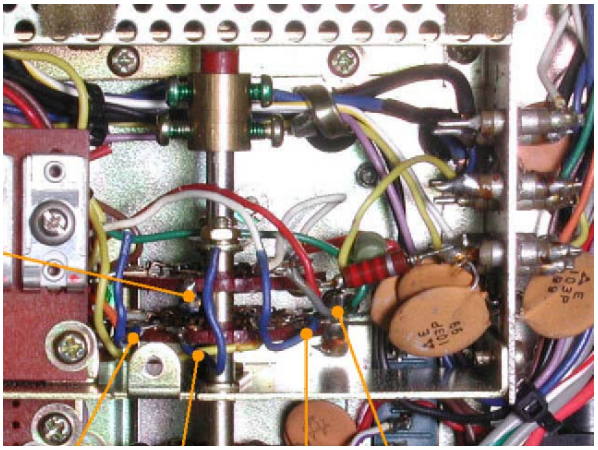
The MODIFICATION

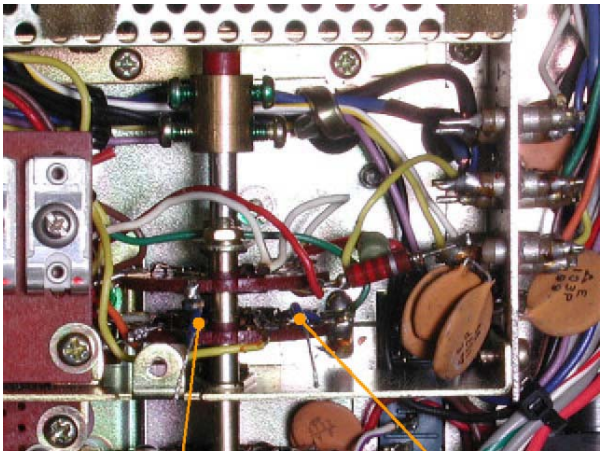
1. Cut all the wires off the communing point on switch wafer S1E, 3 blue & 1 Grey wire.
2. Remove completely the grey wire to switch wafer S1D position 12 m.(best done by using long nosed pliers and twisting it off)
3. Remove completely blue wire off switch wafer S1D position 40 m.



3 BLUE Wires a GREY Wire

Cut all wires

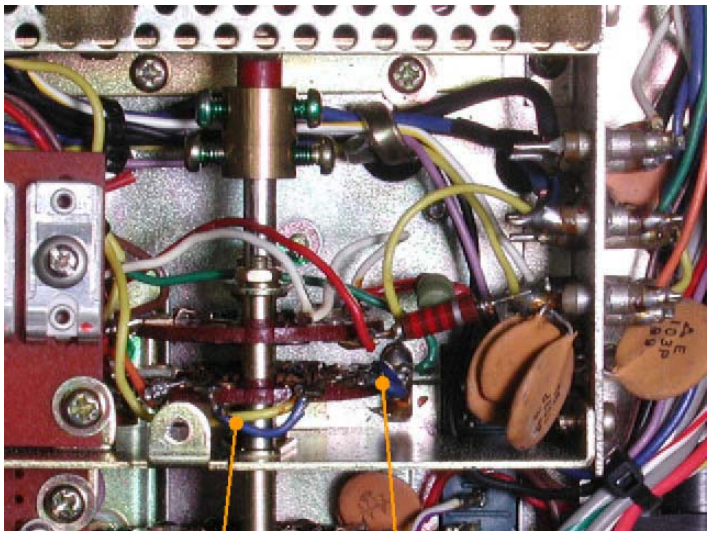




position 40 meter 30m 17m 12m

30 m 17 m

4. Connect as a loop Blue wire on switch wafer S1D position 30 metre to switch wafer S1D position 20 m.
5. Connect as a loop Blue wire on switch wafer S1D position 17 metre to switch wafer S1D position 15 m.

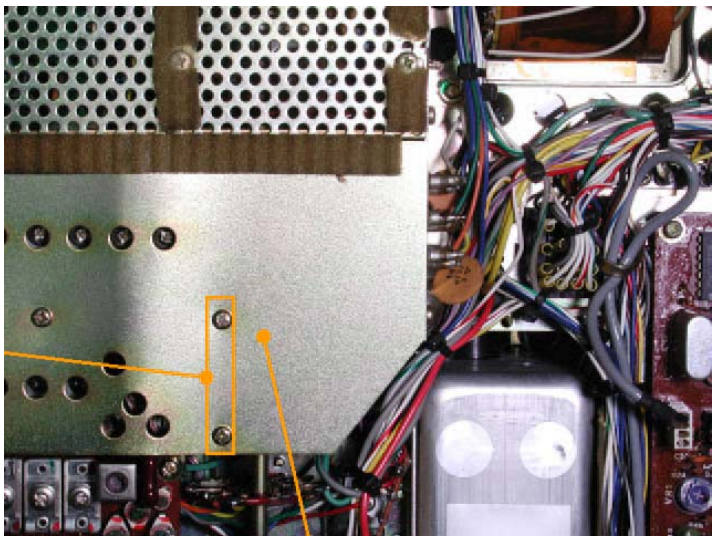


6. End of modification.

30 m connected to 20 m as a loop
17 m connected to 15 m as a loop

Mario Chomicz (G8ODE) & Teruhiko Hayashi (JA2SVZ)

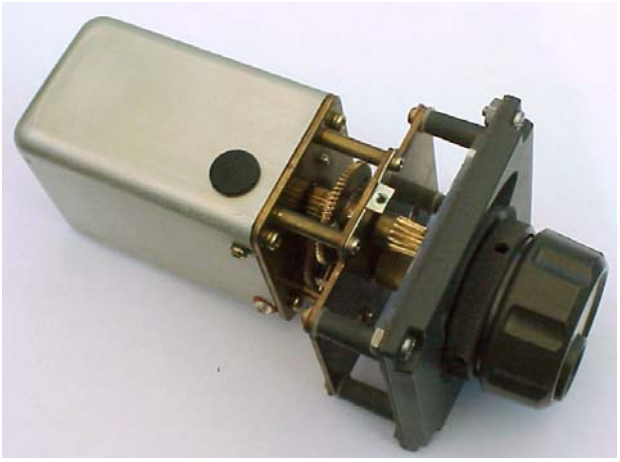
foam tape



Driver section metal plate placed

VFO stability story by Dan WB5TKA

We all know about the Roaming Gnome. He's the little guy who is never still, but rather travels the world sending back post cards from the numerous exotic places he visits, when in fact he should be sitting still. Rock still, in the garden.
The gnome's travels may be humorous but when your radio frequency travels, all humor goes out the window. The dial is supposed to stay put, just as the little concrete guy is suppose to stay put.



A couple of years ago I obtained a very nice and very clean Yaesu FT-902DM. Now this is one fantastic radio. Not only does it, unlike so many other transceivers, have the power supply built right inside the case, it covers all of the WARC bands - all bands from 160 through 10 meters - and operates all modes including AM and FM. Great for 10 meter operation. I won't outline all of the features. Simply take it that it's a very nice radio. It's from an earlier era so it does contain valves (ok, tubes for us on this side of the pond) in the transmitter (driver and PA) so more "tuning" is required than for current solid state rigs. Yes, the receiver is all solid state. It's been a fun radio to operate and makes a great rag chew rig for such bands as 17 meters.

Alas, all is not perfect with this radio. It suffers from a bad case of frequency drift. It requires a very long warm up time to stabilize enough to hold comfortable QSOs. Naturally following a station that drifts away from you while you're trying to carry on a chat is annoying.

The drift is downward in frequency and amounts to several KHz over a period of time, and is consistent on all bands. I determined to resolve the problem by finding the source of the malfunction and correcting it. I said that because some of the advice I received when I inquired on a couple of Yaesu email lists was to take the easy way out and simply get and use the external VFO which mates with the rig. Now having that VFO is certainly ideal and someday I'd like to get one but not for the reason given. The external VFO would allow split frequency operation further adding to the rig's utility.

I monitored the output of the internal VFO and noted that it increases in frequency. By the way, I must add that the drift is heat related. With the filaments turned on and especially while transmitting, the heat buildup is greater and thus the drift is accelerated. That told me on thing. The VFO is using temperature compensating capacitors and the compensation is too much. Surely, it did not leave the factory in that condition, so one must presume that the values selected for the circuit are correctly arrived at. Probably, component values have changed with age. Something has gone bad.

The original complement of capacitors within the tuning portion of the VFO, besides the variable ones, consisted of (in parallel) a 33 pf NPO, a 15 pf NPO, a 3 pf N750, and a 12 pf N750. A total of 15 pf N750 temperature compensation exist.

I ran a couple of tests. I removed both of the temperature compensating caps. but to insure that the total capacitance remained the same, I temporarily tacked in a 15 pf NPO. As expected, the VFO drifted down in frequency. Remember, the VFO had drifted higher in frequency originally. I then added only the 3 pf N750. The VFO still drifted up, but of course not as much as with no temperature compensation. I needed more.
I replaced the 3 pf with the 12 pf N750 and now the drift is downward again. Not nearly so much as at first. Now the drift is much slower (less distance over time) and ends up no more than about 1.5 kHz over a 12 hour or more time period. Not bad, but still not good enough. Far from it.
By rights, something less than 12 pf and more than 3 pf of temperature compensation is needed. Either a capacitance value of perhaps even one of like capacitance but a lower compensation. A N220 perhaps.
I don't know what the final solution will be yet. My next steps will involve some experimentation with different values of temperature compensation caps. At the same time, I will be looking further into the existing components seeking a clue about the real cause of the problem. The caps. I've checked so far have measured very close to their stamped values. That does not mean (if it's possible for this to happen) that one of the temperature compensation capacitors has changed its characteristics. I'll update this article as work progresses.
August 13, 2004. I'm a week or two behind in adding this update. The good news is that the radio is back to normal operation. I removed the recently installed 12 pf N750 and put the 3 pf N750 back in. As before, the drift reversed direction. Drifting up in frequency. I installed - mainly because it was the closest I had for something less than the previously installed 12 pf, an 8.2 pf N220. I'm not sure I could have come much closer had I a large assortment of sizes to work from. Drift now for all practical purposes is gone. After about an hour of warm up time, it's up in frequency only 300 Hz. The manual lists the stability as less than 300 Hz after 10 minutes of warm up and less than 100 Hz after 30 minutes warmup.
I set the dial to read 14.275.0 (no particular reason for picking that frequency) and after 24 hours, the frequency was rock solid at 14.274.8. The warm up time included having the filament switch on to help insure that the heat build up within the radio would be similar at least to normal use. The 200 Hz change, I can live with. It's certainly a vast improvement over the original drift which would have been perhaps a couple of kHz or more.
Now with the radio back in good working condition there is one more thing I am going to have to attend to. The two PA tubes appear to be soft. In the tune mode, the power after tuneup reaches perhaps 90 watts but falls off within a few seconds to perhaps 60 to 70 watts. So an investment in a new matched pair of 6146 tubes is in order.

Questions? Comments? Contact me.
wb5tka

Article courtesy of Dan WB5TKA
More on his website: http://www.dooleystreasurechest.com/wb5tka/index.html

The 6146 Family of Tubes

by

Glen E. Zook, K9STH

Probably the most used tube of all times in the final amplifier of "boat anchor" transmitters is the 6146. From the early 1950s until at least the 1980s, the 6146 found its way into virtually every manufacturer's line of transmitters. In fact, during the early 1960s RCA had a series of advertisements on the back cover of QST that listed a different manufacturer's equipment that used the 6146 each month.

There are actually three distinctive variants of the basic 6146: The 6146, 6146A, and 6146B. It is unfortunate that the 6146B was called the 6146B for it is really a different tube from the first two. Primarily the difference between the "plain" 6146 and the 6146A is the makeup of the heater ("filament"). The 6146A has what RCA calls the "dark heater". This "dark heater" is supposed to be more resilient to vibration, work well at a larger "range" of voltage, etc. Otherwise, the 6146 and the 6146A are the same tube.

In mid-1964 RCA introduced the 6146B with the "claim" of 33.33 percent higher power input than the 6146 / 6146A. Also, it was "claimed" that the 6146B could be directly substituted for the earlier tubes. The 6146 / 6146A had a maximum rated power input of 90 watts for CW and SSB operation and the 6146B had a rating of 120 watts for the same emissions.

Many amateurs are aware that the military "ruggedized" version was designated the 6146W (I will get to these tubes a bit later). However, RCA also introduced in the early 1960s the 8298 tube for use in commercial mobile equipment. The 8298 is just a "heftier" 6146A. Motorola, General Electric, and quite a number of other commercial FM equipment manufacturers used these tubes in all sorts of FM communications equipment for both low band (30-50 MHz) and high band (150.8 - 172 MHz). When the 6146B was introduced, RCA "announced" the 8298A commercial equivalent of the 6146B. In fact, most of the RCA 6146B tubes were "cross branded" with the 8298A number in addition to the 6146B.

Those companies who were manufacturing 6146 series tubes for the military changed from the "plain" 6146 to the 6146A to the 6146B as the military decreed. However, all of the tubes manufactured under military contracts were known as 6146W and, to my knowledge, nothing was done towards marking the tubes as being equivalents of the 6146, 6146A, or 6146B. The only way of telling is from the "date code" which is printed on each tube. Different manufacturers changed tube types at different times. Also, I know of no "master list" telling on what date a particular manufacturer changed from the 6146 to the 6146A to the 6146B. The only "sure" way to know if a particular 6146W is of either the 6146 or 6146A type is to look for a "code date" of before 1964 since RCA introduced the 6146B in the middle of that year. However, some manufacturers did not start manufacturing 6146B equivalent 6146W tubes for at least a year after RCA introduced the 6146B.

RCA "claimed" that the 6146B was directly interchangeable with the earlier members of the 6146 family. Unfortunately, this did not hold true in most cases. Collins, Heath, and probably other companies, at first issued various documents saying that the use of the 6146B in their equipment was "fine". But, this soon proved otherwise!

For example, when the 6146B was used in the Collins 32S-1, 32S-2, 32S-3, 32S-3A, KWM-2, and KWM-2A it was discovered that the components in the neutralization circuitry "burned up" in a very short amount of time. Thus, Collins had to retract the statement that it was "OK" to use the 6146B. Then, due to the fact that the United States military establishment wanted to "standardize" on the 6146W equivalent of the 6146B, the neutralization components had to be redesigned to allow the 6146B to be used. Fortunately, these changes did not affect the use of the earlier 6146 and 6146A in those transmitters manufactured to use the 6146B. All three types of tubes may be used without any problem in these transmitters.

Replacing the 6146 / 6146A tubes with 6146B types often results in spurious emissions, parasitic oscillations, etc. This is due to the fact that there are different bias requirements, different inter-electrode capacitances, etc. of the 6146B versus the other two. It is often difficult to neutralize 6146B tubes when used in place of the 6146 / 6146A. If neutralization can be achieved, often it lasts for just a few minutes before the tube(s) goes into oscillation.

If one insists on trying the 6146B tubes in place of the 6146 / 6146A types, the very first thing to do is to neutralize the final amplifier. If it will not neutralize, then the 6146B tubes should immediately be replaced with the older type tubes. If it does neutralize, then the neutralization should be "watched" for several hours (even days) of operation. If the neutralization changes, then the 6146B tubes again should be replaced with the 6146 / 6146A series. If the neutralization remains constant after several days, then use of the 6146B is fine in that particular transmitter.

I have, in my shack, a number of transmitters that use the 6146 / 6146A type of tubes. These include Collins 32S-1, 32S-3 (earlier model before the neutralization was changed); Heath Apache, DX-100, DX-35, SB-401, SB-110, Seneca; Johnson Pacemaker; and other transmitters as well. Every one is much "happier" with the 6146/6146A type of tubes. In addition, I have owned transmitters like the Knight T-150 and T-150A that use the 6146 tubes. Frankly, these transmitters were much happier with the 6146/6146A tubes.

There is another 6146 family tube that is “superior” for operation at least through 10 meters. That is the 6293. This tube was designed for “pulse” service and is rated at 1-Kilowatt pulse power input. The primary difference between these and the “normal” 6146 is that the plate is much “heavier” in its construction. Back in the late 1950s and early 1960s we would almost “kill” to get our hands on a pair of these for our DX-100s, etc. The 6293 outlasts the 6146 in “normal” service by at least 5 times and often more than 10 times the life of the tube. These tubes “show up” at hamfests, swap meets, etc., from time-to-time. If you see some of these, definitely “glomp” onto them!

The 12-volt equivalent of the 6146 is the 6883, the equivalent of the 6146A is the 6883A, and the 6146B is the 6883B. Now, there are the tubes that were manufactured for FM commercial service. These series go as follows: 6883, 6883A / 8032, 6883B / 8032A / 8552. Again most of these are “cross branded” with all of the tube numbers that are equivalent.

From 1970 until late 1979 when Motorola went out of the reconditioned equipment business, I owned the Motorola reconditioned equipment center for the south-central United States. We reconditioned Motorola FM equipment for 14 states, everything that Motorola sold reconditioned that was exported, and everything that was sold to the United States Government (this was the height of Viet Nam and the Government did buy reconditioned equipment!).

At that time, the Motrac series of mobile equipment was very popular. Depending on the model, these normally used one, or two, of the 6883A / 8032 tubes. It was only in the very “latest” models (HHT “E” series, LHT series, and MHT series) that Motorola had redesigned the equipment to use the 6883B / 8032A / 8552 tubes. Around late 1976 or early 1977, Motorola decided to eliminate some of the tube types that they were “stocking” at the Schamburg, Illinois, parts depot. Thus, they started shipping 8552 tubes in boxes that were marked as 8032. The Motrac is unique in the fact that you cannot see the tubes when they are in operation (they are enclosed in a metal “heat sink”). In fact, it is difficult to even “tune” a Motrac when the heat sink is not in place.

We went through from 50 to over 100 of the 8032 type tubes per week and within days were “down” to using the 8552 tubes in the 8032 boxes. Within a very few days of starting to use the 8552 tubes we started receiving complaints that virtually every Motrac unit that was received by customers arrived with one, or both, tubes broken. Prior to this we had never had a single complaint. Upon investigation we found that the 8552 tubes had so many parasitic oscillations that they were getting so hot that the glass envelope was being annealed! This was happening within a minute, or two, of tune-up and final quality control. When the radio was subjected to normal vibrations of shipping, the glass envelope of the tubes was being shattered.

This was reported to Motorola. At first they refused to believe us saying that we must have gotten a “bad” shipment of tubes. But, within a couple of weeks they received over 1000 complaints from their service stations about exactly the same problem. It cost Motorola one “heck of a lot” of money to pay the warranty claims because they had tried to “cut costs” by eliminating the earlier type of tube. They had to re-box all of the 8552 tubes that had been put into 8032 boxes and get in a “rush” shipment of 8032 tubes.

The whole problem stemmed from the fact that the “B” series of tubes is not the same as the “plain” and “A” series. The parasitic oscillations were caused by the different bias requirements and by the “fixed” neutralization of the driver and/or amplifier tube in the Motrac. There was no practical way to change the circuitry to handle the “B” series tubes. Also, making such a change would void the “type acceptance” of the units.

In a “practical” sense, it is “OK” to mix 6146 and 6146A tubes since the primary difference is in the design of the heaters. But, NEVER mix 6146 / 6146A tubes with a 6146B! This is really “asking for trouble”.

Also, in a number of transmitters and transceivers (especially the Heath SB-Line) the heaters (“filaments”) of the pair of 6146 tubes are in series. In these units it is very easy to change the heaters from series to parallel and substitute the 6883 / 6883A / 8032 tubes. The 12-volt equivalent tubes are often available for “pennies” because of the vast number that were used in the commercial FM market. I have done this with my Heath SB-110A and it works “like a champ”. If you every want to change back, it is a very simple operation to do so.

I know that there are amateurs who say that they have used the 6146B tubes in place of the 6146 / 6146A without any problems. I can definitely believe that. But, I have seen way too many examples of the 6146B causing problems in relation to the cases in which the substitution has no effect. As I said before, neutralize and keep checking the neutralization for several days if you do replace your 6146 / 6146A tubes with 6146B types. Otherwise, you can find yourself with TVI, “burned out tubes”, and other damage to your transmitter.

You must be VERY careful when dealing with the various tubes of the 6146 family, otherwise you just might be in for some very interesting problems. Substitute if you must, but, be aware that you are “treading on thin ice”.

6146 type tubes and equivalents:

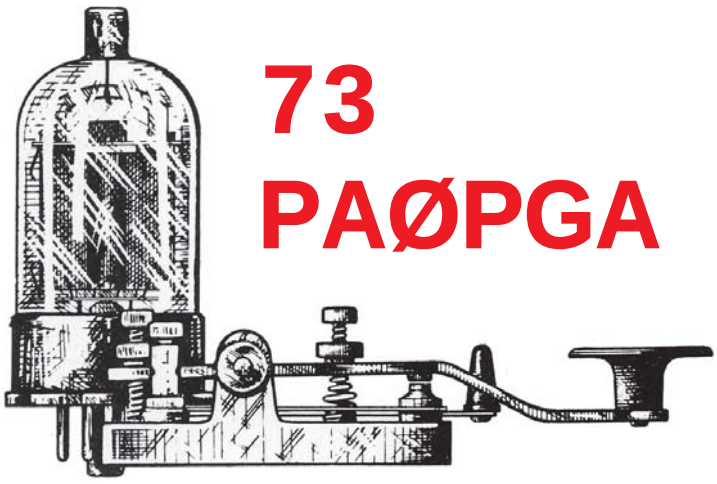
6146	**25W = 6293** (heavy duty pulse tube, 5-10x longer lasting)	
6146A	**25W** = **8298**	**6883A/8032** (12V heater)
6146B	**35W** = **8298A**	**6883B/8032A** (12V heater)
YL1370	**35W = 6146B**	**YL1372** (12V heater)
6146W	**35W** = **6146W**	(fabricated as 6146B after 1962)
QE-06/40	**25W = 6146A**	European version by Philips & Mullard
	QE-06/40**F** = 12V heater, **K** = 13.8 V heater, **H** = 26V heater	

Buyers Beware

Be careful by buying any FT-101ZD transceiver with AM/FM and previously used on 27 Mhz by good buddy's, they have all been heavely overloaded by users that had no real knowledge what they are doiing, so suspect the worst. They liked special the tube-type final sets, because they are not so easely destroyed by misuse as the more modern sets with transistor PA's.
When you buy such a transceiver, it will cost at least a couple of final tubes, at a additional cost of around $ 100.-, if not the total repair of the Power Amplifier. It is better to pay something more for a good-looking, not over-used set from a known source. The same goes for the FT-901DM, even more popular with the CB folks because they had the AM and FM boards installed.
If the price is too good to be true, it usually is. Cheap sets are usually problem sets.
If you can repair everything yourself and have the time, there is nothing wrong with buying cheap, but usually the sets are otherwise misused too, so you always end up with a lesser set than the one in good condition, carefully used by a fellow ham. Of course this sets can also have some problems, but have at least the potential to be restored to a first class piece of equipment. Use your common sense.
Always try to collect the set yourself, that way you can see what you are in for. Sometimes to meet the vendor can give you a clue how the set was used.

Buying at Internet is a good source, if you take some precautions:
If the seller uses the internet much, he has usually a quality marking to his name, wich gives a clue to his reliability, but this means also that he buys and sells very often, and is more interested in a quick buck, than in the equipment itself. So please beware, and be careful. You see often the same pictures of very nice equipment in ads, but when you receive it, is it a box full of junk, scratched and mostly with a lot of internal problems. See the FT-901DM page for a sample.
The best buys come from local hams, or hams who want to upgrade to a newer ricebox with more menu's and knobs to fiddle with. To obtain the new toy, they sell the old, reliable sets often for a modest price. Another source can be the usual swapfest or estate sell fom a deceased Ham.
Of course you have to inform yourself on the market value of the set you are looking for.
Actual prices change with general condition, the available options or accessoires, and are often negotiable. Take your time, and keep an eye at ads, sometimes you have to act fast if your dreamset is at an auction for the right price. If you are in a hurry, you can always place a ad in the asked catagory.

6146 type power tubes:
Try to buy NOS tubes of American brands, I have a special liking for RCA tubes, but other good brands are GE, Eimac, Tungsram, Raytheon or European Philips, Mullard, Siemens or Telefunken. All this firms don't make tubes anymore, but there are still much tubes on the market. Good tubes last practically forever, if you use them properly, special the ruggidized types and SQ types in Europe.
They are in most respects much better than the Chinese and Russian and many other mysterious brands that are on the market today.
A special warning may be worth the brands Haltron and Ultron. They were tube manufacturers in the previous East-European countries and produced low-cost versions of all kind of popular tubes. They still produced tubes when the other brands closed their factories. If you look close to the construction you see skewed electrodes, balloons skewed in the sockets, and a general miss of quality. They never last as long as the others. I prefer anytime a 50% tested secondhand RCA tube to a new Haltron.



73
PAØPGA

Keep them glowing...

PAØPGA