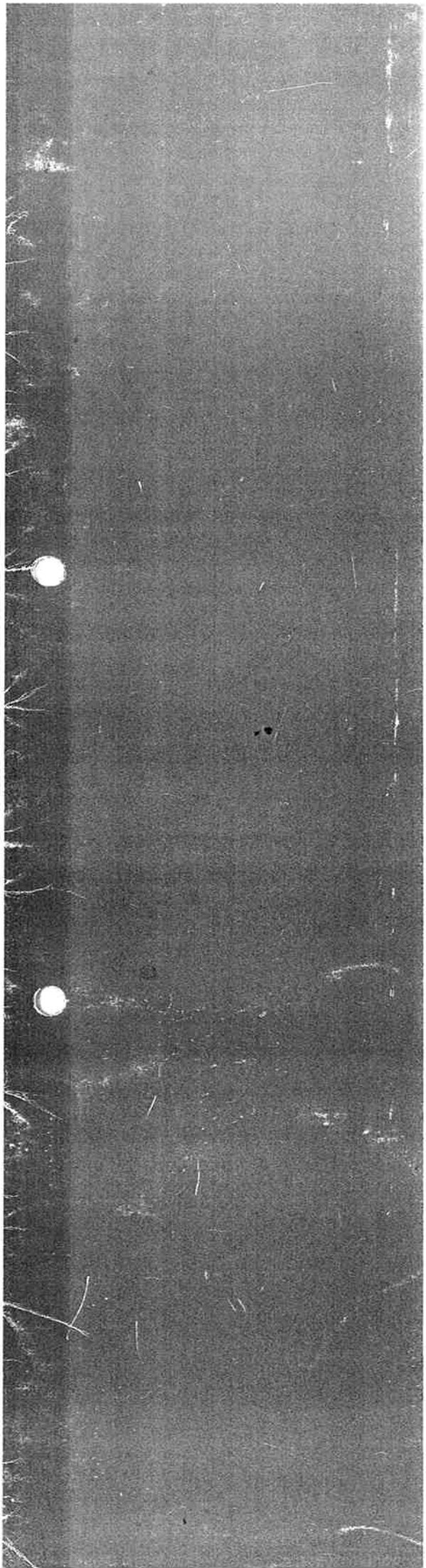


INSTRUCTION MANUAL

FT DX 505

SOMMERKAMP ELECTRONICS GMBH

SPECIFICATIONS

Emission Type	SSB (USB and LSB selectable) CW
Input Power	560 watts PEP maximum, 500 watts CW
Frequency Range	3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-30.0 MHz 10.0 — 10.5 (RX only) (2 extra bands can be added)
Frequency Stability	After warmup 100 Hz for any 30 min.
Antenna Impedance	50 to 120 ohms unbalanced
Carrier Suppression	Better than −40 db
Sideband Suppression	Better than −50 db at 1000 Hz
Distortion products	Better than −25 db
Receiver sensitivity	0.5 μV S/N 20db at 14 MHz SSB
Selectivity	SSB ····2.4 KHz at −6db, 4.2 KHz at −60 db CW ·····600Hz at −6db, 1.2 KHz at −60 db
Image rejection	50 db
Audio output	1 watt
Output impedance	8 ohms
Power requirement	AC 117 or 220 volts at 50/60 Hz
Dimensions	15¾" wide, 6¼" high, 13¾" deep
Weight	approximately (40 lbs.)

CONGRATULATIONS! You have just purchased one of the finest, high performance transceivers available to the amateur today. To fully appreciate the features, flexibility, and efficient operating procedures available with your new transceiver, we recommend that the instruction manual be studied thoroughly prior to operation.

GENERAL:

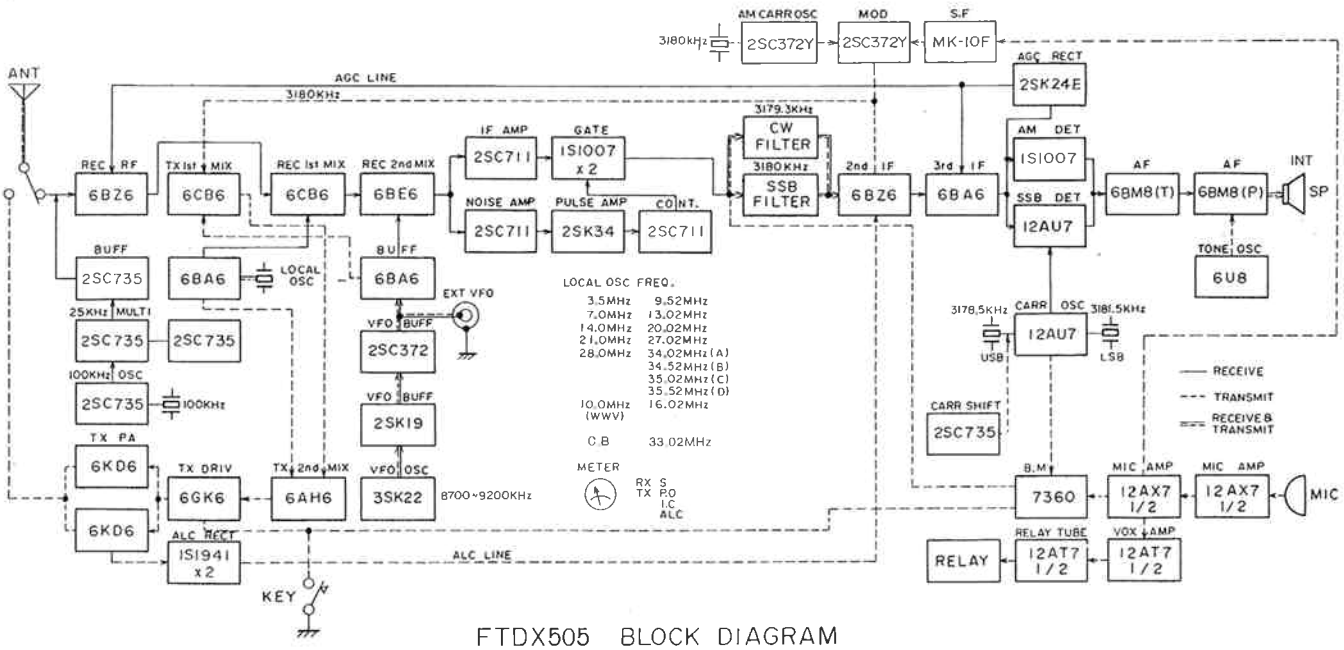
The FTdx505 Single Sideband Transceiver is a precision built transceiver providing SSB (USB and LSB), and CW modes of operation. This transceiver operates at a maximum input of (560) watts PEP for SSB, and (500) watts CW on all bands, 80 through 10 meters.

In addition to the high output power of the transceiver, many features that have previously been considered extra cost options are included as standard equipment on the FTdx505 Standard equipment includes built-in solid state power supply, CW filter, noise blanker, cooling fan, fully adjustable VOX, break-in CW operation, adjustable CW side tone, clarifier control provides ± 5 KHz off-set receiver operation, dual calibration markers at 100 and 25 KHz, 10 MHz WWV Band, provision for two additional transceive bands outside the amateur bands between 3.5 and 30 MHz, and front panel external VFO switching.

FV401 External VFO

The companion FV401 External VFO allows cross-band DX operation and has the effect of providing the operator with split frequency, separate receiver-transmitter operation, controlled by VFO or X-tal.

The FTdx505 has been designed to anticipate the amateur's future operating requirements and will provide many hours of trouble free service.



FTDX505 BLOCK DIAGRAM

5520-6020

PRINCIPLES OF OPERATION

The block diagram and the circuit description provides you with a better understanding of this transceiver. The transceiver consists of a double-conversion receiver and a double-conversion exciter-transmitter. Receiver and transmitter circuits use common oscillators, common crystal filter, and common IF stages. The low frequency IF is 3,180 KHz. The high frequency IF is pass band tuned to cover 5,520 to 6,020 KHz.

RECEIVER CIRCUIT:

A signal from the antenna passes through the antenna relay and trap coil, (tuned to 5,770 KHz), then to the tuned circuit and is applied to the grid of the RF amplifier, V1, 6BZ6.

The high frequency oscillator injection signal is also fed to the cathode of the first mixer from the local oscillator V2, 6BA6. The product of the first mixer is applied from the plate of the tube to the high IF pass band transformer. Output of this transformer (5,520 to 6,020 KHz) is applied to the grid of the second receiver mixer, V203, 6BE6. When the signal is applied to the grid of V203, and the VFO injection signal is applied to another grid of the tube, the 3,180 KHz difference product is fed from the V203 plate circuit to the Noise Blanker Unit.

The output from V203 is fed to the base of the IF amplifier TR351, 2SC711 and the base of the noise amplifier TR352, 2SC711. The output from TR351 is fed to the crystal filter through the noise blanker diodes D351 and D352, 1S1007. The diodes disconnect the input of the crystel filter each time there is noise pulse. The diode switch is driven by TR354. The switching level is adjusted by the noise blanker threshold control VR351.

D1301 through D1304 are diode switches which select the crystal filter for SSB or CW operation. The diode switch selects the CW filter automatically when the MODE switch is set to CW position. The output from the filter is applied to the grid of the first IF amplifier, V204, 6BZ6. The signal is amplified by V204 and V205 and applied through T205 to the AGC rectifier diodes, and the grid of product detector V213, 12AU7.

The beat-frequency oscillator signal which is generated in V206, 12AU7 is applied to the cathode of V213, 12AU7 and the result is the detected audio signal. Output of the AGC rectifier circuit is applied to the grid circuit of the RF amplifier tube and IF amplifier tubes to control the gain of the receiver automatically and prevent overloading. Output from the product detector is applied to the noise limiter circuit by a switch on the front panel. Output from the noise limiter circuit is applied through the AF GAIN control, VR9, to the grid of the first AF amplifier tube, triode section of V210, 6BM8. Amplified audio output of the triode section is coupled to the grid of the AF output amplifier, pentode section of V210, which drives the output transformer T1.

TRANSMITTER CIRCUIT:

The microphone input is connected to the grid of the first microphone amplifier V208A, 12AX7, and then coupled to the grid of the second amplifier, V208B, the other half of the tube. Output from V208B is coupled to the beam deflection electrode of V207, 7360, through the MIC GAIN control, VR-6.

In the CW/TUNE position of the MODE switch, output from the tone oscillator, V212, 6U8, is fed to the grid of the receiver power amplifier tube, V210. The carrier signal generated in V206, 12AU7, is fed to the control grid of V207. Output from the balanced modulator V207 coupled to the grid of the IF amplifier, V204, 6BZ6, through the crystal filter, XF-201 of which the passband is centered at 3,180 KHz. This passes either the upper or lower sideband, depending upon the sideband selected when the MODE switch is set to carrier crystal X201 or X202.

The output from the IF amplifier is fed through T204 to the grid of transmitter VFO mixer, V201, 6CB6. The plate circuit of the first mixer is connected to the passband tuning transformer BPF5, and converts the 3,180 KHz sideband signal to a 5,520 to 6,020 KHz single sideband signal. The passband tuning is so designed that it provides excellent spurious reduction. The output signal from the passband network is fed to the grid of the second mixer, V3, 6AH6, and the high frequency injection signal from crystal oscillator, V2, 6BA6 is also fed to the grid of V3. This arrangement converts the IF signal to the desired transmitting frequency. Output from the second mixer is fed through a tuned circuit to the grid of the driver tube, V4, 6GK6 and amplified to a level sufficient to drive the final linear amplifier, V5 and V6, 6KD6s.

Final output from V5 and V6 is fed to a pi-section network consisting of L15 and PLATE and LOAD capacitors. A section of the bandswitch adjusts the inductance of L15 to the correct value for each band, and adds fixed amounts of capacity to the PLATE and LOAD capacitor on the lower bands. Output from the pi-network is fed to the antenna through the contacts of the antenna relay. Both the driver and final stages are neutralized to ensure stability. A section of the band switch selects the capacitors to the corerct value for perfect neutralization on each band.

The ALC circuit is placed in the grid circuit of the final tubes. When RF driving voltage to the final tubes becomes sufficient to drive the grids positive, the grids begin to draw current and the signal is detected. This produces an audio envelope. The audio is then rectified by the ALC rectifier, which in turn produces a negative DC voltage. The voltage is filtered by C61 and R-29, which also determines the time constant, and controls the gain of V204. This system allows a high average of

modulation without increased distortion.

The output voltage from the second microphone amplifier, V208, is coupled through the VOX GAIN control to the grid of V209A, 12AT7, and fed to the VOX rectifier. The positive DC output voltage of the VOX rectifier is applied to the grid of VOX relay amplifier tube, V209B, 12AT7, causing it to conduct current and actuate the VOX relay RL1. The relay tube is so biased that the relay is actuated by the VOX GAIN switch in the MOX position. Contacts on the relay switch, —70 volts DC muting and bias voltage, the metering circuit from receive to transmit, the clarifier and antenna relay.

The ANTITRIP circuit provides a threshold voltage to prevent the loud speaker output from tripping the transceiver into the transmit function. The receiver output audio voltage is connected through ANTITRIP control, VR8, to a rectifier. Negative DC output voltage from the ANTITRIP rectifier, connected to the grid of the VOX tube V209B, 12AT7, provides the necessary antitrip threshold. ANTITRIP control VR8 adjusts the value of the antitrip voltage threshold so that the loudspeaker output will not produce too much positive DC output from the VOX rectifier so as to exceed the negative DC output from the antitrip rectifier and cause V209B to actuate the relay. However, the microphone input will cause the positive voltage to overcome the negative voltage and actuate the relay. VR13 provides coarse adjustment for relay tube sensitivity.

Relay hold time will be determined by DELAY control, located on chassis rear apron.

OSCILLATORS

The transceiver contains 5 oscillators. They are the carrier oscillator, the high frequency crystal oscillator, the variable frequency oscillator, the tone oscillator, and the crystal calibrator.

Carrier Oscillator

The carrier oscillator is crystal controlled at either 3,178.5 or 3,181.5 KHz, depending upon whether X201 or X202 is selected by the MODE switch. The MODE switch disconnects the cathode circuit of either tube when not in use. These crystal frequencies are matched to the pass band of the crystal filter, to place the carrier frequency approximately 20db down on the skirt of the filter response. The 3,178.5 KHz crystal frequency is shifted into the filter response range to insert the carrier for CW/TUNE operation.

High Frequency Oscillator

The band determining oscillator, V2, 6BA6, is crystal controlled by one of the 9 crystals selected by the BAND switch. Output from the oscillator is fed to the cathode of the receiver first mixer V202, 6CB6, and the grid of the transmitter second mixer, V3, 6AH6. The output frequency of this oscillator is always 6,020 KHz higher than the lower edge of the selected band. The output signal from this oscillator is the crystal fundamental frequency for 80 and 40 meters, but for higher bands, the crystal frequency is doudled in the plate circuit of the oscillator.

Variable frequency oscillator

The VFO uses a FET transistor, TR401, 3SK22G, as the oscillator, and TR402, first buffer and TR403 buffer amplifier. The VFO oscillating frequency is 8,700 to 9,200 KHz to provide 500 KHz Band coverage. Varactor diode 1S145 is in series with capacitor, C415 and is switched into the circuit by the CLARIFIER switch and relay contacts to shift the VFO frequency. Output from TR403 is fed through the SELECT switch to VFO buffer tube V211.

Crystal calibrator

The 100 KHz crystal oscillator, TR301, 2SC735Y is used for dial calibration. Output from the oscillator, TR301 is fed into the 25 KHz multivibrator which generates a marker signal every 25 KHz.

Tone oscillator

The tone oscillator operates when the MODE switch is in CW/TUNE position. It is a phase shift oscillator operating at approximately 800Hz. The output is applied to the receiver audio amplifier for sidetone monitoring in CW operation.

POWER SUPPLY

The built-in power supply is an all solid state bridge-type, delivering 4 different DC voltages and also AC heater supply for all tubes. The power transformer has two primary windings for operation from either 117 or 220 volt AC supply.

The power amplifier plate voltage (600V DC) is supplied from bridge connected silicon rectifiers. 300 volts DC is delivered to the plates of the other tubes, and 150 volt DC supply is provided through the center tap of the medium voltage supply. Bias is supplied from a half wave rectifier, D513, 1S1943 The plate voltage for all oscillator tubes is regulated with a VR-105 MT, stabilizer tube.