

## FM FRONT END/IF

At the inlet, a double-tuning circuit is used. And a dual-gate MOS type FET is employed for high frequency amplification and mixing. This FET has high input impedance and small feedback capacity when compared with a transistor, which are suitable for high frequency amplification and mixing. Thanks to the double-tuning circuit and FET, outstanding selectivity, cross modulation characteristics, low noise and high gain can be obtained.

At the local oscillating section, IC is newly adopted for producing stable oscillating frequency and output voltage.

Intermediate frequency (IF) signal of 10.7MHz fed from the front end is transmitted to IC201 for IF amplification through VR201, and CFs 201 and 202. Output from No. 5 pin is further transmitted to IC202 amplitude limiter through CF203.

Generally, in the pass band of ceramic filter, undulation of characteristics occurs. This undulation causes deviation of phase of transfer frequency (FM modulated factor), resulting in phase distortion at detection output. To reduce such phase distortion, VR201 and T201 are added to the inlets of CF201 and CF202 respectively to match the impedance. This circuit is called "phase distortion compensating circuit."

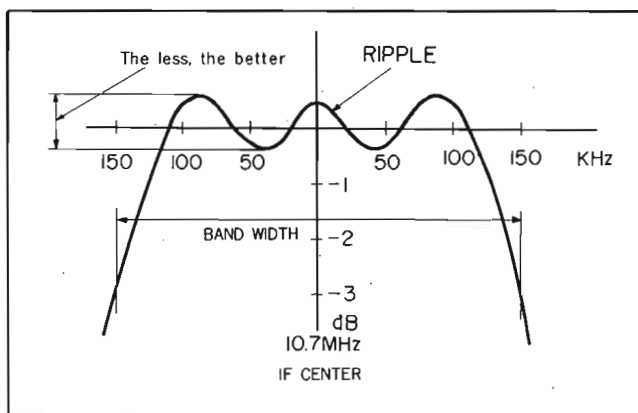


Fig. 1 Band Pass Characteristics of Ceramic Filter

## AFC/TUNING METER CIRCUIT

IC203 amplifies DC element of discrimination output which TR203 and TR204 feed to No. 2 pin. This DC element becomes zero when central frequency of IF is 10.7MHz (perfect tuning) or when discrimination output is zero at perfect detuning. When IF shift from 10.7MHz, signal including DC element corresponding to shifting rate.

Part of amplified DC element is divided, and supplied to the varicap diode of RF pack as AFC control voltage in order to adjust the local oscillating frequency so that IF becomes 10.7MHz (now DC element is zero) at all times. At the same time, a pointer of tuning meter swings by this voltage. When DC element of

discrimination output is zero, AFC voltage is also zero and the pointer of meter reads the center. When DC voltage is +, the pointer swings on + side, and when DC voltage is -, the pointer swings on - side.

## SIGNAL METER CIRCUIT

### FM

At detuning, discrimination output delivered from TR204 emitter contains noise signal with a wide band frequency spectrum from low to high frequency. This noise signal is transmitted to the base of TR220 through high-pass filters of C275, C276, C277, C279, L208 and L209, and then amplified at TR220 and TR219. The amplified signal is further rectified at D207, and separated - voltage is returned to the base of TR220 gets in OFF condition. In addition current does not flow from the emitter to the signal meter, so that the pointer of meter does not swing.

At tuning, amplified noise signal is small and voltage which is returned to the base of TR220 is low, so that TR is turned on. As a result, the current flows from the emitter and the pointer of meter swings.

Basic operation of TR217 and TR218 is similar to that of TR220 and TR219, then sensitivity of meter is further graded up due to functions of two circuits.

### AM

When the voltage applied to D208 (7V of zener diode) exceeds 7V, yielding current flows and pointer or meter swings. In other words, D208 detects the variation of collector voltage at TR229 as signal intensity, and transmits it to the meter.

## AUTO-TOUCH TUNING CIRCUIT

In case of tuning when AFC actuates, AFC activates in the vicinity of tuning point, thus correct tuning point being hardly distinguished.

To avoid this trouble, it is necessary to turn off AFC when tuning is made. The auto-touch tuning circuit automatically does that.

When the tuning knob is touched with finger, noise factor caught by human being is amplified at TR215 and TR216, and then half-wave rectified. As a result, this noise factor emerges as + voltage. This + voltage turns TR201 on, and earthes AFC route leading to the RF pack. When the finger leaves the knob after tuning, noise factor to be amplified is eliminated, so that TR201 is turned off and earthing of AFC route is released.

Muting is to shut off the circuit to cut off noise as output produced while tuning from one station to another.

Muting of the machine is made by means of switching function of transistors. The muting system has 10 transistors – TR221, 224, 225, 226, 222, 223, 227, 202, 209 and 210. Of them TR227 actuates at the FUNCTION switch.

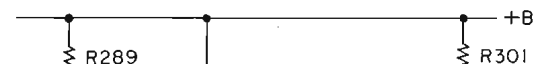
Switching transistors that shut down the signal directly are TR202, TR209 and TR210. When these transistors are forward biased (+B flows to the base of TR202 through R364), TR202 is turned on, and discrimination output from TR204 emitter is short-circuited. Similarly, when TR209 and TR210 are turned on, output system of MPX is short-circuited. At this time, muting function is in service. On the contrary, the bases of TR202, TR209 and TR210 are reversely biased, they are turned off and muting is inoperative. TR226 causes reverse bias. When TR226 is turned on, central potential of R301 and R302 becomes -, and - potential appears on the bases of TR202, TR209 and TR210 through the muting switch S2. When TR226 is turned off, - potential does not flow but +B flow, so that TR202, TR209 and TR210 become to be turned on. Fig. 2 and Fig. 3 show on/off conditions of TR226.

TR220 in the signal meter circuit.

At detuning, when TR220 is turned off, current does not flow through R290 connected to the collector of TR220. At this time, current does not flow through the base of TR221, causing off condition. When TR220 is turned on, TR221 is forward biased and turned on.

In other words, when TR220 is under off condition, TR221 is also off condition, and when TR202 is on, TR221 is on.

TR222 and TR223 serves to mute until almost tuning condition. In the vicinity of tuning point, noise factor is reduced and TR220 and TR221 are turned on (while TR224 and TR225 are turned off). Moreover, due to + and - of slight AFC voltage, TR222 or TR223 is turned on, causing muting condition. When AFC voltage is +, TR222 is turned on, and voltage of R294 appears. This voltage turn TR224 on. On the contrary, when AFC voltage is -, TR223 is turned on, and voltage of R296 appears to turn TR225 on. After a series of actions mentioned above, TR226 is turned off, and muting function becomes activated. TR227 performs muting of the function system. When the FUNCTION switch S1b is already set at FM position, B-E potential of TR227 is almost same. At this time, condition is off, and muting is inoperative. When switch is turned, contact is released and base potential is drops, so that TR227 is turned on, +B is fed to the base of TR202, TR209 and TR210 through R303,



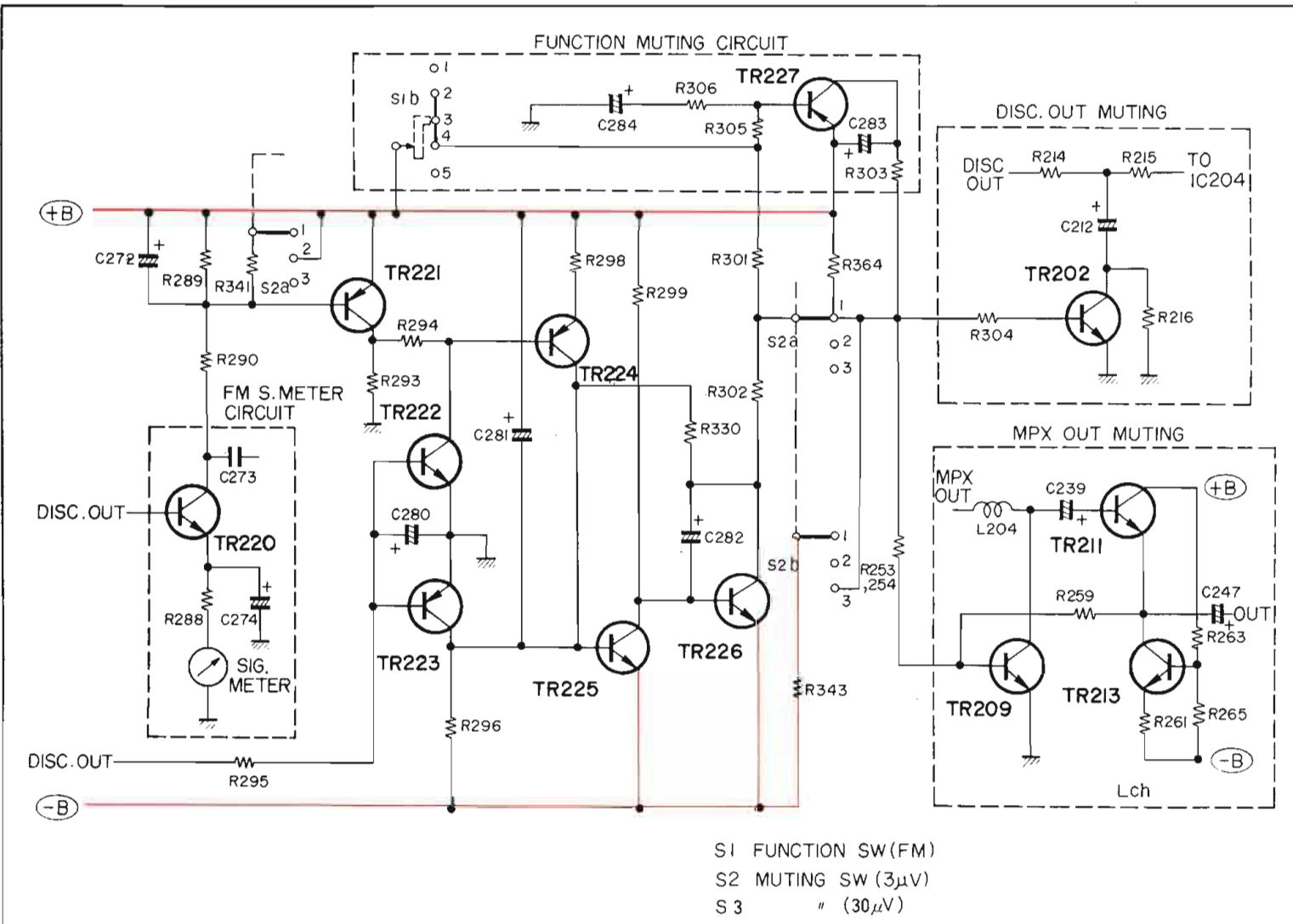


Fig. 4 Muting Circuits

## MPX DECODER CIRCUIT

The MPX circuit uses PLL type IC. No. 2 pin (input terminal) of IC204 receives composite signal from the emitter of TR204.

In addition, 19KHz pilot signal is independently supplied to No. 13 pin (phase comparator input terminal) from the meter output stage of IC203 through the high-pass circuit. Thereby, stability of PLL function is improved.

Oscillating frequency of VCO is controlled and stabilized by phase-comparing 19KHz obtained at the VCO block of IC with pilot signal.

Stereo signals from No. 4 and No. 5 pins of IC204 are respectively amplified at TR207 and TR208 and then put out through the filter.

Part of the stereo signals is fed back to the input stage of IC204 from the emitter of TR207 and TR208.

Futhermore, operating point of the switching block

of MPX is controlled with the variation of NF value in order to improve the separation performance. Pilot signal included in the composite which is fed to base of TR205 is not required because the comparator input is obtained from another system. Then, to erase the pilot signal the phase is reversed at TR228 by using 19KHz rectangular wave of VCO output, and the waveform is reshaped to the sine wave through the resonant circuit. After that this pilot signal is given to the composite signal as reversed-phase one.

## ELECTRICAL ATTENUATOR CIRCUIT

When excessive signal is supplied to the high frequency amplifying stage to voltage-doubler detector, is fed back to the bases of TR229, TR230 and TR231 in order to controlled the base potential. Thereby, amplification of TR229, TR230 and TR231 is reduced, and occurrence of distortion is decreased.