CIRCUIT DESCRIPTION

GMR648-2CK(UT005ZH)

Refer to Schematic Diagrams and Block Diagram.

1. Means for Determinations Frequency

This equipment is employing a Phase Locked Loop (PLL) circuit (IC401, AN29160A) along with the direct oscillation type VCO (D401 & Q402). TX operation frequency (Ftx) and RX 1st Local frequency (Frvco) are determined by the PLL circuit and are respectively generated by the VCO circuit.

The operation frequencies of this equipment is specified from 462.5625 to 462.7250 MHz and 467.5625 to 467.7125MHz (22 Channels).

The VCO directly oscillates frequency range of 462.5625 to 467.7125 MHz at transmitting, and 10.55 MHz below the operation frequency range is also oscillated at receiving because of setting the first intermediate frequency at 10.55 MHz.

Either Ftx or Frvco and the reference oscillation frequency 10.1 MHz (X401) are applied to the PLL (IC401). Ftx (or Frvco) is divided by N (Divide Ratio) and the divided frequency F1 is obtained as below;

F1 = Ft (or FRVCO) / N

The reference oscillation signal (10.1 MHz / 2) is also divided by 808 at IC401, and the resultant F2 is calculated as below;

F2 = 5.05(MHz) / 808 = 6.25(kHz)

F1 is compared with F2 at IC401, and if they are equal in frequencies, the phase locked loop will be under the locked condition.

Therefore, Ft (or Frvco) is determined as below;

Ft (or Frvco) = 2 x N x F2 = 2 x N x 6.25 (kHz)

Ft is changeable at the increment of 6.25 kHz by varying the programmed divide ratio N. For example, when the divide ratio N is programmed to 37849 at the channel number 1, Ft can be calculated as follows;

Ft = 2 x 37849 x 6.25 (kHz) = 462.5625 (MHz)

In the same manner, VCO frequencies for channel number 1 to 22 are determined as shown in the Table 1.

2. Channel Selection Program

Divide ratio of the programmable divider is programmed by serial data which is fed into IC401(Pin 3,4 and 5) from the microprocessor, when the channel selection is performed by the key operation or when the transceiver is turned on.

The microprocessor reprograms the divide ratio every time when TX/RX mode key(PTT) is operated from RX to TX or TX to RX. (Pin8/PTT, of IC801)

3. Means for Frequency Stabilization

Overall frequency stability of the unit is determined depending on crystal oscillator X401.

Stability rank of X401 is used +/- 1.5 ppm in the temperature range from –20 deg.C to +55 deg.C. The temperature compensation circuits(R449,TH401) are assisting the frequency stability of X401 within +/-2.5ppm in the temperature range from -20deg C to -10deg C, and +/-5.0ppm in the temperature at -30deg C.

4. Means for Attenuation of Spurious Emission

The Low Pass Filter circuit which consists of the capacitors (C102, C104, C105, C106) and the inductors (L101 & L102) are installed between the TX Final Amplifier (Q201) and the RF output terminal to reduce the spurious harmonic emissions.

5. Means for Limiting Modulation

C485 and R511 consist of the pre-emphasis which provides audio signal with 6dB/oct frequency characteristics.
IC401 also has functions of limiting amplifier and low pass filter(Pin 47,48 and Pin 50,51). The limiting amplifier limits the amplitude of audio signal which goes into the modulator and prevents maximum deviation from exceeding the limit.
The low pass filter eliminates the harmonics which are generated by the limiting amplifier, to avoid the harmful interference in adjacent channels.
IC401 is also a low pass filter(Pin33,34,35 and 36) which eliminates the harmonics of CTCSS tone which is generated by the microprocessor.

6. Means for Limiting Power

The RF Output stage (Q201, Q202, Q203) of this transmitter is designed to generate the maximum transmitter power within 0.5 Watts. Adjusting collector voltage of driver device Q202 and base voltage of final device Q201 controls transmitter power level.

7. Means for Prevention of unauthorized Frequency Emissions

This equipment has the TX Inhibit circuit which keeps off a transmitting of unauthorized frequency. This control is performed by the microcomputer.

Table 1: Frequency Chart of VCO Frequency (FVCO) and Divide Ratio (N)

TX LOCAL FREQUENCY					RX LOCAL FREQUENCY				
CH No.	TX FREQUENCY MHz	REF FREQ. MHz	N		CH No.	RX FREQUENCY MHz	LOCAL FREQ. MHz	REF FREQ. MHz	N
01	462.5625	0.00625	37005		01	462.5625	473.113	0.00625	37849
02	462.5875	0.00625	37007		02	462.5875	473.138	0.00625	37851
03	462.6125	0.00625	37009		03	462.6125	473.163	0.00625	37853
04	462.6375	0.00625	37011		04	462.6375	473.188	0.00625	37855
05	462.6625	0.00625	37013		05	462.6625	473.213	0.00625	37857
06	462.6875	0.00625	37015		06	462.6875	473.238	0.00625	37859
07	462.7125	0.00625	37017		07	462.7125	473.263	0.00625	37861
08	467.5625	0.00625	37405		08	467.5625	478.113	0.00625	38249
09	467.5875	0.00625	37407		09	467.5875	478.138	0.00625	38251
10	467.6125	0.00625	37409		10	467.6125	478.163	0.00625	38253
11	467.6375	0.00625	37411		11	467.6375	478.188	0.00625	38255
12	467.6625	0.00625	37413		12	467.6625	478.213	0.00625	38257
13	467.6875	0.00625	37415		13	467.6875	478.238	0.00625	38259
14	467.7125	0.00625	37417		14	467.7125	478.263	0.00625	38261
15	462.5500	0.00625	37004		15	462.5500	473.100	0.00625	37848
16	462.5750	0.00625	37006		16	462.5750	473.125	0.00625	37850
17	462.6000	0.00625	37008		17	462.6000	473.150	0.00625	37852
18	462.6250	0.00625	37010		18	462.6250	473.175	0.00625	37854
19	462.6500	0.00625	37012		19	462.6500	473.200	0.00625	37856
20	462.6750	0.00625	37014		20	462.6750	473.225	0.00625	37858
21	462.7000	0.00625	37016		21	462.7000	473.250	0.00625	37860
22	462.7250	0.00625	37018		22	462.7250	473.275	0.00625	37862