

EXHIBIT C

1. GENERAL

1.1 Introduction

This unit is FRS (Family Radio Service) transceiver for U.S. market, which will be distributed by Radio Shack with model name "PERSONSL FM TRANSCEIVER".

1.2 Function

(a) Name of Parts and their Functions

- (1) ANTENNA : Fixed type flexible rubber antenna
- (2) VOLUME KNOB : To adjust the volume level of receiving voice.
To switch off the radio, turn the knob against clockwise until it clicks.
- (3) PTT BUTTON : To transmit by pressing and holding the button, the unit enters the receiving mode.
- (4) MONITOR BUTTON : To make the squelch off by pressing and holding the button.
When releasing the button, the squelch is on.
- (5) CALL BUTTON : When this button is pressed, a paging tone will be emitted at the called unit.
- (6) QUIET BUTTON :
Selecting the quiet number
 1. Press and hold this button for more than a second.
The "QUIET" mark flashes and the current CTCSS code will appear instead of channel number.
 2. By pressing the CHANNEL UP/DOWN buttons, select the desired CTCSS code.
CTCSS code will be scrolled as below.
17 ⇄ 18 ⇄ ⇄ 23 ⇄ 24
 3. Press the QUIET button again.
Selected CTCSS code will be stored and the setting mode will be terminated with a confirmation tone. Display will resume to the channel number display.Quiet mode ON/OFF
 Press and release the QUIET button will set or reset the quiet mode.
 When the quiet mode is set to ON, the selected CTCSS code will appear for 2 seconds and the "QUIET" mark lights until the quiet mode is reset.
- (7) LIGHT/LOCK BUTTON : Once pressing, the LCD backlight will turn on for only 5 seconds.
By pressing for a second or more, the unit enters or cancels the channel lock mode.
- (8) CHANNEL UP/DOWN BUTTON : Δ - To switch the channel up
 ∇ - To switch the channel down
- (9) MICROPHONE : Electric Condensor Microphone
- (10) SPEAKER : 32 Φ , 8 Ω speaker
- (11) TX LED : The LED lights Red when TX is on.
- (12) CHARGE LED : The LED lights Green when AC adaptor is connected.

(13) BATTERY : AA size Alkaline battery $\times$ 3 pcs. should be used.
Ni-Cd battery can be used.

(14) EXTERNAL MIC/SPEAKER JACK : To connect an external speaker and/or microphone in this jack.

(b) Other Functions

- (1) BATTERY SAVING : When no operation or no reception is made for more than 10 seconds, the unit will go into the battery save mode.
- (2) LOW BATTERY INDICATION : The battery mark lights when battery voltage becomes low.

1.3 Physical Size and Weight

- (1) Size : 108(H) $\times$ 60(W) $\times$ 30(H) mm
- (2) Weight : Approx. 200 g

1.4 Accessories : Belt clip and screw for belt clip
Owner's manual

2. CIRCUIT DESCRIPTION

2.1 Receive Signal Flow

A received RF Signal from Antenna goes through Low Pass Filter (L1,L2,L3,L4,C2,C3,C4,C5) and Band Pass Filter (F1) , and is fed to the RF Amplifier (Q1), and then 1st Mixer (Q2).

The received RF Signal is mixed down to a 21.3MHz 1st IF signal by mixing with a local signal which is generated by the synthesized local oscillator, and then is connected to the FM IF Amplifier LSI (IC1) via 1st IF Filter (F2) and 1st IF Amplifier (Q3) .

This IF LSI consists of 2nd Mixer, 2nd IF Filter, 2nd IF Amp., Detector circuit, and 2nd Local Oscillator circuit.

The 1st IF Signal is mixed down to a 2nd IF Signal (50kHz) and goes through 2nd IF Filter, 2nd IF Amp. and Detector circuit and outputted from the LSI as an Audio signal.

The Audio signal goes through the High Pass Filter (IC2) , the analog switch (Q5) and the audio adjustment volume (VR2/CPU unit) .

The adjusted audio signal is inputted into the Audio Amplifier (IC5) through the de-emphasis (R60, C43) and fed to the speaker .

2.2 Transmit Signal Flow

An Audio Signal picked up by the Microphone is amplified at the Mic Amplifier (IC3) .

The amplified Audio Signal goes through the pre-emphasis circuit (R58, C38) and is fed to Limiter Amplifier (IC3) and then to Splutter Filter (IC3) .

The Audio Signal is limited by the Limiter Amp ., filtered by the Splutter Filter and fed to the modulation input terminal of the VCO (Voltage Controlled Oscillator) through the level adjust volume (VR2/RF unit)

The RF Signal generated by the VCO is modulated by the Audio Signal directly and amplified by the Buffer Amplifier (Q12) .

The Amplified RF Signal is much more amplified by RF Amplifier (Q6, Q7) , Driver Amplifier (Q5) , and Power Amplifier (Q4) .

The Amplified RF Signal goes through the Antenna switch (D2, D39) and Low Pass Filter , and is radiated by the Antenna .

2.3 Synthesized Local Oscillator

The synthesized local oscillator consists of PLL IC (IC2) and VCO (Q11) .

When the PLL IC is out-of lock , PLL IC sends out pulses HIGH to the MPU (IC8) , and then the MPU stops transmission .

2.4 MPU Control

MPU (IC8) controls PLL , the transmission when un-lock , LCD display and switches .

3. Parts List

LOC. NUMBER	DESCRIPTION	MAKER CODE	MAKER	YP CODE
D2 , D3	CHIP DIODE	1SS314	TOAHIBA	TO1SS314(TR)
F1	SAW FILTER	B4033	SIEMENS	FF254(TR)
F2	CRISTAL FILTER	21.3 MHz	NIKKO DENSHI	FF253(TR)
IC1	IF IC	TA31180FN	TOSHIBA	TITA31180FNTR
IC2	PLL IC	M64082AGP	MITSUBISHI	TIM64082AGPTR
IC3	OPERATIONAL AMP.	NJM2902V	JRC	TINJM2902VTR
IC8	MPU	μ PD753104GC	NEC	TY4MW200
Q1, Q11	CHIP TRANSISTOR	2SC5065Y	TOSHIBA	TC5065Y(TR)
Q2, Q6, Q7	CHIP TRANSISTOR	2SC5107Y	TOSHIBA	TC5107Y(TR)
Q3	CHIP TRANSISTOR	2SC4215Y	TOSHIBA	TC4215Y(TR)
Q4	CHIP FET	2SK3078	TOSHIBA	TK2SK3077(TR)
Q5/RF	CHIP FET	2SK3077	TOSHIBA	TK2SK3078(TR)
Q5/CPU	CHIP FET	2SK1829	TOSHIBA	TK2SK1829(TR)