

SERVICE MANUAL

MT9300 RADIO SECTION

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1. OVERVIEW

1-1. General

The MT9300 radio section is a 400 MHz band duplex communication radio transceiver with 80 channels and 15 W of RF output power. It was designed as the radio section of the mobile subscriber station (MSS) MT9300 of the COMVIK Mobile Radio Telephone System. The other sections of the MSS are the mobile communication control (MCC) section, handset (HS) and antenna. Since the MSS with the MT9300 radio section is compact, lightweight, and low in power consumption, it can be used as a portable subscriber station as well as an automobile-mounted station.

1-2. Radio Section Features

The MT9300 radio section has the following features:

- (1) The compact, concise design of its circulator-based antenna duplexer enables it to be mounted inside the radio section.
- (2) A phase-locked loop (PLL) with a high-output voltage-controlled oscillator (VCO) in the transmitter reduces noise in the RF output signal.
- (3) Direct frequency modulation using a voltage-controlled crystal oscillator (VCXO) provides excellent modulation characteristics.

- (4) A first center frequency of 69.7 MHz makes the RF circuitry of the receiver simple and compact.
- (5) An 80-channel frequency synthesizer is used, including a vibration-resistant voltage-controlled oscillator (VCO) that oscillates directly in the 400 MHz band, a pulse-swallowing direct divider, and a small and highly stable temperature-compensated crystal oscillator (TCXO).
- (6) As a fail-safe design feature, autonomous circuit monitors degradation of the supply voltage and RF output signal and open the power circuit when an abnormal condition occurs.
- (7) As another fail-safe feature, a thermal sensor in the RF power amplifier module reduce the transmitter output power if an abnormal temperature rise is detected.
- (8) Modular construction simplifies maintenance.

2. SPECIFICATION

2-1. General Specification

Frequency Range	:	450.350 - 462.325 MHz
Frequency Generation	:	Frequency Synthesizer
Frequency Stability	:	Better than ± 2.5 KHz
No. of Channels	:	80
Channel Spacing	:	25 KHz
Maximum Bandwidth	:	2.0 MHz
TX-RX Separation	:	10 MHz
Channel Switching Time	:	10 ms for Single Channel Shifts 20 ± 10 / -20 ms for Random Channel Shifts
Maximum Frequency Deviation	:	± 5 KHz
Modulation	:	FM
Traffic Mode	:	Full Duplex
Antenna Impedance	:	50 Ohm Nominal
Supply Voltage	:	10.8 - 15.6 V Negative Ground with polarity protection
Operating Ambient Temperature	:	-25°C to +55°C
Storage Ambient Temperature	:	-40°C to +60°C
Dimensions	:	H:51, W:179, L:173.5 (mm)
Weight	:	2.5 Kg.

2-2. Transmitter Specification

(at Vcc: +13.2 V, Room Temperature = 20°C)

RF Power Output

Full Power	:	15 W \pm 1.5 dB
Reduced Power	:	5 W \pm 1.5 dB, 2W \pm 1.5 dB
Duty Cycle	:	100%
AF Response	:	300 - 3,000 Hz, Pre-Emphasis 6 dB/Octave
AF Distortion	:	Less than 3% at 1 KHz, 60% of Full Deviation
AF Input Sensitivity	:	0.25 V RMS, 600 Ohm at 1 KHz, 60% of Full Deviation
Power Attenuation in Adjacent Channel	:	-70 dB
Harmonic Spurious Emission	:	Less than 2 μ W
Other Spurious Emission:		Less than 0.25 μ W
Carrier Rise Time	:	\leq 10 ms
Carrier Fall Time	:	\leq 10 ms

2-3. Receiver Specification

(at Vcc: +13.2 V, Room Temperature = 20°C)

Sensitivity (12 dB SINAD)	:	0.5 μ V, EIA
Adjacent Channel Selectivity	:	76 dB μ
Intermodulation Attenuation	:	70 dB μ
Blocking	:	90 dB μ V within Fr \pm 1 MHz to Fr \pm 10 MHz except Spurious
Co Channel Rejection	:	-2 dB μ or Better
Spurious Rejection	:	76 dB μ
Receiver Spurious Emission	:	0.002 μ W
AF Response	:	300 - 3,000 Hz De-Emphasis 6 dB/Octave
AF Distortion	:	Less than 3% at Center Frequency
Carrier Detect	:	CDL 0 dB μ \pm 3 dB CDM 15.5 dB μ \pm 3 dB CDH 20 dB μ \pm 3 dB
AF Output Power	:	0.25 V RMS 600 Ohm at 1 KHz Standard Modulation

2-4. Power Supply Specification

Supply Voltage	:	13.2 V Negative Ground
Standby Current	:	Maximum 200 mA / 13.2 V
Active TX/RX Current	:	Maximum 6A / 13.2 V

3. MECHANICAL CONSTRUCTION

3-1. External Dimensions

Figure 3-1 shows the external dimensions of the MT9300 radio section.

3-2. Internal Structure

Figure 3-2 shows the internal structure of the MT9300 radio section.

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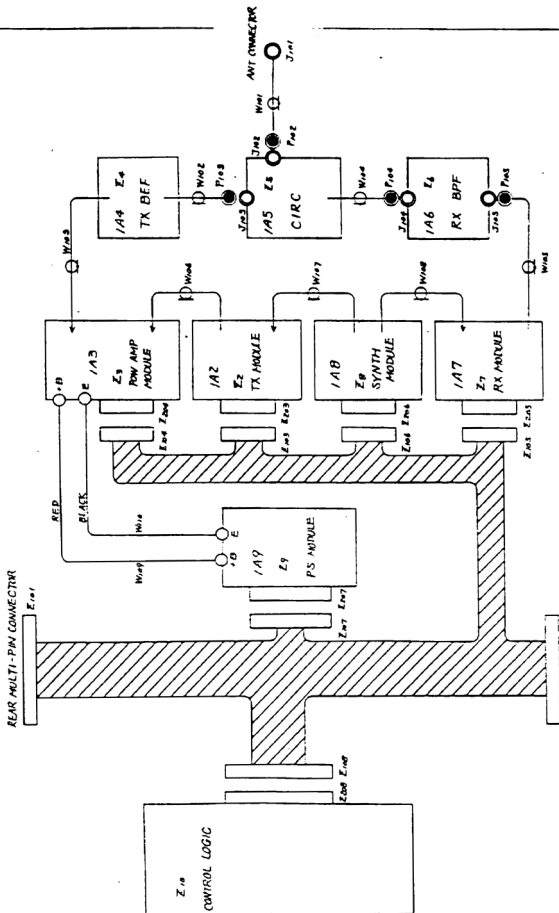


Figure 3-1

AP

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CHKD

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APP.

MODULE-BASIS STRUCTURE DIAGRAM ON (1A1) CHASSIS

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TOYOCOM
TELECOMMUNICATION EQUIPMENT CO., LTD.

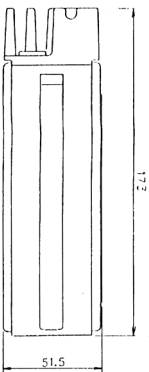
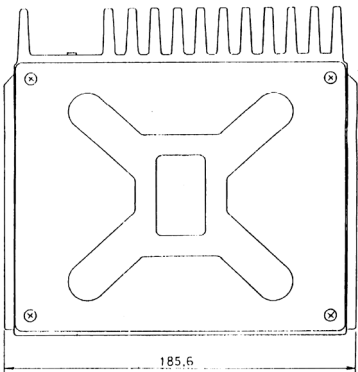
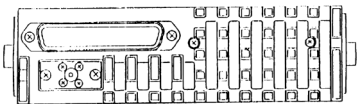


Figure 3-1



M3330 RADIO SECTION
EXTERNAL DIMENSIONS

33-7541G3

DRAWN

T. Yamada

CHKD

ENG

T. Sakurai

APP

T. Sakurai

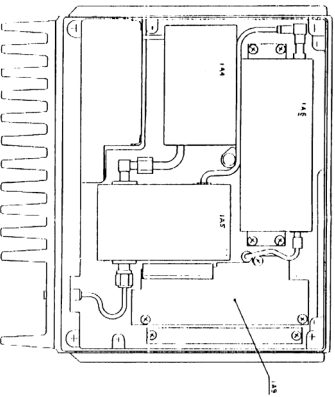
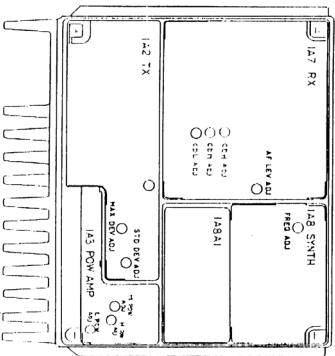


Figure 3-2

W19300 RADIO SECTION
INTERNAL STRUCTURE

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Checked
C.M.D.
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4. FUNCTIONAL OVERVIEW

4-1. Transmitter

The transmitter of MT9300 radio section subjects voice, tone, and digital signals to frequency modulation and frequency conversion, and amplifies them for supplying to the antenna. It has an RF output power of 15 W, a frequency range of 450.350 to 452.325 MHz, a channel spacing of 25 KHz, and a maximum of 80 channels. The frequency of each channel is controlled by a highly stable frequency synthesizer, and any channel within the frequency range can be selected.

The main functions of the transmitter are to switch the RF transmit output on and off, to reduce it in power, and to switch channels. These functions are controlled by the MCC (mobile communication control) section. To make the unit fail-safe, the transmitter output signal is monitored constantly during transmission by the autonomous circuit incorporated in the power supply module and the MCC, which shut the transmitter off whenever an abnormal condition arises. In addition, a thermal sensor incorporated in the power amplifier module monitors the same module and automatically reduce the transmitter output power on any abnormal temperature rise.

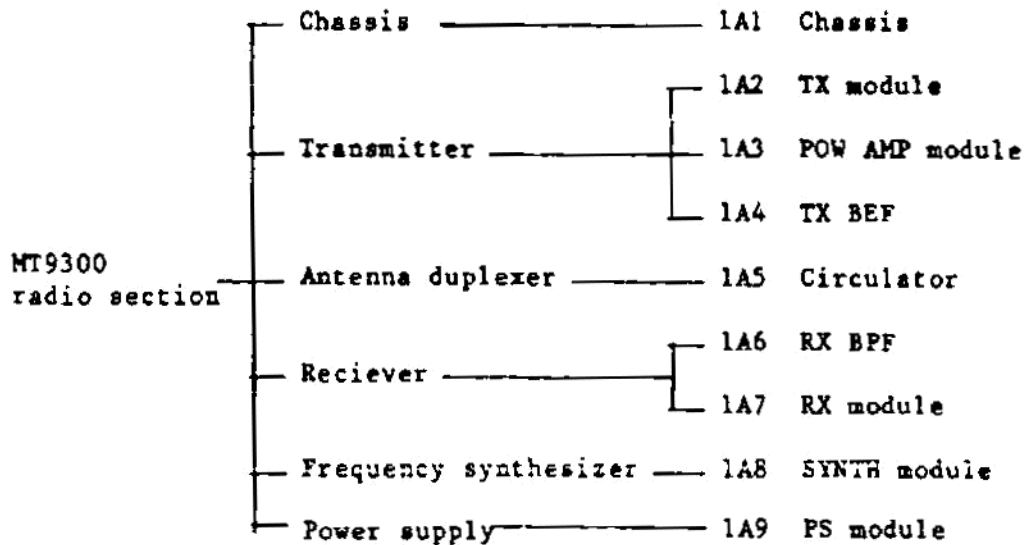
4-2. Receiver

The double-superheterodyne FM receiver has a frequency range of 460.350 to 462.325 MHz and a maximum 80 channels with a channel

spacing of 25 KHz. It receives the desired frequency-modulated signal from the antenna, amplifies it at high frequency, converts it to a lower frequency, filters it through a bandpass filter, then demodulates it to obtain a voice, tone, or digital signal. The channels in the receiver are controlled by the same frequency synthesizer as used by the transmitter. The receiver has a carrier detect function that monitors the input field strength. Information from these monitor functions is provided as reference signal for radio link control to the autonomous circuit in the power supply module and the MCC. The 10 MHz separation between transmit and receive frequencies is applied for all channels.

5. CONFIGURATION OF THE MT9300 RADIO SECTION

The radio section consists of the modules listed below. See also the functional block diagram of the radio section: 33-105868



The modules are connected as shown in Fig. 5-1 module-basis structure diagram. Coaxial cables carry high-frequency signals between modules, while the power lines, low-frequency signal lines, and control lines are all routed through multi-pin connectors on the flexible printed circuit board mounted on the bottom of the chassis. Fig. 5-2 shows the connections on the flexible printed circuit board.

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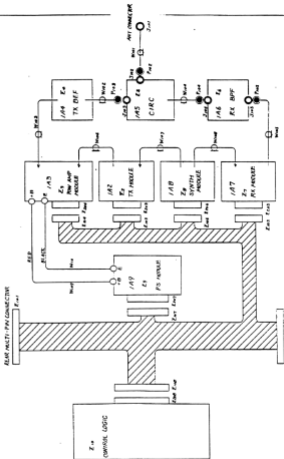


FIGURE 3-1

MODULE-BASIS STRUCTURE DIAGRAM ON (1A1) CHASSIS

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