1. T2DR (Transmitter)

1.1 General description

The transmitter, 2DR, is the two-stick type, the basic function of which is designed specially for automotive application. Its operation is highly reliable and its simple structure makes maintenance service much easier.

1.2 Electrical specification

a. Transmitting frequency

27 MHz 4 Band for EU market		6 Band for US market.	
band 1 (brown)	26.995 MHz	band 1 (brown)	26.995 MHz
band 2 (red)	27.045 MHz	band 2 (red)	27.045 MHz
band 4 (yellow)	27.145 MHz	band 3 (orange)	27.095 MHz
band 5 (green)	27.195 MHz	band 4 (yellow)	27.145 MHz
		band 5 (Green)	27.195 MHz
		band 6 (Blue)	27.255 MHz

b.	Modulation system	amplitude modulation (AM)
c.	Transmission output	within the limited range by the law
d.	Operating voltage	7.0 to 14.5 (V)
e.	Rated supply voltage	12.0 (V)
f.	Current dissipation	200 (mA)
g.	Operating temperature	-10 to +45 (℃)
h.	Storage temperature	-20 to +60 (℃)

1.3 General specification

a.	Channels	2 channels (steering and throttle)
b.	Frequency used	27MHz Band
c.	Battery	8 AA Size Dry Batteries
d.	Operating part	2 channels for the two-stick system (steering/throttle)
e.	Trimming	Channel 1 for trimming of steering Channel 2 for trimming of throttle
f.	Reversing	Channel 1 for reversing of steering Channel 2 for reversing of throttle
g.	Battery level indicator	A red LED indicates the remaining power of the battery. Voltage for blinking the red LED=8.3(V)
h.	Crystal	Externally changed (only 27MHz Band)
i.	Dimensions	165×230×90 (mm), excluding antenna
j.	Weight	approx. 350g (approx. 440 with batteries)
k.	Operating angle of the servo	40°±5° (trimming fixed)

1.4 Operation

1.4.1 Block diagram of T2DR

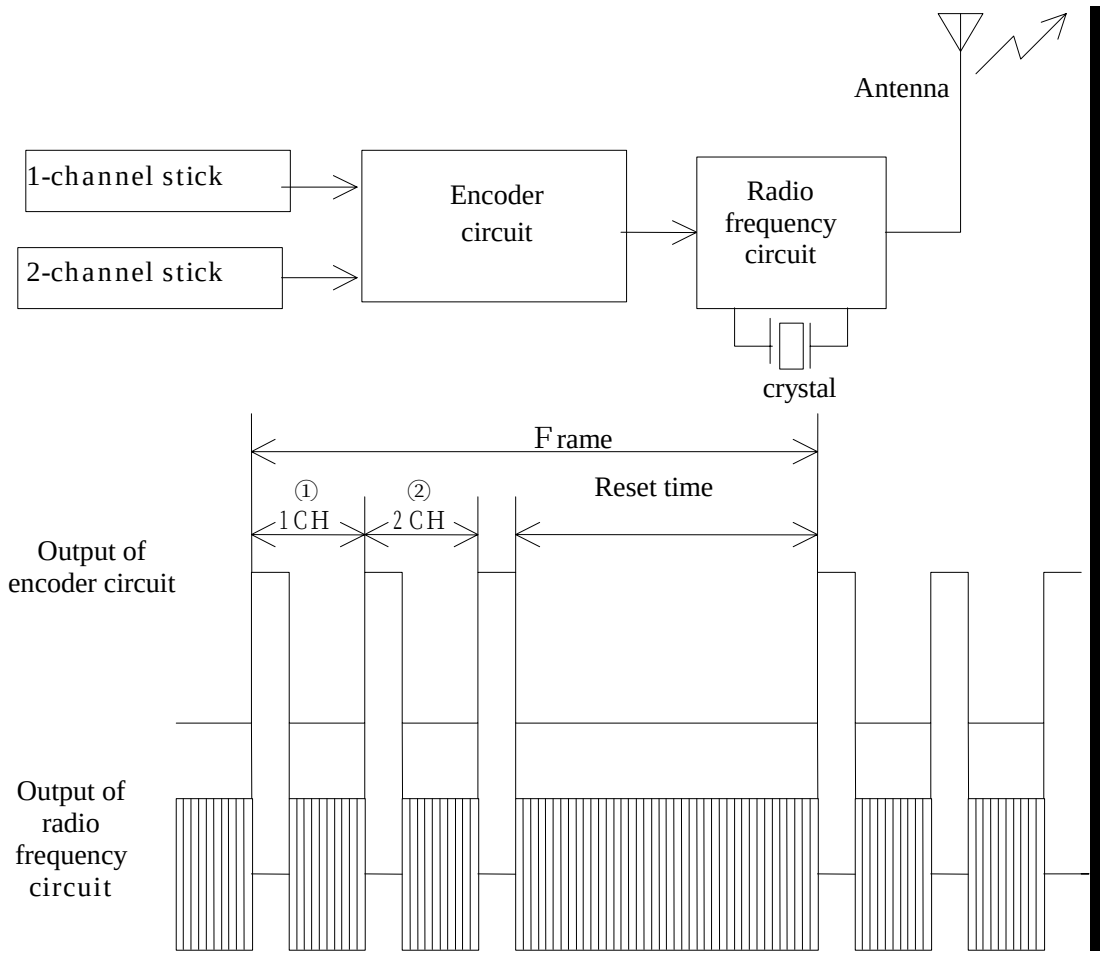


Fig. 1-1

1.4.2 Explanation of each block

a. 1-channel steering stick and 2-channel throttle stick

b. The operation of the steering stick and throttle stick generates the voltage in proportion to the stick position, which is input to the encoder circuit as the respective information to the 1-channel and 2-channel.

c. Encoder circuit
Signals of the encoder circuit are output in the form of waves as shown in Fig. 1.1, which are modulated to the proportional pulse width to each channel.

d. Radio frequency circuit
This circuit is to create radio frequency signal and to output the signal by the antenna with modulating the incoming signal from the encoder circuit. The frequency of which is determined by the crystal.

The output waveform is shown in Fig. 1.1.

1．5 Handling of T2DR and precaution for operation

① Antenna
Extend the antenna to the maximum length, otherwise, the available distance will be shorter.

② Power switch
Before operation, make sure that the battery level indicator (LED) lights in red with the power switch in the ON state.

③ Battery level indicator
When the battery level indicator (LED) blinks in red, replace the batteries with new ones immediately.

④ Steering stick (1-channel)
To be used for steering operation.

⑤ Steering trim
To be used for trimming the steering operation.

⑥ Throttle stick (2-channel)
To be used for throttle operation.

⑦ Throttle trim
To be used for trimming the throttle operation

⑧ Reverse switch
To be used for reversing the operating direction of the steering servo and throttle servo.

⑨ Neutral position (inside the transmitter)
The neutral position is set to the center at the factory.

⑩ Battery cover
To replace batteries, open the slide battery cover on the bottom.

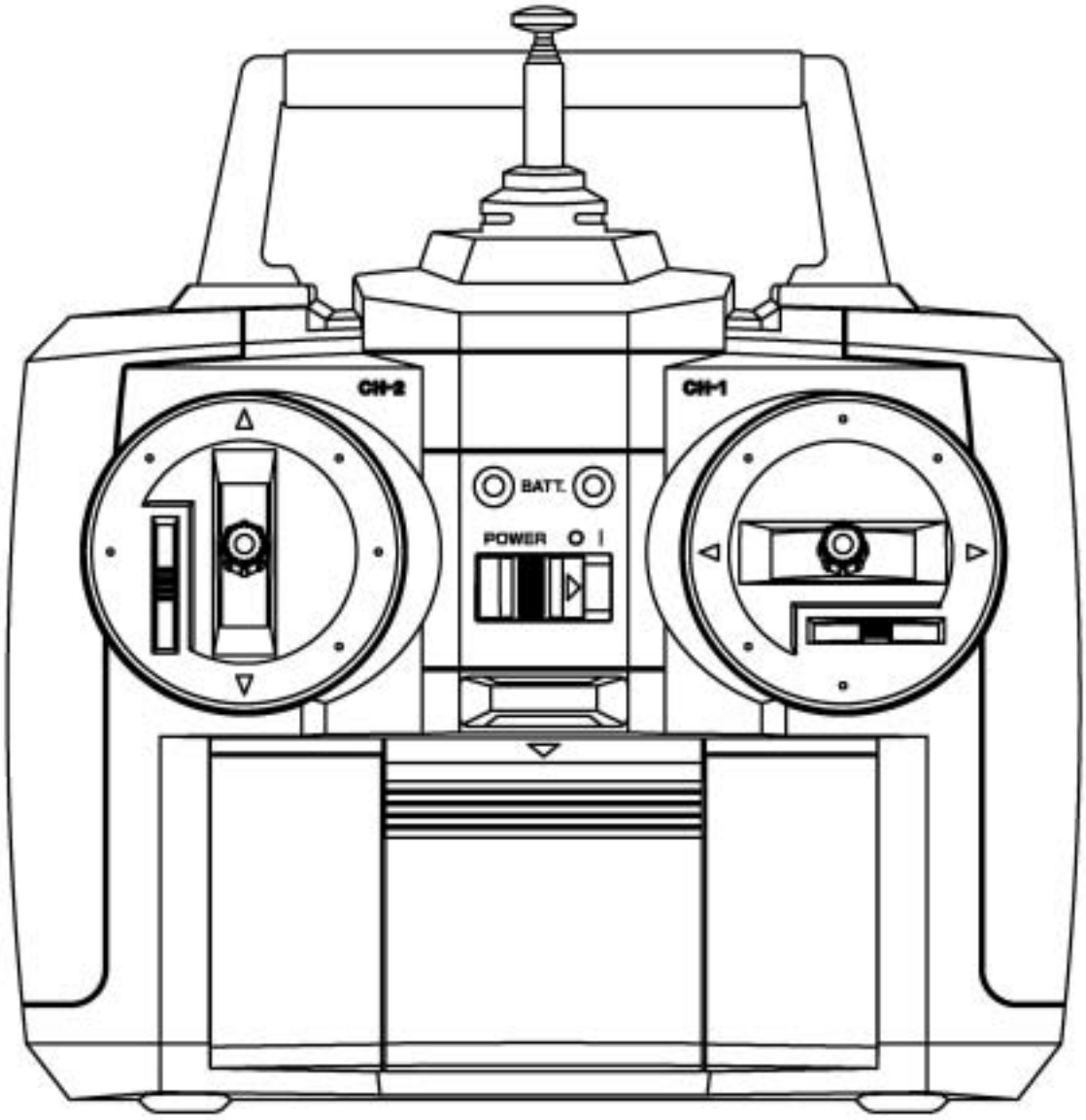
⑪ Non-sensitive band
To secure the maximum operating angle of the servo, the pulse width of each channel is set a little wider.
Particularly with the throttle, non-sensitive band may be generated at the foremost side or the rear side depending on the trimming position. When assembling the model, adjust the linkage to make the trim close to the neutral position.

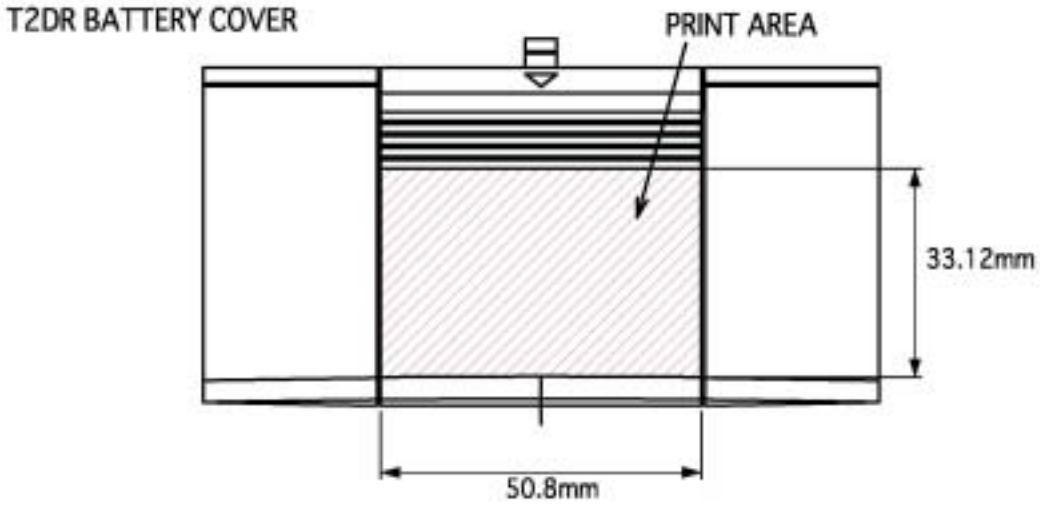
⑫ Charge jack

Charge jack is installed.

If Ni-Cd battery is used, the battery can be re-chargeable by the Charging jack.

1.6 Appearance of T2DR





2. R132JE (Receiver)

2.1 General description

R132JE is designed specially for automotive application.

Features:
1. One-chip IC, containing the mixer, intermediate frequency amplifier and wave detection circuits, is used.
2. High selectivity is realized by using a ceramic filter in the intermediate frequency amplifier circuit.

2.2 Electrical specification

a. Receiving frequencies

27 MHz	4 Band for EU market		6 Band for US market.
band 1 (brown)	26.995 MHz	band 1 (brown)	26.995 MHz
band 2 (red)	27.045 MHz	band 2 (red)	27.045 MHz
band 4 (yellow)	27.145 MHz	band 3 (yellow)	27.095 MHz
band 5 (green)	27.195 MHz	band 4 (yellow)	27.145 MHz
		band 5 (Green)	27.195 MHz
		band 6 (Blue)	27.255 MHz

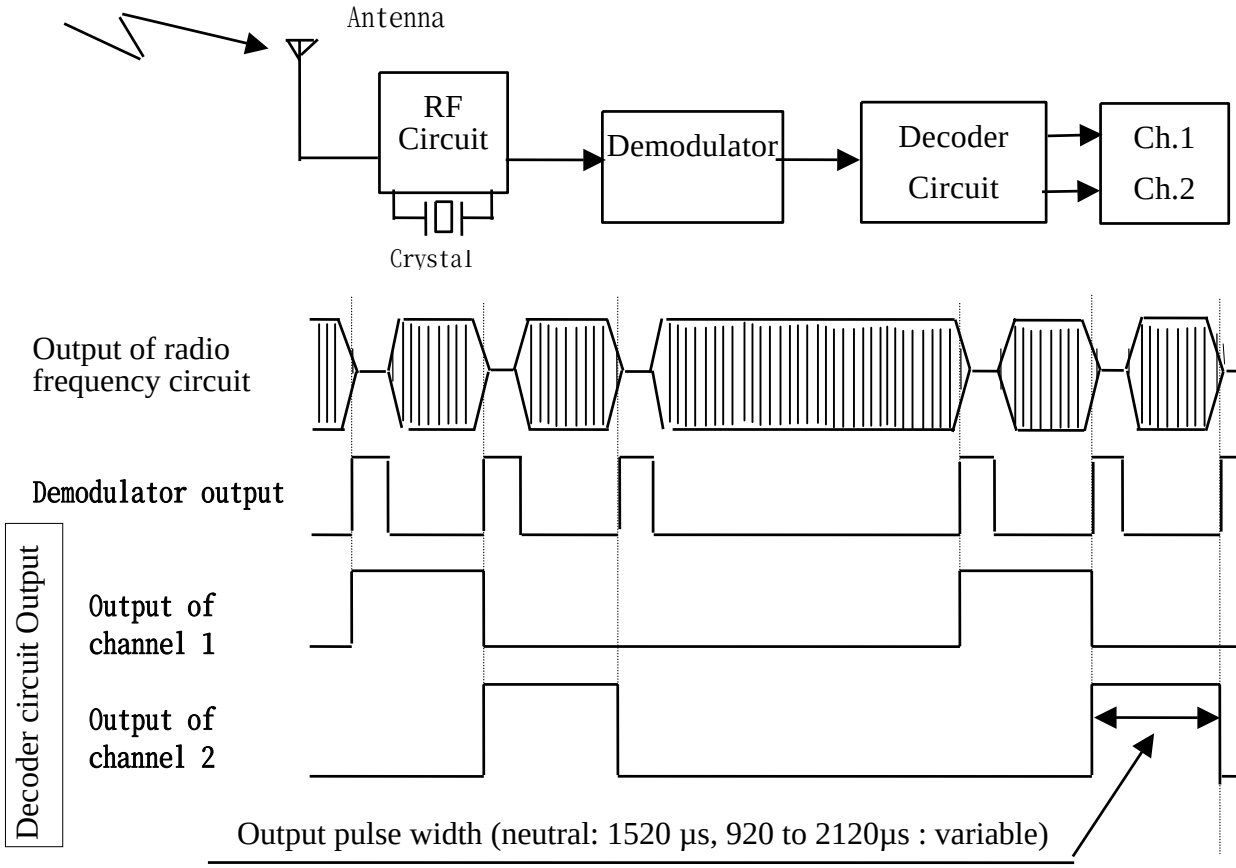
b.	Demodulation	wave detection by amplitude modulation
c.	Receiving system	super heterodyne
d.	Intermediate frequency	455 kHz
e.	Selectivity	3KHz／-6dB
f.	Distance to reach	over 300m, depending on the ambient condition
g.	Antenna	lead wire in the length of 50cm
h.	Channels	2 channels (channel 1: steering servo, channel 2: throttle servo)

2.3 General specification

a.	Rated supply voltage	4.8V to 7.2V
b.	Current dissipation	30 to 37mA in static state (Vcc=4.8V)
c.	Operating temperature	-10℃～+45℃
d.	Storage temperature	-20℃～+60℃
e.	Dimensions	See the drawing.
f.	Weight	Approx. 17g

2.4 Operation

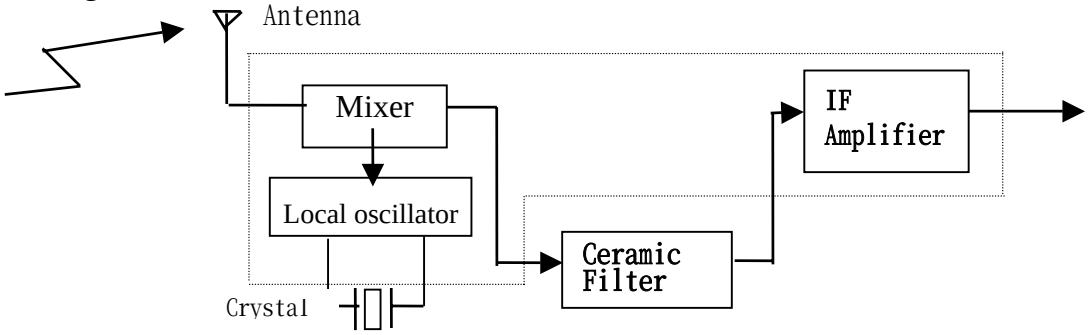
a. Operation principle of R132JE



b. Radio frequency circuit

This circuit receives the waves of the determined frequency by the crystal (the wave from the transmitter using the crystal of the same band) and amplifies them.

Block diagram of radio frequency circuit



The wave received from the antenna passes through the band path filter to be mixed with the signal of the local oscillation, amplified by the IF amplifier (intermediate frequency amplifier circuit) and input to the demodulator circuit.

c. Demodulator circuit

At this circuit, signals from the radio frequency circuit are to be acknowledgeable signal by the decoder circuit.

d. Decoder circuit

This circuit divides the signals from the demodulator circuit to output them separately from channel 1 and channel 2.

2.5 Handling and precautions for operation

1. Antenna
   Extend the antenna as long as possible while the equipment is in operation.
   Never tie up in a bundle or cut it.
   Extend it perpendicularly to the car to the direction apart from the motor and servo.

2. Crystal
   For replacement, use Futaba's AM crystal set in a pair of the transmitter and receiver.