INSTALLATION

1. Contents

Unpack and inspect your RT-20SDR for missing or damaged components. Your RT-20SDR includes the following items:

Quantity	Description
1	RT-20SDR Transceiver
1	Stock Microphone
1	DC Power Cord with Inline Fuse
1	Mounting Bracket with Hardware
1	Microphone Hanger with Hardware Set
1	Operating Manual
1	Warranty Registration Form

2. Microphone Hanger

The microphone hanger comes with mounting screws and may be attached to any convenient location.

3. Mounting

When attaching the RT-20SDR mounting bracket to the vehicle, choose a location that will provide easy access to all front panel controls and air circulation to the rear panel. When selecting a mounting location, make sure that there is ample space behind the unit for the cables. Do not pinch, or bend sharply, the power or antenna cables. Do not install the MAGNUM 1 in any compartment that restricts airflow and do not install in a location that interferes with the safe operation of the vehicle.

Attach the mounting bracket to the vehicle first then mount the RT-20SDR to the bracket. If the rear panel is not accessible you may want to attach the power and antenna cable prior to mounting.

4. Electrical Connections

The RT-20SDR is designed to work on any 12 - 13.8 volt DC, negative ground, source. The condition of a vehicle's electrical system can affect operation. A low battery, worn generator/alternator, or poor voltage regulator will seriously impair the performance of the transceiver. Any of the above conditions could result in a high level of receiver noise generation or a substantial loss of the transmitter's RF output. Make sure that all of these components of your vehicle's electrical system are in good condition prior to installing the transceiver.

CAUTION!

VOLTAGE EXCEEDING 16 VDC WILL DAMAGE THE RADIO. MEASURE VOLTAGE AT BATTERY TERMINALS, WITH VEHICLE RUNNING, PRIOR TO INSTALLATION!

Before making any electrical connections make sure the volume (VOL) control is in the "OFF" position.

Connect the positive (+) red wire of the DC power cord to a positive 13.8 volt source at the vehicle fuse block. If connecting to the fuse block, it is recommended that a switched power source is used so that the power to the transceiver is disconnected when the vehicle is off. This will eliminate the possibility of the transceiver draining the vehicle's battery.

Connect the negative (-) black wire to a metal part of the vehicle's frame, or chassis ground. Make sure that this is a good ground connection.

The RT-20SDR power cord may also be connected directly to the battery. Connecting directly to the battery has several benefits, the first of which is to maximize RF output. Secondly, the battery is a very large capacitor and will help eliminate certain types of ambient and vehicle noise. If connecting directly to the vehicle's battery, additional power cable may be required. On runs of 8 feet or less use 12-gauge stranded wire. Use 10-gauge wire on longer runs.

5. Antenna Connection

The transceiver will operate using any standard 50-ohm ground-plane, vertical, mobile whip, long wire or similar antenna. The antenna should be rated at 30 watts PEP minimum. A standard SO-239 type antenna connector is located on the rear panel of the RT-20SDR . Connection is made using a PL-259 and high-grade coaxial cable (RG213, RG58A/U or Mini RG-8 is recommended).

A ground-plane antenna provides greater coverage and is recommended for fixed station-to-mobile operation. For point-to-point fixed station operation, a directional beam antenna operates at greater distances even under adverse conditions. A non directional antenna should be used in a mobile installation; a vertical whip is best suited for this purpose. The base loaded whip antenna normally provides effective communications. For greater range and more reliable operation, a full quarter wave whip may be used. Either of these antennas uses the metal vehicle body as a ground plane.

Once the antenna is mounted on the vehicle, route the coaxial cable so that it is not next to any power cables or vehicle cables. Connect the PL-259 to the antenna connector on the rear panel of the MAGNUM 1. Make sure that the cable does not interfere with the safe operation of the vehicle.

6. VSWR

Before use, it is important to determine the antenna system's VSWR (voltage standing wave ratio). You will need a high quality SWR bridge (meter) to accurately tune your antenna system. First, make sure the SWR bridge is in good working order and is calibrated. To ensure your radio is performing properly the VSWR should never exceed 1.5 to 1. Never transmit on any antenna system where the VSWR exceeds 1.8 to 1. This will stress the output stage and could destroy the RF transistors; this type of misuse and failure is not covered under warranty.5 Measure the VSWR at the center of the operating band. Tune the antenna (according to the antenna manufacturer's tuning instructions) so that the VSWR is as close to 1 to 1 at the center of the operating band. Next, measure the VSWR at the lowest and highest frequency of the transceiver. If the antenna has a wide enough frequency range and band-pass, the VSWR readings should be below 1.5 to 1 across the entire operating band. If at the lower or upper end of the transceiver operating frequency, the VSWR measures more than 1.5 to 1, it is recommended that the antenna be re-tuned before operating on those frequencies.

If you are experiencing unusual VSWR readings check for the following possible problems:

1) Make sure that the antenna is installed properly and grounded.

2) Check all coaxial cable and connectors for defects and poor routing.

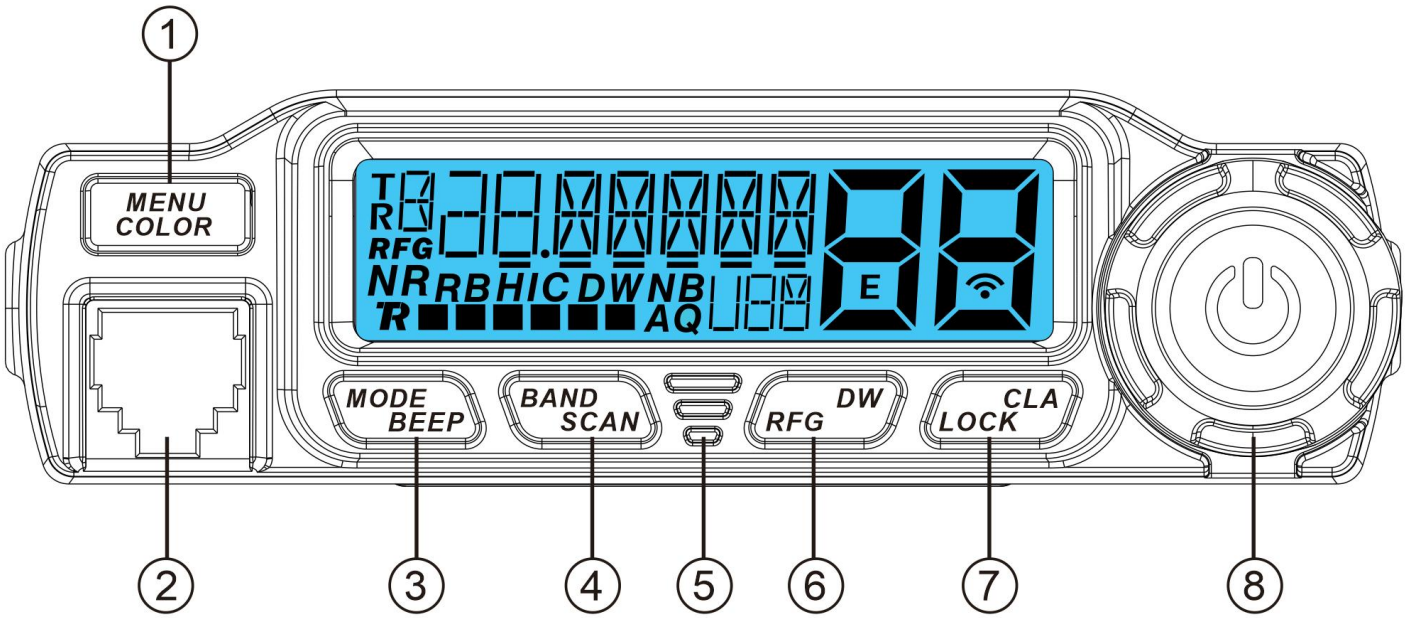
3) If testing a vehicle installation, make sure that all vehicle doors are closed when testing.

4) Do not test near or around large metal objects or buildings.

7. Ignition Noise

In certain vehicle installations, electrical noise or interference may be present in the receive audio of the transceiver. Typically the vehicle's ignition system or more specifically the alternator generates this noise. The RT-20SDR is equipped with a noise blanker circuit that is designed to reduce, and in many instances eliminate, this electrical noise.

In extreme cases, the noise blanker may not eliminate all the electrical noise. In such cases, an alternator / ignition noise filter can be used. The XLF Series by RF Limited is designed for use with the RT-20SDR and is an effective way to eliminate alternator and ignition noise problems. Contact RF Limited or your local dealer for information.



1. MENU/COLOR: short press the button, the radio enter menu function, short press again quit menu mode, press 2 second the button to change the LCD backlight color

2. Microphone/firmware update port

3. MODE/BEEP: short press the button to switch modes between PA/AM/FM/USB/LSB, press 2 second the button to switch Beep function on/off

4. BAND/SCAN: short press the button to select bands, press 2 seconds to active scan function, press 2 second the button

again to quit scan mode

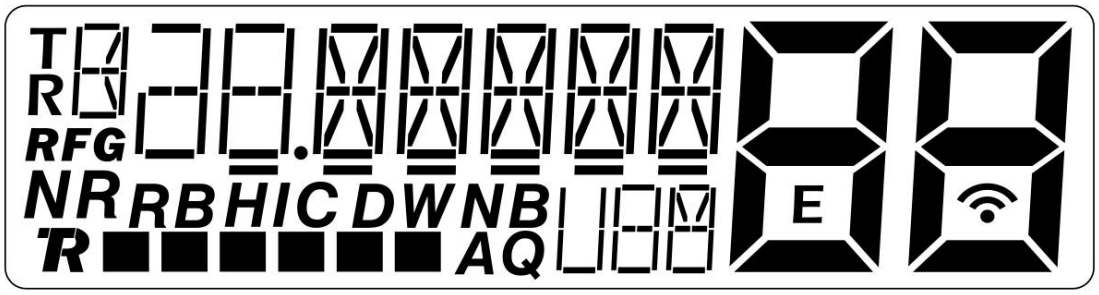
5. TX/RX indicator light, Red LED lighting during PTT pressed, Greed LED lighting during open the speaker

6. DW/RFG: short press the button the LCD “DW” ICON start to blink, then press microphone UP/DN button to select other CHANNEL, then short press DW button again, radio start to dual watch between 2 CHANNELS, short press DW button again quit DW mode, press 2 second the button to switch RFG function on/off

7. CLA/LOCK: short press the button, the radio enter CLARIFIER mode, now push the knob(8) to select clarifier step, rotate the knob(8) to tune frequency, short press the button quit CLARIFIER mode, press 2 second the button, all butons and knob are locked, press 2 seconds the button again to un-lock butons and knob.

8. Knob: Rotate knob directly to change speaker volume, short push the knob enter SQ/ASQ level adjust mode, then rotate the knob to select SQ/ASQ levels.

MENU SETTINGS



Above is LCD full display

TR shows Clarifier status

shows Band status

88 shows Channel numbers

RFG shows RFG fucntion status

NR shows Noise Reduction status

RB shows Roger Beep function status

HIC shows Hi-cut function status

DW shows Dual watch function status

NB shows Noise Blanker function status

AQ shows ASQ status

shows AM/FM/USB/LSB modes

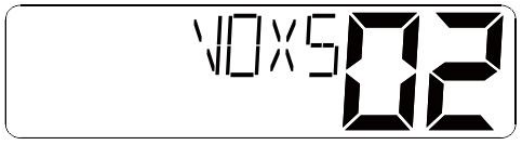
shows wireless microphone connect status

AI Noise Reduction setting, push knob and rotate knob to select Noise Reduction on/off, default:off

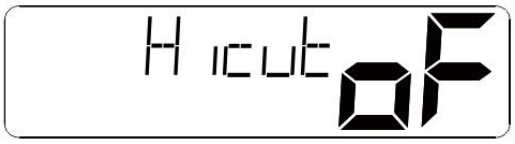
AI Noise Reduction level setting, push knob and rotate knob to select Noise Reduction level from 1 to 15, default:06

AI VOX setting, push knob and rotate knob to select AI VOX on/off, default:off

ANL function setting, push knob and rotate knob to select ANL on/off, default: off



AI VOX Sensitivity level setting, push knob and rotate knob to select levels from 1 to 9, default:02

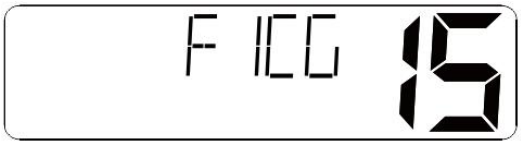


Hi-cut function setting, push knob and rotate knob to select levels from off, 1 to 6, default: 02

AI VOX time level setting, push knob and rotate knob to select levels from 1 to 9, default:05

AM TX MIC GAIN setting, push knob and rotate knob to select levels, default: 15

DSP type Noise Reduction setting, push knob and rotate knob to select Noise Reduction on/off, default:off



FM TX MIC GAIN setting, push knob and rotate knob to select levels, default: 15

DSP type Noise Reduction level setting, push knob and rotate knob to select Noise Reduction level from 1 to 9, default:04

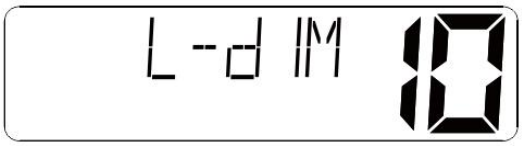
USB TX MIC GAIN setting, push knob and rotate knob to select levels, default: 15

Clarifier mode setting, push knob and rotate knob to select 3 modes of Clarifier: RX only, TX only, TX and RX both, default: TX and RX both

LSB TX MIC GAIN setting, push knob and rotate knob to select levels, default: 15

ASQ level setting, push knob and rotate knob to select ASQ level from 1 to 9, default:05

LCD backlight colors setting,push knob and rotate knob to select seven colors, default: cyan



LCD backlight dim setting, push knob and rotate knob to select dim levels from off to 10, default: 10

Talk back function setting, push knob and rotate knob to select talk back function on/off, deault: off

Scan mode setting, push knob and rotate knob to select scan mode: SQ/TIME, default: SQ

Roger Beep function setting, push knob and rotate knob to select Roger Beep function on/off, default: on

Roger Beep frequency setting, push knob and rotate knob to select frequency from 300Hz to 3000Hz, default: 850Hz

Roger Beep time setting, push knob and rotate knob to select Roger Beep time from 50mS to 1000mS, default: 500mS

Beep volume setting, push knob and rotate knob to select volume levels from 1 to 9, default: 3

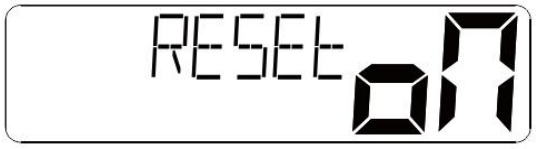
Roger Beep volume setting, push knob and rotate knob to select Roger Beep volume from 1 to 9, default: 05

The tone for turning on radio, push knob and rotate knob to select on/off, default: on

The tone for turning off radio, push knob and rotate knob to select on/off, default: on

Limit of TX time setting, push knob and rotate knob to select TOT time from OFF to 600S, default: off

TX RF OUTPUT POWER setting, default: 3



Resset function setting, push knob and rotate knob to select Reset on/off, default: off

GENERAL SPECIFICATIONS

Parameter	Value
Antenna Impedance	50 ohms, unbalanced
Frequency Control	Digital Phase-Locked Loop (PLL) Synthesizer
Frequency Tolerance	0.005%
Frequency Stability	0.001%
Operating Temperature	-30°C to +50°C
Power Supply	12–13.8V DC, negative ground
Physical Dimensions	
---	---
Radio Size	128 × 101 × 25 mm
PTT Size	120 × 60 × 40 mm
PTT Cable Length	700 mm
Package Size	205 × 189 × 45 mm
Product Weight (Radio + PTT)	478 g
Package Weight	605 g

TRANSMITTER SPECIFICATIONS

Parameter	Value
Output Power	SSB: 15W, FM: 7W, AM: 7W (Avg), PEP: 16W
Frequency Steps	10 Hz – 1 MHz
Spurious Emissions	>50 dB below peak output
Carrier Suppression	>55 dB below peak
Unwanted Sidebands	>50 dB below peak (1 kHz tone)
FM Deviation	±2 kHz max
Audio Response	>30 dB below peak
Microphone Impedance	300–30,000 Hz, ECM, 2.2 kΩ

RECEIVER SPECIFICATIONS

Parameter	Value
Circuit Type	Double Conversion Superheterodyne
IF Frequencies	1st: 10.695 MHz (SSB), 2nd: 455 kHz
Sensitivity	SSB: 0.25 µV (10 dB S+N/N), AM: 1.0 µV, FM: 0.3 µV (12 dB SINAD)
Selectivity	SSB: 2.6 / 3.3 kHz (-6 / -60 dB), AM/FM: 6.0 / 9.0 kHz (-6 / -60 dB)
Clarifier Range	Continuous (Digital VFO)
Adjacent Channel Rejection	>70 dB
Image Rejection	>80 dB
Audio Frequency Response	250 – 3000 Hz
Audio Output Power	≥2 W at 10% THD, 8 Ω load
Audio Output Impedance	8 Ω

Noted: how to select bands

Press PTT and turn on radio, enter bands select between BR, 10M, 12H, CB, HF bands