

# CB 4-WATT, 40-CHANNEL BASE/MOBILE TRANSCEIVER

## TRC-431



## OWNER'S MANUAL

PLEASE READ BEFORE  
USING THIS EQUIPMENT

# REALISTIC®

CAT. NO  
21-1544

CUSTOM MANUFACTURED FOR RADIO SHACK  A DIVISION OF TANDY CORPORATION

The REALISTIC TRC-431 is a quality 4-watt, 40-channel CB Transceiver designed for mobile or base use. As a mobile unit, you can easily install it in a car, truck, boat or airplane. As a base station, you can use it at home or in the office.

It is loaded with state-of-the-art circuitry to give you a highly selective, sensitive receiver combined with an efficient 4-watt output transmitter. The circuitry is all solid-state, on rugged printed circuit board construction. 3 Field Effect Transistors, 28 Transistors, 1 Large Scale Integrated Circuit (LSI), plus 2 standard IC's, 30 Diodes and 1 Thermistor are used to insure optimum performance on both Receive and Transmit.

Your TRC-431 features an innovative PLL (Phase Lock Loop) frequency control system to generate the multiple frequencies necessary to operate on the 40 channels authorized by FCC. This PLL circuit uses only three crystals which assures ultra-precise frequency control (as compared to conventional multi-crystal synthesized transceivers) and results in greater reliability.

## FEATURES

- \* Full 40 channel operation from an innovative "Phase Lock Loop" frequency system.
- \* Two ceramic filters provide superior selectivity and freedom from adjacent channel interference.
- \* Digital readout indicates channel selection in bright L.E.D. numerals.
- \* Variable Squelch control eliminates background noise between calls.
- \* Delta Tune zeros in on signals which are slightly off-frequency and reduces adjacent channel interference.
- \* S/RF Meter shows the relative strength of signals in Transmit and Receive modes.
- \* Useful Public Address System for paging and announcements.
- \* Detachable Low Impedance Dynamic Microphone for clear transmissions — easy to replace too.
- \* A headphone jack lets you listen privately or isolates you from noise, for instance, at the scene of an accident.
- \* A special jack lets you use an external speaker for remote monitoring.
- \* AC and DC power cables for base or mobile installations.
- \* Coaxial type antenna connector.
- \* Use with either negative or positive ground electrical systems.
- \* Universal Mounting Bracket fits almost any type of vehicle or boat.

**For your own protection, we urge you to record the Serial Number of this unit in the space provided. You'll find the Serial Number on the back panel of the unit.**

Serial Number
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### **RADIO SHACK LIMITED WARRANTY**

This equipment is warranted against defects for 90 days from date of purchase. Within this period, we will repair it without charge for parts and labor. Simply bring your sales slip as proof of purchase date to any Radio Shack store. Warranty does not cover transportation costs. Nor does it cover equipment subjected to misuse or accidental damage.

This Warranty gives you specific legal rights and you may also have other rights which vary from state to state.

*We Service What We Sell*

### **F.C.C. LICENSE(U.S.A.)**

Before transmitting with your Transceiver, you must have an FCC Class D Citizens Radio Service License. If you don't have a license yet, you can fill out the Temporary Permit Form 555-B for a temporary license. Also, fill out and mail in FCC Form 505 CB License Application to:

Federal Communications Commission  
P.O. Box 1010  
Gettysburg, Penn. 17326

You must also read and know Part 95 of the FCC Rules and Regulations; they apply to the operation of a Class D Citizens Band unit. We've provided a copy of this regulation (along with the forms noted above).

**NOTE:** Units manufactured for sale in the U.S.A. can not legally be used in Canada. Canadian models have been D.O.C. approved and carry a D.O.C. approval label with its approval number.

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### **D.O.C. LICENSE(CANADA)**

Before transmitting with your Transceiver, you must obtain a Department of Communications (D.O.C.) General Radio Service license. We've provided such an application form with your unit—complete the form and mail with the appropriate fee to the Radio Regulations Office nearest you.

D.O.C. Approved Number: \_\_\_\_\_

**NOTE:** Units manufactured for sale and use in Canada are not identical to units type-accepted by the FCC. Canadian models have been approved by D.O.C. and are to be used only in Canada.

# SPECIFICATIONS

## GENERAL

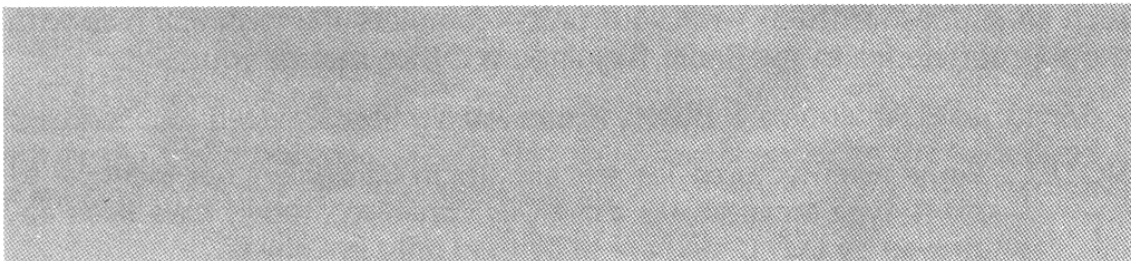
Channels . . . . .	All 40 channels
Frequency Coverage . . . . .	26.965 to 27.405 MHz
Microphone . . . . .	Dynamic with push-to-talk switch and coiled cable
Power Requirements . . . . .	48 watts
Current Drain . . . . .	DC 1.5 A
Semi-conductors . . . . .	3 FETs, 28 Transistors, 1 LSI, 2 IC's, 30 Diodes and 1 Thermistor
Dimensions . . . . .	3-9/16"x11-3/8"x9-7/16" (9 cm x 29 cm x 23.9 cm) (HWD)
Weight . . . . .	8 lbs. 12 ozs. (3.9 kg)

## RECEIVER

Sensitivity . . . . .	0.5 $\mu$ V for 10 dB S/N
Selectivity . . . . .	$\pm$ 3 kHz at -6 dB
Adjacent Channel Rejection . . . . .	60 dB
Audio Distortion at 1000 Hz . . . . .	Less than 10% at 3.5 watts output
Spurious Signal Rejection . . . . .	-60 dB
Spurious Radiation Leakage . . . . .	Less than 2.0 nW
I.F. Frequency . . . . .	9.785 MHz, 455 kHz
Squelch . . . . .	Adjustable from 0.25 $\mu$ V to 2 mV
Built-in Speaker . . . . .	3" (7.7 cm)

## TRANSMITTER

Power Output . . . . .	4 watts maximum
Modulation . . . . .	+90%, -100%
Spurious Radiation . . . . .	-65 dB or better
Emission Type . . . . .	6A3
Frequency Tolerance . . . . .	Better than 0.002%
Antenna Impedance . . . . .	50 ohms (SO-239 receptacle)





## CONTROLS AND THEIR FUNCTIONS

**VOLUME with On/OFF switch** — Turn the transceiver on and off and adjust listening level (or PA level when using that function). This control has no effect on the transmitter output.

**SQUELCH** — Eliminates annoying noise between transmissions. When properly set, it allows signals to come through, but shuts off the receiver's sound when no signal is present.

This control also permits you to cut out incoming CB calls while using PA function. To do so, rotate **SQUELCH** maximum counterclockwise till it clicks to CB OUT position.

**Channel Selector** — Selects one of the 40 CB channels as indicated in the Channel Indicator window.

**PA push-button** — In the "out" position (button out), your Transceiver operates in the normal manner. To use the Public Address function, press this button in. This disables the transmitter and lets you use the power amplifier circuitry as a 4-5 watts Public Address amplifier — but, you must have an external speaker connected to the PA SP jack on the back.

If you leave **SQUELCH** in the maximum counterclockwise position — **but not switched to CB OUT position** — you can continue to monitor CB signals on the channel you have selected. If you do not want this constant background noise, set **SQUELCH** to CB OUT position.

**DELTA TUNE** — Functions as a "fine tuning" control. If you receive a signal that is not clear because it is "off-frequency", set to "+" or "-" as required to achieve best signal quality. It is also helpful to reduce adjacent channel interference caused by another station on an adjacent channel operating slightly off frequency. Use the position which in best signal and/or least adjacent channel interference.

**Channel Indicator** — Shows the selected channel in a large, easy-to-read 7-segment LED display.

**S/RF Meter** — When receiving, indicates the relative strength of the incoming signal in "S" units. When you transmit, it reads the relative RF power output from your transceiver.

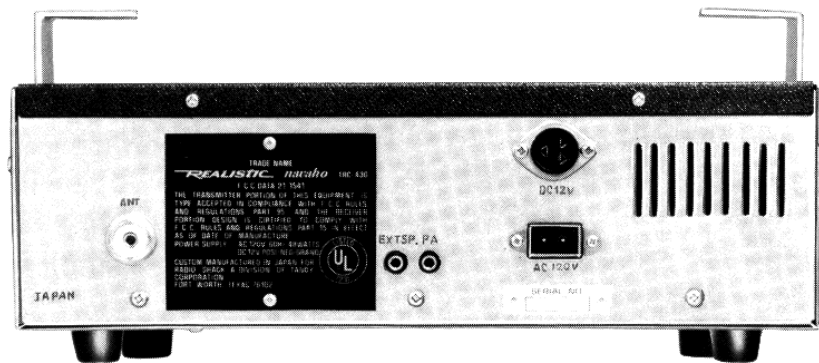
**Transmit Indicator** — When transmitting, ON THE AIR is illuminated. The MODULATION light flickers as you talk to indicate your signal is properly modulated.

**Headphone Jack** — Accepts low impedance headphones for private listening or to seal out noisy surroundings. When headphones are connected, the built-in speaker is shut off.

**Microphone Jack** — Accepts the dynamic microphone provided with your transceiver.

**Microphone** — This high-quality dynamic microphone must be connected to the jack on the front (be sure the plug is pressed firmly and securely into the jack). To Transmit, press the button on the microphone. To Receive, release the button.

When Transmitting (or using the PA function), hold the microphone at an angle, 2"–3" (5–7.5cm) from your mouth and speak clearly, in a normal voice.



## REAR PANEL

**ANTenna Connector** — Attach mobile or base CB antenna to this jack using PL-259 connector.

**EXTernal SPEaker Jack** — If you want to use an external speaker in conjunction with the CB operation of your Transceiver, plug it into this jack. Use a standard 8 ohm type, either the PA type noted above or other high-quality communication-type. We suggest Radio Shack's 21-549. Use a standard miniature phone plug such as suggested above. When a plug is inserted into this jack, the built-in speaker is automatically disconnected.

**P A Speaker Jack** — To use the Public Address function, you must connect an external speaker to this jack. We recommend Radio Shack Catalog Number 40-1236, a weatherized PA speaker; to make the connection, use a miniature-type phone plug such as Catalog Number 274-288.

**A C 120V Jack** — Accepts power cord for AC operation.

**D C 12V Jack** — Accepts power cable with in-line fuse for 12-16 volt, negative or positive operation. The red wire with in-line fuse to a positive source, the brown wire to a ground.

# INSTALLATION

Your unit is designed primarily as a base station, but is versatile enough to function very well as a mobile unit. We have included most of the things you need for base or mobile operation. All you need to purchase are an antenna and its accessories. Refer to the ANTENNA section for additional information.

## LOCATION

Plan the location of your Transceiver, Microphone and Antenna carefully before installing.

For mobile installations, safety and convenience are the primary considerations. All controls must be in easy reach of the driver without interfering with safe operation of the vehicle. Be sure all cables are clear of the brake, clutch and accelerator. Also, thought must be given to the convenience of passengers (will they have adequate leg room?).

Another extremely important requirement is easy installation and removal for service and maintenance. Mount the transceiver so it can be slipped in and out easily.

Do not mount the unit in the heater or air conditioner's air stream.

## BASE

Place your base antenna as high as possible within the limits of the FCC regulations and away from obstructions.

All antenna cables absorb a small amount of power, both in Transmit and Receive. So keep the length of the transmission line to a minimum. It is best to use poly-foam coaxial cable with an impedance of 50 ohms. We suggest type RG-58/U for short lengths and RG-8/U for long lengths (over 50 feet or 15 m).

A good impedance match is as important for reception as for transmission. If a mismatch exists between the antenna and the receiver, the receiver's excellent sensitivity and signal-to-noise ratio will be defeated.

Place the Transceiver in the location you've chosen and plug the Microphone into the jack provided for it on the front panel. Plug the AC Power Cable to its jack on the rear panel.

Attach a PL-259 connector to the transmission line and then screw the connector onto the ANTenna connector on the rear panel.

You may now insert the AC Power Cable in any convenient 120 volt AC, 60 Hz outlet. You are now ready for base operation.

## MOBILE

Select the desired location for the Transceiver. This is usually under the dashboard directly over the driveshaft hump.

After you have determined the best mounting location, temporarily mount the brackets to the side of the unit. Use the unit, with brackets installed, as a template to mark where the holes are to be drilled. Take care when you drill holes that you do not drill into wiring, trim or other accessories. Remove the brackets from the unit and assemble them to the dash with bolts, lockwashers and nuts or with self-threading screws. Use the wing screws to mount the Transceiver in the bracket.

The TRC-431 is designed for use with either Negative or Positive Ground Electrical Systems.

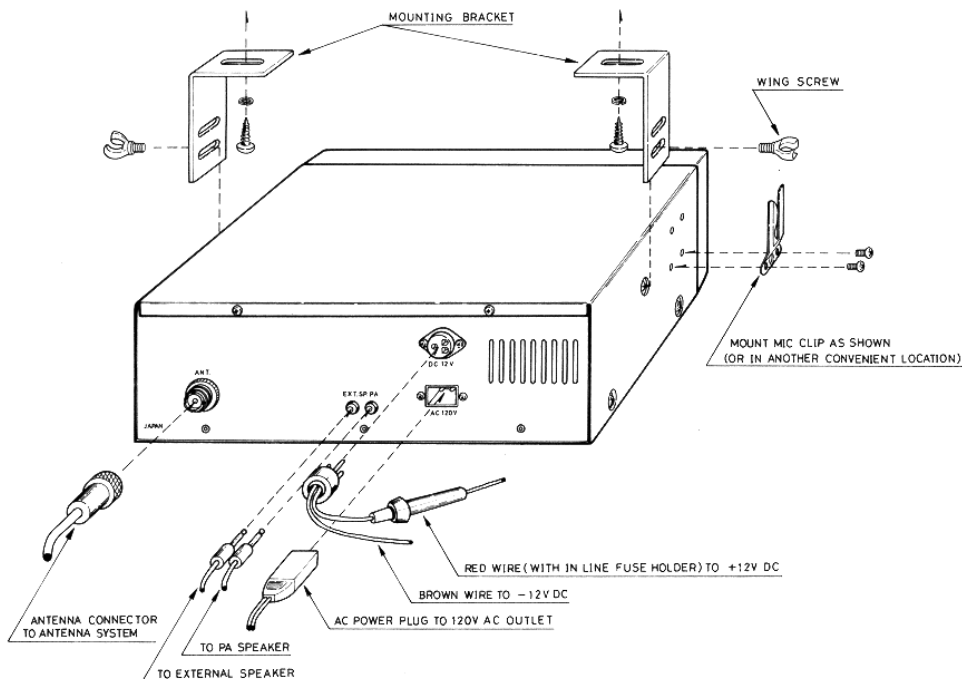
### Negative Ground Systems

Connect the red fused wire of the power cable to the positive or (+) battery terminal (or to a fuse block or ignition switch or other convenient + connection point). The brown wire is negative and should be connected to the metal part of the vehicle body or (-) battery terminal.

### Positive Ground Systems

Connect the red fused wire of the power cable to the positive terminal (+) of the battery (or to the metal part of the vehicle's body). The brown wire is negative and should be connected to the "hot" side of the ignition switch or directly to the negative terminal of the battery.

Connect the Antenna system to the ANTenna coax connector. If you are using an external speaker connect it to the EXT SP jack.





# USING YOUR TRANSCEIVER

Do not transmit without a suitable antenna or load connected to the ANTenna connector. For installation, refer to that section.

## TO RECEIVE

1. Set PA push-button to the "out" position (button out).
2. Turn the **SQUELCH** control fully counterclockwise.
3. Turn power "on" by rotating **VOLUME** clockwise.
4. Select the desired channel by rotating **Channel Selector** to the desired position as indicated in the Channel Indicator window.
5. Adjust **SQUELCH** to cut out annoying background noise when no signal is being received. To do this, set Channel Selector to a channel where no signals are present (or wait till signals cease on a channel). Then, rotate **SQUELCH** clockwise to the point where the background noise just stops. Now, when a signal is present, you will hear it, but you will not be disturbed by noise between signals.

When properly set, **SQUELCH** will keep the receiver "dead" until a signal comes in on that channel. Do not set **SQUELCH** too high or weak signals will not be able to "open" the Squelch circuit. To receive weak signals, it is best to leave **SQUELCH** set to the minimum position (fully counterclockwise).

6. Use **DELTA TUNE** to tune in slightly off-frequency stations, or to tune out adjacent channel interference caused by a station on the next channel (which may be too close to your channel). Use the position which results in the highest S/RF meter reading and/or least adjacent channel interference.
7. Adjust **VOLUME** for a suitable listening level.

## TO TRANSMIT

1. Be sure the Microphone is firmly connected to the jack on the front.
2. Select the desired channel of operation.
3. Press the push-to-talk button on the Microphone. Hold the mic at a slight angle about 2"—3" (5—7.5 cm) from your mouth and speak in a normal voice. "ON THE AIR" light will appear; "MODULATION" light will flicker as you talk.
4. To Receive, release the push-to-talk button.





## USING THE PUBLIC ADDRESS AMPLIFIER FEATURE

You can use the Transceiver to provide 4-5 watts of audio power as a Public Address Amplifier. To use this function, you must connect an 8 ohm public address type speaker to the P.A. jack on the rear of the unit. Radio Shack has a number of suitable PA type speakers.

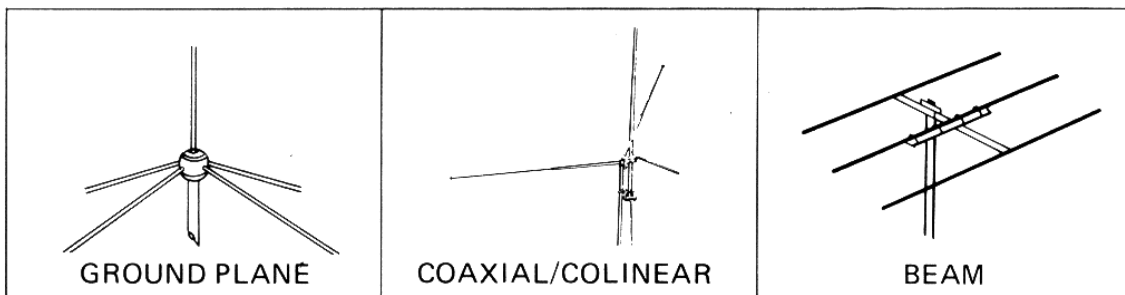
1. Be sure an 8 ohm speaker is connected to the P.A. jack.
2. Set **SQUELCH** to any point except CB OUT position.
3. Press **PA** push-button (button in).
4. Rotate **VOLUME** in a clockwise direction to turn power "on".
5. Be sure the microphone is connected. Press the push-to-talk button on the microphone and talk into the microphone.
6. Adjust **VOLUME** as required.
7. Even though you have your Transceiver set for PA operation, CB signals can still be monitored. Since the Receiver is operating (when you are not using the PA amplifier), you will hear CB signals through the PA speaker. This feature assures that you will not miss important calls even while using the PA function. If you don't want to hear the CB signals, set **SQUELCH** to CB OUT position.
8. To return to normal Transceiver operation, press **PA** push-button to release the function (button out).

## ANTENNAS

### BASE STATION ANTENNAS

No base station is better than its antenna, so give careful consideration to the type of antenna which will best suit your needs.

There are three basic types.



GROUND PLANE antenna is the most commonly used antenna for base stations. It is fairly effective, omni-directional, lightweight, easy to mount, and economical. It is designed for medium-long range communications. We suggest Radio Shack's (catalog number) 21-901.

COAXIAL/COLINEAR antenna is a high-efficiency radiator with improved omni-directional characteristics. It provides an effective increase in power when compared to a regular ground plane antenna. It is designed for medium-long range communications. Try our 21-902 or 21-1133.

BEAM antenna is highly directional and must be used with a rotor unless you are communicating with a fixed station. Since it is directional, it greatly reduces noise and interference from all other directions. The increased forward gain and the higher front-to-back ratio results in an effective power gain many times that of a standard ground plane. As you might expect, it is designed for long range communications.

Whatever type of antenna you choose, ground the antenna mast and connect a lightning arrester to the coaxial lead-in. This will protect your system and reduce static interference.

An SWR meter helps match the antenna to your transceiver and can substantially increase your effective range.

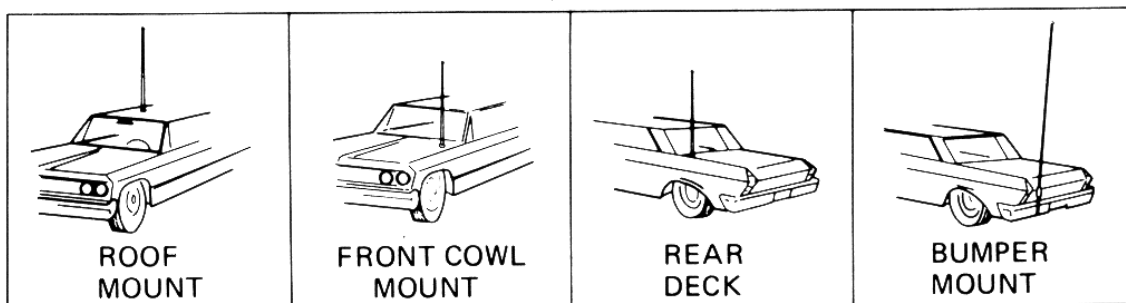
For more information of antennas and how to install them, your nearest Radio Shack store has a helpful book, *Introduction to Antennas*.

## MOBILE ANTENNAS

There are two types of mobile CB antennas: a full-length whip or a loaded whip. Your local Radio Shack store has a complete line of both types and the salesman can help you choose the best antenna for your needs.

A vertically polarized whip antenna is best suited for mobile service. It is omni-directional and can be the loaded type or a full quarter-wave (quarter-wave being more efficient).

There are many possible antenna locations on a car. Four of the most popular are shown.



**ROOF MOUNT** – In this position the antenna radiates equally in all directions. Since the normal  $\frac{1}{4}$  wavelength whip antenna is too long (102" or

2.6 m) for roof mounting on a vehicle, the antenna is shortened and a loading coil is utilized to provide the proper electrical length. Our Fiberglass Roof-Mount catalog number 21-925, is a good durable antenna.

**FRONT COWL MOUNT** – The radiation pattern is slightly greater in the direction of the rear fender opposite the side on which the antenna is mounted. However, this position offers a number of advantages. The CB antenna can be easily mounted. It can double as both the CB and the standard auto radio antenna by employing a two-way coupler. Ask about our catalog number 21-930 Front Cowl Mount antenna which is designed for CB, AM and FM operation.

**REAR DECK** – The radiation pattern is strongest in the direction of the front fender opposite the side on which the antenna is mounted. In this position you can use a full quarter-wave antenna or a shorter, loaded whip. Here you might consider Radio Shack's catalog number 21-926 or 21-908, or one of the full 102''(2.6 m) whips.

**BUMPER MOUNT** – The antenna radiates in a pattern directly in front of and to the rear of the vehicle, with maximum radiation directly away from the vehicle, in a horizontal plane. Despite its fairly irregular pattern, a bumper mounted full-length whip antenna will normally give the best results. Removing the antenna is simple and will leave no holes in the car. We suggest you try our bumper-mount fiberglass whip, catalog number 21-927.

A few general rules should help you install any mobile antenna properly.

1. Keep it as far as possible from the main bulk of the vehicle.
2. Keep as much of it as possible above the highest point of the vehicle or boat.
3. During operation, it must be vertical. Thus, it should be mechanically rigid so it will remain vertical when the vehicle or boat is in motion.
4. Mount it as far as possible from sources of noise (ignition system, gauges, etc.) and keep the transmission line away from these noise sources.

An antenna mounted in a boat requires a ground. This can be either a metal hull or a ground made of tin-foil or copper sheeting. This ground should cover an area of 12 square feet (1 m<sup>2</sup>) or more. Be sure the transceiver also has an adequate ground.

If you use Radio Shack's 102''(2.6 m) Fiberglass Marine Antenna (21-912), You won't need a ground; it has been designed with its own "ground" system.

**NOTE:** The ON THE AIR Lamp circuitry in your TRC-431 incorporates a special feature you should be aware of. If you operate the transmitter without a load (open transmission line or no connection) or with a high SWR, the ON THE AIR Lamp will not come on (with high SWR it will be dim). The TRC-431 will not be damaged under these conditions, but this warning will let you know you need to check the antenna, its connections or to check for high SWR. Check the coax cable too.

# HINTS

## NOISE IN MOBILE INSTALLATIONS

Your vehicle or boat can cause a lot of interference. Since the receiver section of your transceiver is very sensitive, it will pick up even the smallest electrical impulses and amplify them. Most of the noise you hear is from external sources. The receiver itself is exceptionally quiet. Noise problems can not be solved internally (in the transceiver); they must be solved at the noise's source.

This interfering noise can be generated anywhere in the electrical system of the vehicle or boat. The first step in reducing or eliminating this noise is to locate the source.

If you think the noise is from your ignition system, try this simple test. Turn your ignition switch off and set to ACC (accessories). This turns off the ignition, but supplies power to the transceiver. Most of the noise will disappear – indicating the source of noise is your ignition system.

## IGNITION SYSTEM

The ignition system is the most common source of noise. It consists of a series of popping sounds occurring at a regular rate which varies with the speed of the engine and stops when the ignition is off.

There are a number of things that can be done to reduce such noise:

1. Use only "radio suppression" high voltage ignition wire. Most new cars are already equipped with this type of wire.
2. Inspect the high voltage ignition wire and all connections made with this wire. Old ignition wire may develop leakage, resulting in "hash".
3. If noise persists, replace the spark plugs with plugs that have built-in suppressor resistors. Be sure to use the correct type for your vehicle.

Other sources of noise are: generator/alternator, regulator, gauges and static discharge. Most types of noise can be effectively reduced or eliminated with bypass capacitors at the output voltage points. Check your Radio Shack store for a wide selection of noise reduction accessories.

## SERVICE AND MAINTENANCE

Your transceiver has been built in accordance with Radio Shack's exacting quality control standards. However, it should be treated with reasonable care accorded any electronic equipment. Avoid exposing it to severe shock, dirt or moisture.

If you run into problems with the unit, we recommend you check the following:

1. If trouble is experienced with receiving.
  - \* Check VOLUME On/OFF switch setting.
  - \* Be sure SQUELCH is adjusted properly. Is it over-squelched?
  - \* Check if the unit is switched to an operating channel.
2. If trouble is experienced with transmitting.
  - \* Be sure the Microphone is firmly connected to the Microphone jack on the unit.
  - \* Check if the transmission line is securely connected to ANTenna Coax Connector.
  - \* Check if the antenna is fully extended for proper operation.
  - \* Are all transmission line connections secure and free of corrosion?
  - \* Make sure you are fully depressing the push-to-talk button on Microphone.
  - \* Check PA push-button setting. It must be in "out" position.
3. If the transceiver is completely inoperative.
  - \* Check the power cable and fuse (2A).

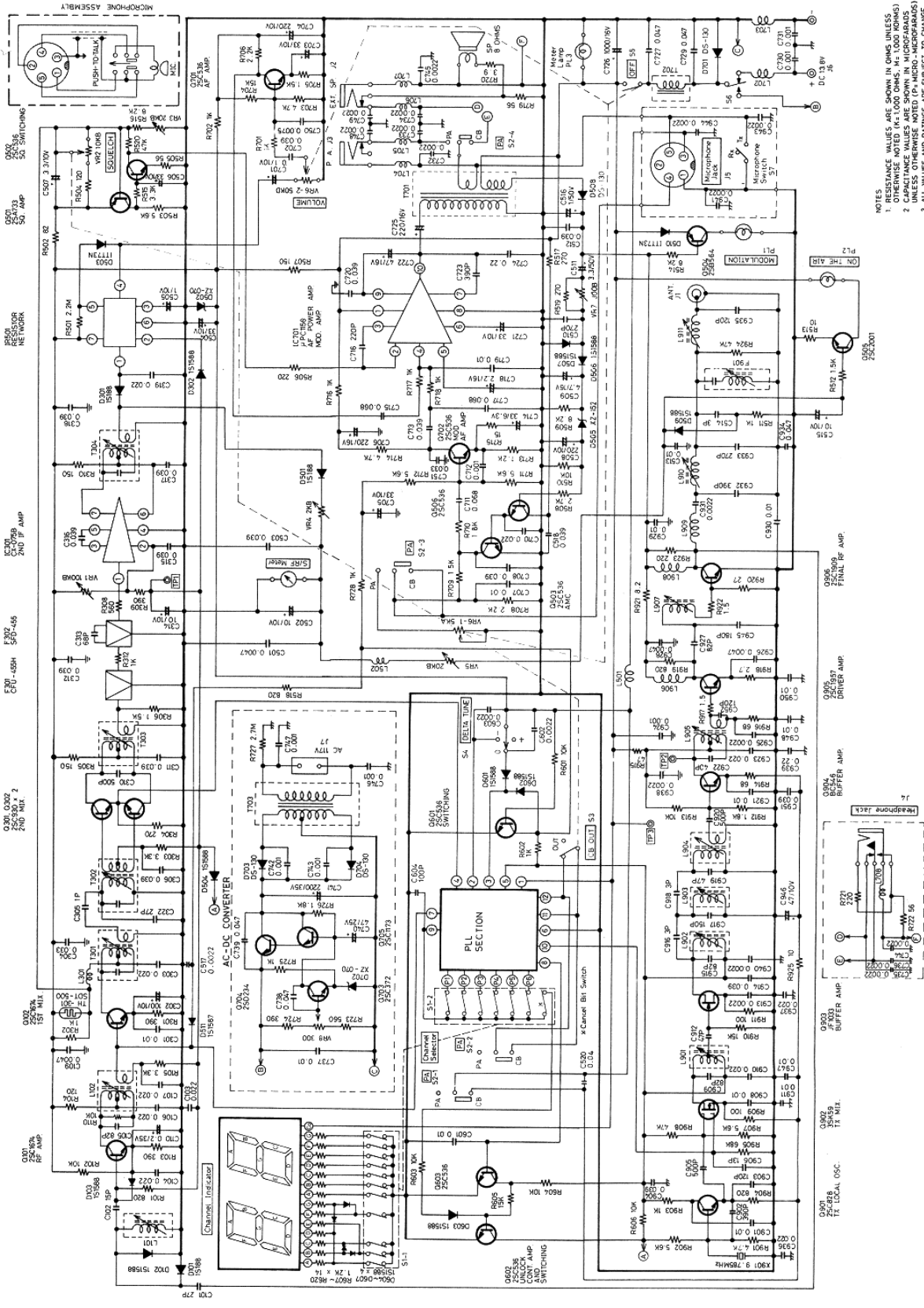
If these checks don't solve the trouble, do NOT attempt repair or adjustments yourself. The unit should be serviced only by a qualified radio technician. Whenever possible, return the unit to the store from which it was purchased.

## 10-CODES

Citizen band radio operators have largely adopted the 10-code for standard questions and answers. Its use permits faster communication and better intelligibility in noisy areas. The following table lists some of the more common codes and their meanings.

Code	Meaning	Code	Meaning
10-1	Receiving poorly	10-10	Standing by
10-2	Receiving well	10-13	Advise road/weather conditions
10-3	Stop Transmitting	10-20	What is your location?
10-4	OK	10-33	Emergency traffic
10-7	Out of Service	10-36	Correct time
10-8	In Service	10-41	Switch to Channel
10-9	Repeat	10-62	Cannot copy you

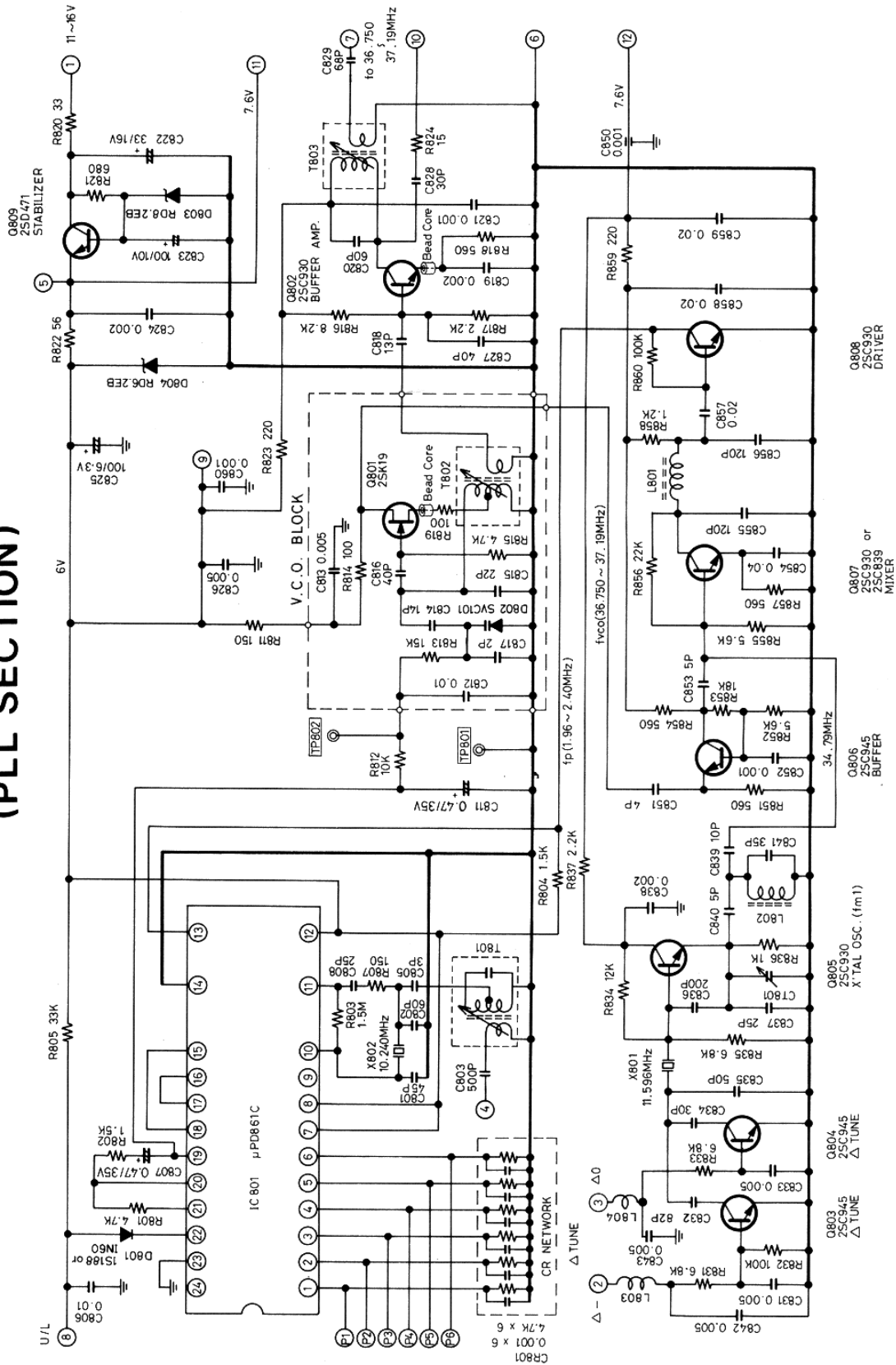
# SCHEMATIC DIAGRAM



NOTES  
 1. RESISTANCE VALUES ARE SHOWN IN OHMS UNLESS OTHERWISE NOTED (K=KILOHMS, M=MEGAHMS)  
 2. CAPACITANCE VALUES ARE SHOWN IN MICROFARADS UNLESS OTHERWISE NOTED (P=PICO-MICROFARADS)  
 3. ALL VALUES AND RATINGS ARE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT NOTICE



# SCHEMATIC DIAGRAM (PLL SECTION)



## WARNING

**Do not open up the Transceiver to make any internal adjustments.**

Any internal adjustments can be made only by (or under the direct supervision of) a person holding an FCC 1st or 2nd Class Radio Operator's License.

Internal adjustments and/or modifications can lead to illegal operation as defined by FCC Rules and Regulations, Part 95. Such illegal operation can lead to very serious consequences.

**TO BE SAFE AND SURE:**

1. You should never open up the case of your Transceiver.
2. Never change or replace anything in your Transceiver.