



DRAKE

TR-200

**2 METER FM
TRANSCEIVER**

430291

1. GENERAL DESCRIPTION

1.1 FEATURES

The TR-22 is a 2 meter VHF-FM transceiver with a capacity for 6 channels and will operate from an external 12 VDC source or from its internal rechargeable nickle cadmium batteries . A 120 VAC 50-60 Hz battery charger is built into the TR-22 .

1.2 SPECIFICATIONS

1.2.1 GENERAL

Frequency Coverage: 144 - 148 MHz

Number of Channels: 6 channels , 3 supplied

	<u>Channel 1</u>	<u>Channel 2</u>	<u>Channel 3</u>
Receive:	146.94 MHz	146.94 MHz	146.76 MHz
Transmit:	146.34 MHz	146.94 MHz	146.34 MHz

Transmitter Control: Push-to-talk

<u>Power Drain:</u>	<u>D.C.</u>
Receive:	45 mA
Transmit:	450 mA

Power Source: 13 VDC \pm 20%
120 VAC 50-60 Hz (for recharging nickle cadmium batteries only)

Dimensions: 5-3/8" x 2-5/16" x 7-1/8"

Weight: 3-3/4 pounds

Accessories Supplied: Dynamic microphone,
Over-the-Shoulder carrying case,
120 VAC and 12 VDC power cord,
Speaker plug, and
Ten nickle cadmium batteries .

1.2.2 RECEIVERReceiver Circuit:

Completely transistorized crystal controlled double conversion super-heterodyne.

1st IF Frequency:

10.7 MHz

2nd IF Frequency:

455 kHz

Antenna Input Impedance:

50 Ohms

Sensitivity:

0.5 Microvolt or less for 20 dB quieting.

Audio Output:

0.7 Watt at 10% or less distortion.

1.2.3 TRANSMITTER

R.F. Output Power:

1 Watt (conservative)

Frequency Deviation:

Adjustable to ± 15 kHz maximum.
Factory set to ± 5 kHz.

2. INSTALLATION

2.1 UNPACKING

Carefully remove the TR-22 Transceiver from its carton and examine it closely for signs of shipping damage. Should any be apparent, notify the delivering carrier immediately, stating the full extent of the damage. Fill out and mail the enclosed registration card so that your warranty will be effective. Save the packing material. You may need it later for reshipment or storage. Inspect the packing material closely before putting it away to be sure you have not overlooked the accessories packed with the unit.

2.2 LOCATION

In general, the location of the TR-22 is not critical. However, extremely hot locations, such as near radiators or heating units, or on top of other radio equipment should be avoided.

2.3 ANTENNA REQUIREMENTS

The TR-22 has a self contained antenna. It should be extended to its full length for proper operation. An external antenna connector is provided on the rear of the TR-22. External antennas should be resonant at the operating frequency and present an impedance of 50 ohms. The self contained antenna should be retracted whenever external antennas are in use.

2.4 POWER REQUIREMENTS

The TR-22 is supplied with rechargeable nickle cadmium batteries for portable operation. It is also possible to operate the TR-22 from eight size AA carbon zinc dry cells. A D.C. power plug is provided for operating on an external 12 VDC source. This plug plugs into the connector on the rear of the TR-22 just below the external antenna connector. When the DC power plug is in use, the internal batteries are disconnected. The 120 VAC power cord and rear connector are provided for charging the nickle cadmium batteries. Operation from the 120 VAC charger is not recommended.

2.5 SPEAKER AND HEADPHONE REQUIREMENTS

The TR-22 has a built-in speaker. An external 8 ohm headphone or speaker may be plugged in the miniature phone jack located on the front panel just above the microphone jack. Plugging an external speaker or headphone into this jack turns off the built-in speaker.

2.6 MICROPHONE REQUIREMENTS

A 500 ohm dynamic microphone with a push-to-talk switch is supplied with the TR-22.

3.. CONTROL FUNCTIONS

3.1 FRONT PANEL CONTROLS

3.1.1 ON-OFF SWITCH AND VOLUME CONTROL

The ON-OFF switch and VOLUME control are combined in the lower left control. Clockwise rotation turns the TR-22 on and increases audio gain.

3.1.2 SQUELCH AND BATTERY CHECK CONTROL

The SQUELCH and BATTERY CHECK control is located directly beneath the meter. Full counterclockwise rotation will operate the battery check switch and the battery voltage will be indicated on the meter. Clockwise rotation of this control increases the signal level required to defeat the squelch circuit and allow reception .

3.1.3 CHANNEL SELECTOR

The large knob in the approximate center of the TR-22 selects one of six possible transmit and receive crystal pairs .

3.2 INTERNAL CONTROLS

3.2.1 DEVIATION CONTROL

Frequency deviation is factory set to ± 5 kHz. Greater deviation than this can be obtained by adjusting VR21 on the transmitter circuit board. Remove the case by releasing the two captive snap buttons on the case rear at both corners. Remove the plastic cover by first removing the two flat beryllium copper springs on each side of the chassis. With the TR-22 upside down and front panel facing you, VR21 is located 2 inches behind the squelch control and the designation "VR21" is printed on the circuit board. Frequency deviation increases when the slider of VR21 is moved towards the rear of the TR-22. Use a screwdriver with an insulated shaft and handle for this adjustment. Replace the plastic cover and flat springs .

3.2.2 TRANSMITTER FREQUENCY ADJUSTMENT

With the front panel facing you and the TR-22 upside down, the transmitter crystals correspond to the channel numbers and are numbered from the extreme left to the right, 1 through 6. The bank of trimmer capacitors in back of the transmit crystal sockets allow transmit frequency adjustment left to right, channels 1 through 6.

3.2.3 RECEIVER FREQUENCY ADJUSTMENT

There are no provisions for receiver frequency adjustment. Receiver crystals must necessarily have a low frequency tolerance.

3.2.4 S-METER SENSITIVITY ADJUSTMENT

The S-meter response sensitivity is determined by the trim pot VR2 on the receiver circuit board. With the front panel facing you and the TR-22 upright, VR2 is located at the right, close to the front panel. Apply a 10 microvolt signal to the TR-22 antenna on 146.76 MHz and adjust VR2 for full scale meter deflection. Use a screwdriver with an insulated shaft and handle for this adjustment.

3.2.5

RELATIVE RF OUTPUT METER ADJUSTMENT

The RF Output Meter response sensitivity is determined by the trim pot VR23 on the transmitter circuit board. With the front panel facing you and the TR-22 upside down, VR23 is located immediately behind the left two transmitter trimmer capacitors. While transmitting into a 50 ohm dummy load, adjust V23 for a reading of 8 on the RF output meter. Use a screwdriver with an insulated shaft and handle for this adjustment.

3.2.6

BATTERY CHECK METER ADJUSTMENT

The Battery Check meter response sensitivity is determined by the trim pot VR22 on the transmitter circuit board. With the front panel facing you and the TR-22 upside down, VR22 is located at the right rear of the circuit board. With 10.0 volts applied to the D.C. power cord, turn the TR-22 on and rotate the squelch control fully counterclockwise into the "B. CH" (Battery Check) position and set VR22 so that the battery check meter needle covers the blank space between the red and black sectors on the meter face. Use a screwdriver with an insulated shaft and handle for this adjustment.

4. OPERATION

4.1 OPERATION WITH INTERNAL NICKLE CADMIUM BATTERIES

The TR-22 is shipped with ten Ni-Cad batteries. Special precautions should be observed when using these batteries or permanent damage to them may occur. The batteries may be charged by plugging the AC cord supplied into the 120 volt socket in the rear of the TR-22. The batteries should be charged when the battery check meter needle is at the right edge of the red scale. Battery condition may be checked by turning the TR-22 on and rotating the squelch control fully counter clockwise into the "B, CH" (Battery Check) position. Do not charge the batteries longer than 16 hours. Do not completely discharge the batteries (below 5 on the meter scale) because permanent damage may occur. Do not operate the TR-22 during charging.

Battery condition should be checked each time before using the TR-22 and operation should be suspended if the battery condition is not within the black scale. Operation is obtained by turning the switch on, extending the built-in antenna and rotating the squelch control clockwise until the receiver is muted. A channel with no stations transmitting must be selected in order to set the squelch control. An external antenna may be plugged into the connector on the rear of the TR-22. When using an external antenna, the built-in antenna must be retracted. Do not transmit on the TR-22 when no external antenna is connected and with the built-in antenna retracted. The TR-22 transmits when the button on the microphone supplied is depressed.

4.2 OPERATION WITH DRY CELL BATTERIES

The TR-22 is supplied with an extra 4 cell battery holder so that it may be operated from penlite dry cells. Remove all of the Ni-Cad batteries. Fill both four cell battery holders with dry cells and install the 8 dry cell batteries in the TR-22. Do not use more than 8 dry cells. Do not charge the dry cells with the TR-22 charger. Do not leave discharged dry cells in the TR-22. Do not store the TR-22 for long periods with dry cells installed and use only leak proof dry cells in the TR-22.

The TR-22 may be operated as described in the second paragraph of 4.1.

4.3 OPERATION WITH AN EXTERNAL D.C. SOURCE

The TR-22 may be operated from an external 13 volt \pm 20% source by plugging the D.C. cable supplied into the D.C. connector on the rear of the TR-22. The wire with the gray stripe is the positive lead. The internal batteries may be charged from AC while the D.C. plug is installed. The internal batteries cannot be charged from the external D.C. source.

The TR-22 may be operated from an external D.C. source as described in the second paragraph of 4.1.

5. TRANSMIT AND RECEIVE CRYSTALS

5.1 INSTALLATION

5.1.1 INSTALLING TRANSMIT CRYSTALS

With the front panel facing you and the TR-22 upside down, transmitter crystals correspond to the channel numbers and are numbered extreme left to right, 1 through 6. Crystals should be adjusted on frequency before operating.

5.1.2 INSTALLING RECEIVE CRYSTALS

With the front panel facing you and the TR-22 upside down, receiver crystals correspond to the channel numbers and are numbered extreme right to left, 1 through 6.

5.1.3 TRANSMIT CRYSTAL JUMPERS

One transmit crystal can be used on several channels by connecting a jumper wire from the terminal lug in front of the transmit crystal to the lug of the channel that is desired to be repeated. With the front panel facing you and the TR-22 upside down, the terminal lugs correspond to the channel numbers and are numbered extreme left to right, 1 through 6.

5.1.4 RECEIVE CRYSTAL JUMPERS

One receive crystal can be used on several channels by connecting a jumper wire from the terminal lug in front of the receive crystal to the lug of the channel that is desired to be repeated. With the front panel facing you and the TR-22 upside down, the terminal lugs correspond to the channel numbers and are numbered extreme right to left, 1 through 6.

5.2 CRYSTAL ORDERING INFORMATION

Accessory channel crystals may be ordered from the R.L. Drake Company. To order, specify the desired receive and transmit frequency and indicate that they are for the TR-22. Due to critical TR-22 crystal requirements we recommend ordering crystals only from R.L. Drake Co. If you desire to order crystals from another source, the following information should accompany your order.

Transmit Crystals

Fundamental mode parallel resonant with 42 pF load capacity in HC-25/U plug-in holder.

Divide transmit frequency by 12 to obtain crystal frequency.

Receive Crystals

Parallel resonant, 5th overtone mode with 35 pF load capacity in HC-25/U plug-in holder and $\pm .001\%$ frequency tolerance or less.

Crystal frequency = (Operating frequency in MHz - 10.7 MHz)

6. TROUBLE SHOOTING

Careful consideration has been given in the design and testing of the TR-22 to keep maintenance problems to a minimum.

If you experience difficulty, we recommend that you return the TR-22 to your Drake dealer or write direct to our customer service department describing your problem in detail.

DO NOT RETURN EQUIPMENT TO THE FACTORY

WITHOUT PRIOR AUTHORIZATION!

The high component density and small circuit board size of the TR-22 necessitates extreme care and a high level of competency in the repair of this unit. We highly recommend all repair work be performed by our service department. Please note that our warranty is void if unauthorized repair work is performed on the TR-22.

SUPPLEMENTAL TR-22 INFORMATION1. BATTERY

- A. Alkaline batteries may be used in the TR-22 and are considerably less costly than ni-cads - 30¢ to 50¢ each. "AA" size are not normally rechargeable. Do not charge alkaline batteries.

Since alkaline batteries have a unit voltage of 1.5 volts, only eight (8) units are required to replace the ten (10) ni-cads. Do not use more than eight (8) alkaline batteries.

Typical manufacturer numbers are:

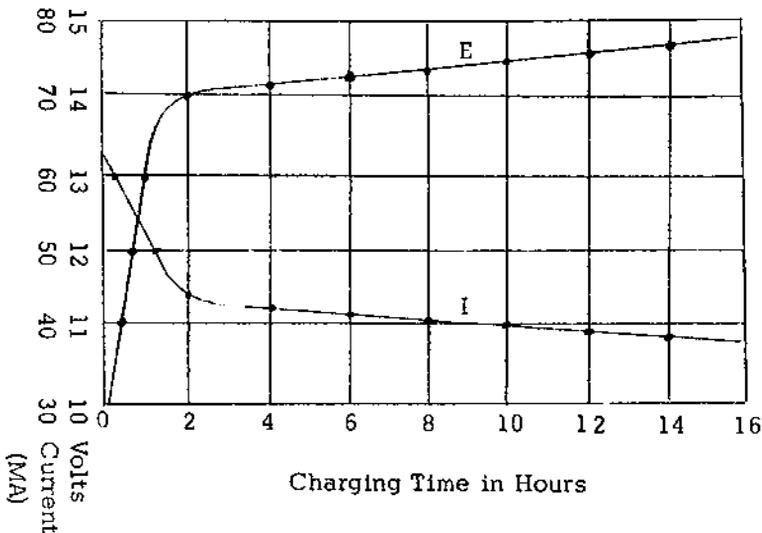
Eveready	E91
Mallory	MN1500
Burgess	AL-9

- B. Nickel-cadmium are normally chargeable 250 to 300 times. Care should be exercised in not discharging the series batteries below 10 volts. If discharged too far, the weakest cell in the string will reverse polarity and become permanently damaged.

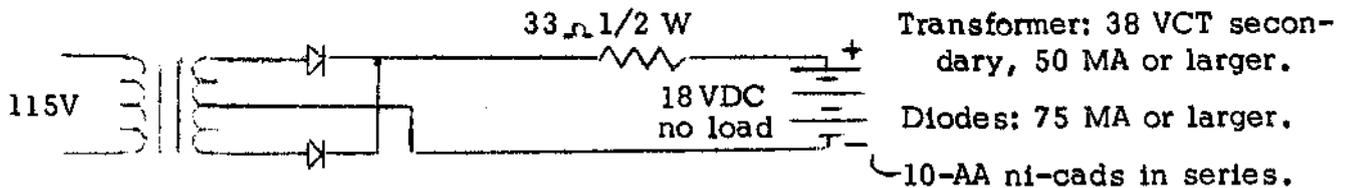
Japanese brands of ni-cads are identified by their type number N-450AA and are 450 milliampere hour batteries and usually cost about \$1.50 each. American brands are usually 500 MA hour and cost about \$2.00 each. Typical replacements are:

Eveready	CH500
	C450T (450 MA hour)
Burgess	CD6

Charging curve:



C. Suggested ni-cad charging circuit for charging AA size units:



D. Charging while using receiver.

Battery manufacturers recommend 45 MA charging rate for AA size ni-cads, therefore, the TR-22 charging circuit is designed to charge at the maximum rate of 45 MA and this will decrease to 38 to 40 MA current with squelch off (up to 150MA squelch on), therefore, no battery condition improvement can be expected while simultaneously charging and receiving. Because of transmitted hum, do not attempt to transmit while charging. Do not operate the TR-22 during charging.

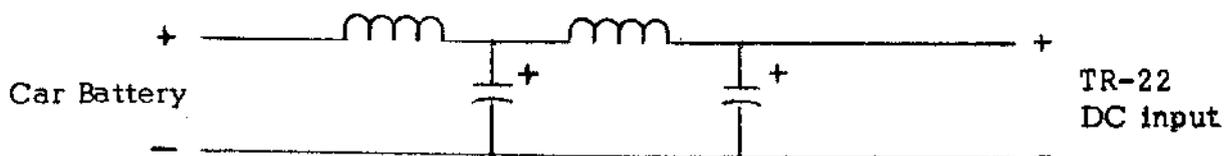
E. AC Operation.

True AC operation of the TR-22 may be accomplished only by use of a 12.5 VDC power supply, 115 VAC primary. Such a supply should have reasonable regulation and be of sufficient size to provide at least 500 milliamperes of current. The TR-22 draws 450 MA in the transmit mode.

The power supply 12.5 V terminals should be attached to the DC power cord furnished with each unit.

2. AUTO IGNITION NOISE

Certain automobile alternator/ignition systems are not sufficiently filtered and a slight buzz in the transmitted TR-22 signal may be reported by receiving stations. This will occur only when the unit is operated on the auto's battery system and not when used on ni-cads. It can be corrected by inserting the following filter at the a + line:



Capacitors - 1000 ufd @ 15 V or more.

Chokes - 1 mh or more @ 1/2 amp.

Chokes are available direct from the Drake Company. Please write regarding price or any further information.

R. L. D R A K E C O M P A N Y

540 Richard Street
Miamisburg, Ohio 45342

ACCESSORY GAIN ANTENNA

BBLT-144D	Newtronics 3.4dB gain antenna, quick mount type with coax and connectors	\$27.95
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TR-22 SCHEMATIC DIAGRAM

