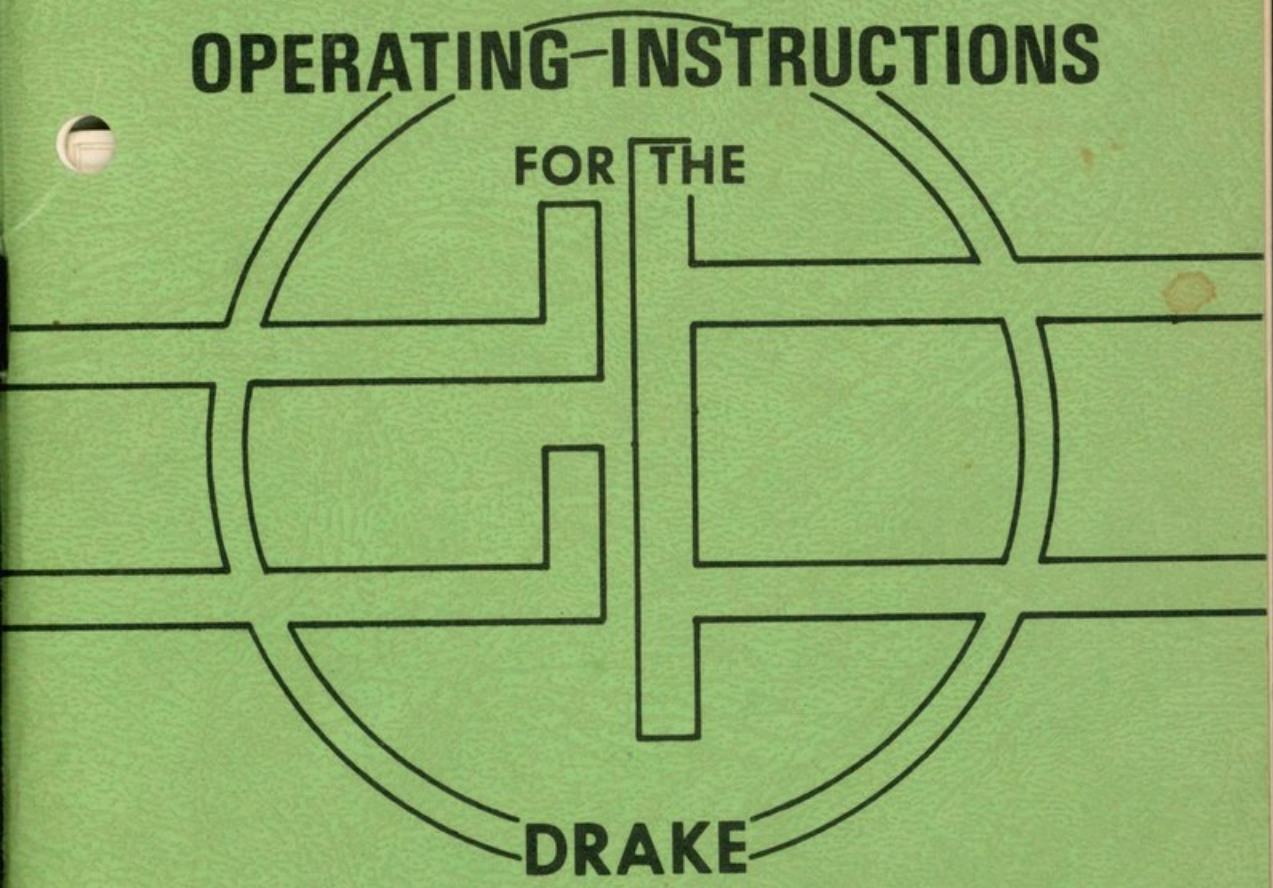
OPERATING INSTRUCTIONS

FOR THE



DRAKE

MODEL

SPR-4

COMMUNICATIONS RECEIVER

MANUFACTURED BY THE R. L. DRAKE COMPANY
540 Richard Street
Miamisburg, Ohio 45342

1. DESCRIPTION

FEATURES

The SPR-4 is an all solid-state receiver which may be programmed for many uses: standard broadcast, short wave listening, aircraft radio and weather, marine ship and shore stations, HF communications, WWV time signals, citizens band, etc. The SPR-4 may be powered from 120 VAC, 220 VAC, and 12 VDC.

SPECIFICATIONS

Frequency Coverage: Can be programmed with accessory crystals for 23 ranges (each tuning a 500 kHz band*) from .5 to 30 MHz plus 150 to 500 kHz. Crystals supplied with the receiver allow coverage on these ranges; 150-500 kHz, .5-1.0 MHz, 1.0-1.6 MHz, 6.0-6.5 MHz, 7.0-7.5 MHz, 9.5-10 MHz, 11.5-12 MHz, 15-15.5 MHz, 17.5-18 MHz, 21.5-22 MHz.

Modes of Operation: AM, CW, SSB (upper and lower)

Selectivity: AM - 4.8 kHz @ 6 dB, 10 kHz @ 60 dB
SSB - 2.4 kHz @ 6 dB, 7.2 kHz @ 60 dB
CW - .4 kHz @ 6 dB, 2.7 kHz @ 60 dB

Intermediate Frequencies: 1st IF 5645 kHz four pole crystal lattice filter, 2nd IF 50 kHz four pole Hi-Q Ferrite LC filter.

Frequency Stability: At room temperature, drift for all causes (including $\pm$ 10% change in supply voltage) is less than $\pm$ 100 Hz.

Sensitivity: SSB and CW: .25 microvolt gives 10 dB S+N/N, AM: .5 microvolt with 30% Mod gives 10 dB S/N.

Automatic Volume Control: AVC is used on AM, CW, and SSB. Time constants are selected for the optimum effectiveness on each mode. Audio output is held constant to 6 dB over a 100 dB range of input signals.

Input Impedance: 50 ohms approximately on ranges C - H. On ranges A and B, high impedance and low impedance loop antenna.

Output Power: 3 watts into 4 ohm load (less into higher impedance loads).

Power Consumption: 18 watts on 120 VAC or 6 watts on 12 VDC. 2.5 watts on 12 VDC with dial lamps turned off.

Calibration: Dial is accurate to better than $\pm$ 1 kHz when calibrated at nearest 100 kHz calibration point.

Hum and Noise: More than 60 dB below rated output.

Size and Weight: 5-1/2" H. x 10-3/4" W. x 12-1/4" D.
Weight: 18 pounds.

* Generous PTO overtravel actually allows 50 kHz or more coverage at the ends of each range.

II. INSTALLATION

UNPACKING

Carefully remove the receiver from the shipping carton, and examine it for evidence of damage. If any damage is discovered, immediately notify the transportation company that delivered the receiver. Be sure to keep the shipping carton and packing material, as the transportation company will want to examine them if there is a damage claim. Keeping the carton and packing material is recommended even when no shipping damage occurs, as having the original carton available makes shipment of the receiver much easier should it ever be necessary to return it to the factory for service.

On the front of this manual you will find a brown envelope, which contains a warranty card and some hardware. Fill out the warranty registration card and mail it.

LOCATION

The SPR-4 will work well in almost any location. Extremely hot areas such as over a radiator should be avoided. No air circulation around the receiver is required.

POWER REQUIREMENTS

The SPR-4 will operate on 120 or 240 VAC 50/60 Hz or on 12–15 VDC from a car battery, battery pack, or other DC source with negative ground.

The SPR-4 is shipped from the factory ready for 120 volt AC operation with the power cord supplied. A 1/4 amp, slow-blow fuse, BUSS type MDL 1/4, is installed in the fuse holder on the rear of the chassis.

For operating from 240 volt AC, the same power cord is used and the 120/240 volt slide switch is moved to the 240 volt position.

This requires moving the small metal keeper from the right to the left mounting screw on the slide switch.

Also for 240 volt operation, the fuse should be changed to a 1/8 amp, slow-blow, BUSS type MDL 1/8.

WARNING: NEVER CONNECT THE SPR-4 TO 240 V. WITH THE SWITCH IN THE 120 V. POSITION.

For DC operation, a separate power cord is all that is required. This cord is available with a cigar lighter plug installed.

ANTENNAS

For optimum performance the SPR-4 should be used with a good antenna. For general broadcast and short wave listening, a long wire antenna from 50 to 100 feet long will give good results. An antenna kit (Model AN-5) is available.

For best single band performance, a half wave dipole or other resonant antenna, fed with unbalanced 50 ohm coaxial cable, may be used.

For directional reception on 150 kHz to 1600 kHz, the accessory AL-4 shielded loop antenna may be used. All antennas other than the AL-4 loop antenna, connect to the Ant. jack on the rear panel.'

SPEAKERS

The SPR-4 has a built-in 3" x 5" ceramic magnet speaker which makes optimum use of the available space in the cabinet. It may be desirable to use an external speaker when the receiver is used at fixed locations.

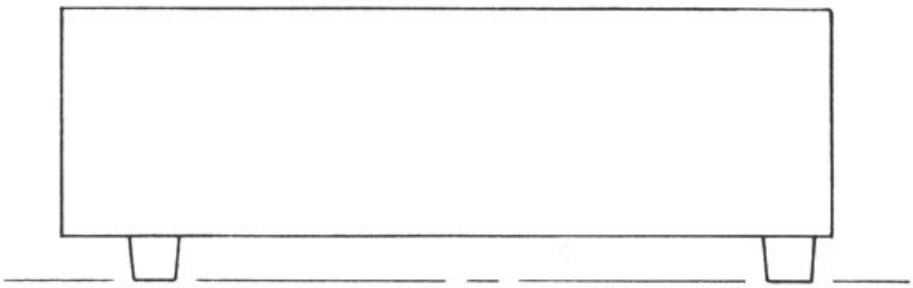
The Drake MS-4 speaker, housed in a cabinet that matches the SPR-4, provides excellent audio reproduction and comes equipped with a cable terminated in a phono plug matching the output socket of the receiver.

HEADPHONE OPERATION

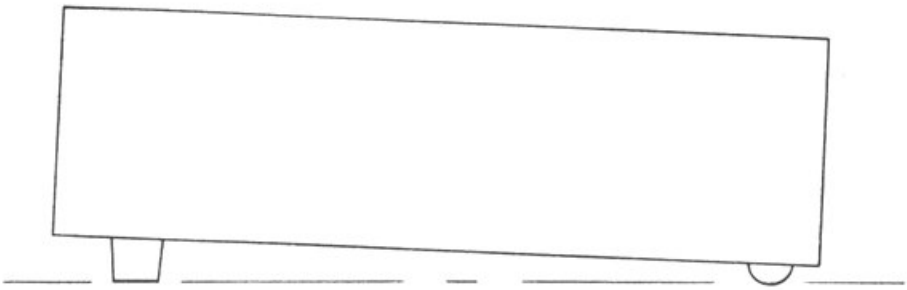
Best results will be obtained with a set of good quality headphones. The headphone connection is made through the jack at the bottom left of the front panel of the receiver. A standard 1/4 inch phone plug will mate with the jack. Connecting the headphones to the receiver will turn off the speaker.

VIEWING ANGLE OPTIONS

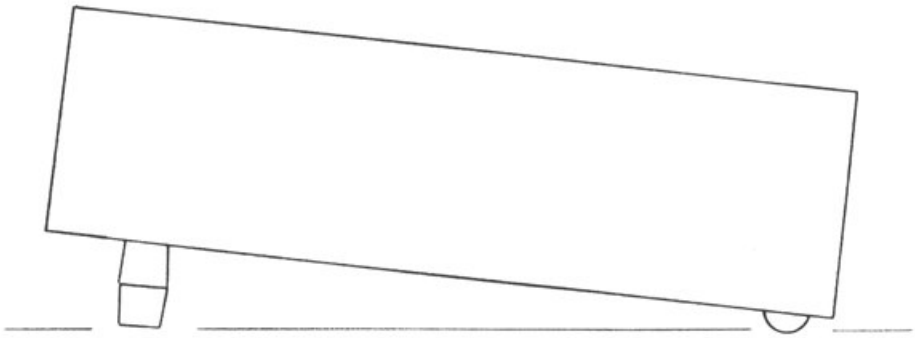
As supplied, the SPR-4 sits with its base parallel to the mounting surface, and its front panel vertical to the mounting surface. With the studs and rubber feet supplied, it is possible to position the SPR-4 for either of two alternate viewing angles, as shown in Figure 1. To convert the SPR-4 to either option, remove the bottom row of three screws on each side of the receiver, and then remove the cover. Remove the rear feet, and snap the small rubber feet into the holes just inboard from the original rear feet. For option 1, replace the bottom cover. For option 2, remove the front feet from the receiver, invert them, and remount them on the same screws. Thread one of the accessory studs into each of the remounted front feet, mount the feet that were removed from the rear of the receiver onto the studs, and replace the bottom cover.



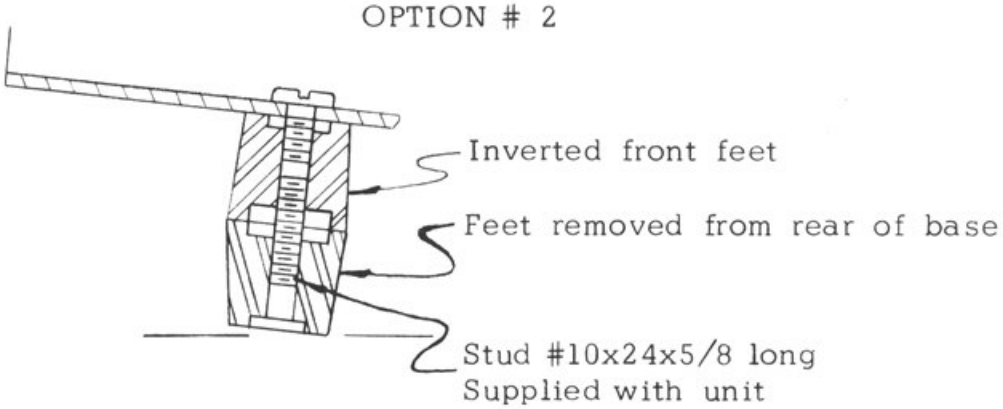
STANDARD



OPTION # 1



OPTION # 2



VIEWING ANGLE OPTIONS

Fig. 1

Fig. 2

OPERATING CONTROLS

III. OPERATION

OPERATING CONTROLS

Refer to Figure 2 for the location of the operating controls:

1. The S-meter indicates the relative level of received signals.

2. The Crystal Selector switch selects the band determining crystals. The top line of the dial sector reads the lowest frequency of each band in MHz, the middle line indicates the approximate position for tuning the Preselector and the bottom line indicates the proper setting of the Range switch.

3. The Main Tuning dial reads 0 to 500 kHz with one kHz graduations. When the tuning dial reading is added to the crystal dial reading, the actual received frequency is indicated to 1 kHz.

   The Main Tuning dial consists of two concentric transparent discs that rotate at different speeds. Zero to 100 kHz is indicated on one disc and hundreds of kHz are indicated on the other disc. The dial may be calibrated by rotating the skirt with respect to the knob.

4. The Preselector is set to the position indicated by the number on the middle line of the crystal selector dial and then fine tuned for peak signal. This control tunes the antenna and RF circuits and tracks the pre-mixed injection to the first mixer.

5. The Range switch sets up the proper tuned circuits to cover the desired band of frequencies. It is set to the position indicated on the bottom line of the crystal selector dial.

6. The Headphone jack mates with a standard 1/4 inch phone plug. Connecting the headphones to the receiver will turn off the speaker.

7. The Audio Gain control adjusts the audio output to the proper level.

8. The RF Gain control reduces the gain of the receiver for all signals which are below the level to which the control is set. This control is normally set in the full clockwise position. Counter-clockwise rotation reduces the gain of the receiver.

9. The Mode Selector switches in a product detector for CW and SSB or a diode detector for AM. It also selects the proper bandwidth.

10. The Notch control may be used to eliminate or reduce an interfering hetrodyne or CW signal. The off position, which is shown in Figure 2, has a positive detent. Counter-clockwise rotation of the knob from the off position moves the rejection notch across the receiver passband.

11. The Accessory switch controls the 5-NB, noise blanker, and the SCC-4 crystal calibrator when they are installed.

SIMPLIFIED OPERATING PROCEDURE

As an example, suppose that the SPR-4 is to be tuned to 7272 kHz. First turn the crystal selector dial to the 7.0 MHz position. Set the preselector to 5.5 as indicated on the second line of the crystal selector dial. Next, set the Range switch to E as indicated on the bottom line of the crystal selector dial. Turn the tuning knob until the 100 kHz dial is between 200 and 300 and the one kHz dial is on 72. Select the desired mode of reception with the mode switch. The RF Gain Control should be full clockwise and the Notch should be in the off position. Turn on the receiver with the Audio Gain control and adjust it for normal audio output. Fine tune the preselector for maximum indication of the S-meter.

The frequency of the received signal is the sum of the crystal dial reading and the main tuning dial reading as shown by the example:

Crystal Selector Dial Reading	7.000 MHz
100 kHz Dial Reading	.200
One kHz Dial Reading	.072
Frequency of Received Signal	7.272 MHz

REAR CONTROLS AND CONNECTORS

Refer to Figure 3 for the location of the connectors and controls:

1. The Power connector mates with both the AC and DC power cords. See Section II.

2. The fuse holder must have the proper fuse installed for 120 VAC or 240 VAC operation. See Section II.

3. The 120/240 volt slide switch must be in the proper position for either 120 VAC or 240 VAC operation. See Section II.

4. The internal speaker is normally connected to the Speaker jack. When an external speaker is used, disconnect the internal speaker by removing the plug and connect the external speaker to this jack.

5. A shorted phono connector is normally installed in the Mute jack. When the shorted connector is removed, the SPR-4 will be muted. When the SPR-4 is used with a transmitter, the mute jack should be connected to a circuit which is open on transmit and shorted on receive.

6. The Audio In/Out jack provides approximately .08 volts of audio into a high impedance load such as a tape recorder. The output level is independent of the setting of the Audio Gain control.

   The SPR-4 audio amplifier may be used with an external audio source such as a tuner. The level of the external source must

be approximately .08 volts into a 3 K load. The output level of the SPR-4 audio amplifier may be controlled by the Audio Gain control. Muting may be accomplished by turning the RF Gain control counter-clockwise or by removing the mute plug.

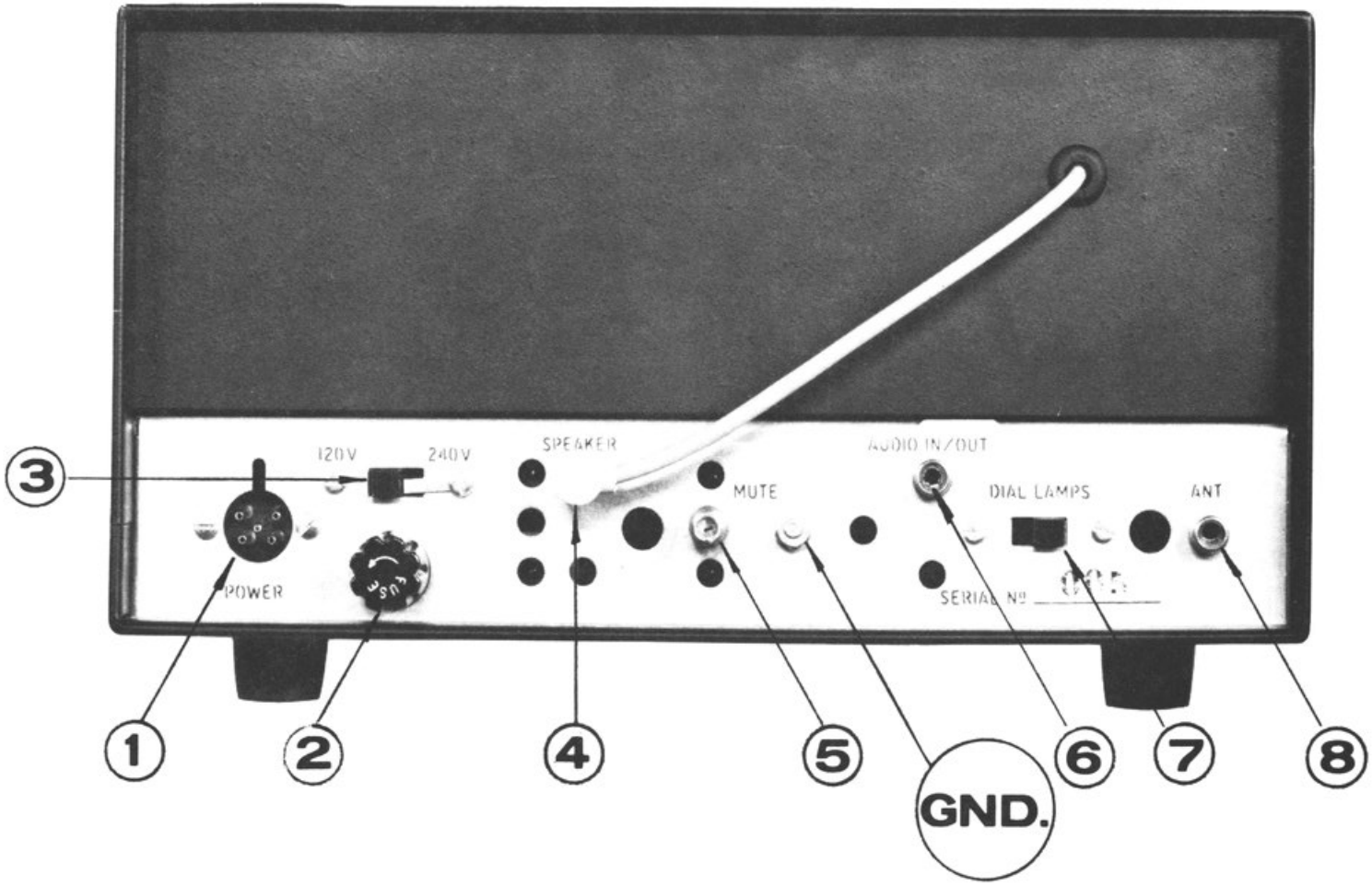
7. The Dial Lamp switch may be used to turn off the three dial lamps. Since the power required to operate the dial lamps is somewhat greater than the power required by the rest of the SPR-4, the operating time for a battery power supply may be extended by turning the lamps off. The on and off positions of the switch are interchanged when operating with a DC power cord.

8. The Antenna jacks mate with a standard phono fitting. Alternately, the special antenna fitting (a pin with a spring clip attached) which is supplied with the SPR-4 may be used by inserting it into the antenna jack. The antenna lead-in is then connected to the clip.

   The ground terminal should be connected a good earth ground such as a cold water pipe.

DIAL CALIBRATION

The main tuning dial calibration may be adjusted over a small frequency range by using the known frequency of the SCC-4 crystal calibrator or a station such as the National Bureau of Standard WWV at 10.0 MHz or 15.0 MHz. With the Mode switch in the CW, LSB or USB position, tune the signal from the SCC-4 or WWV to zero beat. Hold the knob stationary and rotate the skirt until the dial reads the correct frequency.



REAR CONTROLS AND CONNECTORS

IV. CRYSTAL INSTALLATION

The top of the cabinet must be removed in order to install additional crystals. This is accomplished by removing the top row of screws on both sides of the set. Also, disconnect the cable from the speaker jack. Be sure the power cord is disconnected. The top of the cabinet may now be removed.

At the bottom of each segment of the crystal dial there is a small number (0-23) which corresponds to a particular crystal socket. The crystal location diagram which is located on the chassis behind the crystal sockets indicates the number of each socket.

Install the accessory crystal in one of the empty sockets. Locate the appropriate crystal dial decal from the sheet supplied with the crystal. Remove the decal from the sheet by cutting along the appropriate lines with a pair of scissors. Remove the backing from the decal and install it in the dial sector with the same number as the crystal socket. Replace the cabinet top and the speaker cable.

On certain ranges there are spurious internal signals which are unavoidable in this double conversion, super-hetrodyne receiver. These are due to outputs of internal conversion oscillators. There are five frequencies that should be avoided if possible: 5.222, 5.595, 5.695, 9.963, and 15.334.

V. SERVICE

If you have technical questions or wish factory service, write to: R.L. DRAKE COMPANY, Customer Service Department, 540 Richard Street, Miamisburg, Ohio 45342; or call 513-866-3211.

A technical manual which has complete service information is available for a nominal charge.

STANDARD WARRANTY

R. L. Drake Company warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use, and service discloses such defect, provided the unit is delivered by the owner to us or to our authorized radio dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgement that it is thus defective. Should a malfunction be suspected, write in detail to our Service Department for suggestions concerning the operation, repair or return of your unit if it should prove necessary.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside our factory, nor in cases where the serial number thereof has been removed, defaced or changed, nor to units used with accessories not manufactured or recommended by us.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

The R. L. Drake Company reserves the right to make any improvements to its products which it may deem desirable without obligating itself to install such improvements in its previously manufactured products.

R. L. DRAKE COMPANY MIAMISBURG, OHIO

SPR-4 Accessory and Crystal Ordering Form

R. L. DRAKE COMPANY

540 RICHARD ST., MIAMISBURG, OHIO 45342

NAME_____

STREET_____

CITY_____ STATE_____ ZIP_____

Take this form to your dealer or mail directly to the R. L. Drake Company.

Operating Freq. in MHz.	Crystal Freq. in MHz.	QTY.	Price Each	TOTAL
.15 - .5*	None Req'd.	N/A	$5.00	$ N/A
.5 - 1.0*	11.59		5.00	
1.0 - 1.5*	12.09		5.00	
1.5 - 2.0	12.59		5.00	
2.0 - 2.5	13.09		5.00	
2.5 - 3.0	13.59		5.00	
3.0 - 3.5	14.09		5.00	
3.5 - 4.0	14.59		5.00	
4.0 - 4.5	15.09		5.00	
4.5 - 5.0	15.59		5.00	
5.0 - 5.5	16.09		5.00	
5.5 - 6.0	16.59		5.00	
6.0 - 6.5*	17.09		5.00	
6.5 - 7.0	17.59		5.00	
7.0 - 7.5*	18.09		5.00	
7.5 - 8.0	18.59		5.00	
8.0 - 8.5	19.09		5.00	
8.5 - 9.0	19.59		5.00	
9.0 - 9.5	20.09		5.00	
9.5 - 10.0*	20.59		5.00	
10.0 - 10.5	21.09		5.00	
10.5 - 11.0	21.59		5.00	
11.0 - 11.5	22.09		5.00	
11.5 - 12.0*	22.59		5.00	
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16.5 - 17.0	27.59		5.00	
17.0 - 17.5	28.09		5.00	
17.5 - 18.0*	28.59		5.00	
18.0 - 18.5	29.09		5.00	
18.5 - 19.0	29.59		5.00	
19.0 - 19.5	30.09		5.00	
19.5 - 20.0	30.59		5.00	
20.0 - 20.5	31.09		5.00	
20.5 - 21.0	31.59		5.00	
21.0 - 21.5	32.09		5.00	
21.5 - 22.0*	32.59		5.00	
22.0 - 22.5	33.09		5.00	
22.5 - 23.0	33.59		5.00	
23.0 - 23.5	34.09		5.00	
23.5 - 24.0	34.59		5.00	
24.0 - 24.5	35.09		5.00	
24.5 - 25.0	35.59		5.00	
25.0 - 25.5	36.09		5.00	
25.5 - 26.0	36.59		5.00	
26.0 - 26.5	37.09		5.00	
26.5 - 27.0	37.59		5.00	
27.0 - 27.5	38.09		5.00	
27.5 - 28.0	38.59		5.00	
28.0 - 28.5	39.09		5.00	
28.5 - 29.0	39.59		5.00	
29.0 - 29.5	40.09		5.00	
29.5 - 30.0	40.59		5.00	

* SPR-4 normally supplied with these operating frequencies.

ACCESSORIES

ITEM		QTY.	Price Each	TOTAL
SPR-4	Receiver		$____	$____
SCC-4	Crystal Calibrator		20.00	
MS-4	Matching Speaker		22.00	
5-NB	Noise Blanker		65.00	
AL-4	Loop Antenna		22.00	
AN-5	Antenna Kit		8.80	
DCPC	DC Power Cord		5.00	
TA-4	Transceive Adaptor		15.00	
MMK-3	Mobile Mount Kit		6.95	
BP-4	Battery Pack	Available August 1970		
Dial, Crystal Sel., Plain			1.00	
RY-4	RTTY Adaptor		10.00	
World Radio & TV Handbook			6.95	
Technical Manual		Available September		

CRYSTAL KITS

Amateur Bands - 6 xtals		$27.00	$____
Marine Bands - 11 xtals		49.00	
Aero.Overseas - 7 xtals		32.00	
Time & Freq.,WWV - 5 xtals		22.00	
CB - 1 xtal & Freq. Chart		5.00	
Tropical Broadcast - 3 xtals		13.50	
MARS - 5 xtals		22.00	
Teletype, Comm. - 4 xtals		18.00	

OHIO Residents add 4% Sales Tax $____

TOTAL $____

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

PRICE

AMATEUR BANDS - 160 M, 80 M, 20 M, 15 M and 10 M ranges - Six crystals cover: $ 27.00

1.5 - 2.0 MHz	21.0 - 21.5 MHz
3.5 - 4.0	28.0 - 28.5
14.0 - 14.5	28.5 - 29.0

MARINE BANDS - Eleven crystals cover: $ 49.00

2.0 - 2.5 MHz	8.5 - 9.0 MHz	17.0 - 17.5 MHz
2.5 - 3.0	12.0 - 12.5	22.0 - 22.5
4.0 - 4.5	13.0 - 13.5	22.5 - 23.0
8.0 - 8.5	16.5 - 17.0	

AERONAUTICAL OVERSEAS - Seven crystals cover: $ 32.00

2.5 - 3.0 MHz	6.5 - 7.0 MHz
3.0 - 3.5	8.5 - 9.0
4.5 - 5.0	13.0 - 13.5
5.5 - 6.0	

TIME & FREQUENCY STANDARD, WWV - Five crystals cover: $ 22.00

2.5 - 3.0 MHz	15.0 - 15.5 MHz (original equipment)
5.0 - 5.5	20.0 - 20.5
10.0 - 10.5	25.0 - 25.5

CITIZENS BAND - One crystal and Frequency chart: $ 5.00

27.0 - 27.5 MHz* (*Generous overtravel gives additional 50 kHz or more off ends of each range).

TROPICAL BROADCAST - Three crystals cover: $ 13.50

2.0 - 2.5 MHz 3.0 - 3.5 MHz 4.5 - 5.0 MHz

MARS - Five crystals cover: $ 22.00

2.0 - 2.5 MHz	4.0 - 4.5 MHz	18.0 - 18.5 MHz
3.0 - 3.5	5.0 - 5.5	

TELETYPE COMMERCIAL - UPI, AP, STOCK MARKET, WEATHER, ETC. - Four crystals cover: $ 18.00

7.5 - 8.0 MHz	13.5 - 14.0 MHz
9.0 - 9.5	15.5 - 16.0

ACCESSORIES

MATCHING SPEAKER - Same size as SPR-4, has 5 x 7 speaker,
Model MS-4 ..... $ 22.00

CALIBRATOR - Plug-in 100 kHz crystal oscillator with harmonics that occur at 100 kHz intervals throughout range of SPR-4
Model SCC-4 ..... $ 20.00

NOISE BLANKER - Plug-in IF type noise blanker mutes receiver for duration of each noise pulse. 18 transistors, 2 diodes,
Model 5-NB ..... $ 65.00

LOOP ANTENNA - Directional antenna nulls out undesired stations, plugs into receptacle through top of the cabinet. Works from 150 kHz to 1600 kHz only.
Model AL-4 ..... $ 22.00

ANTENNA KIT - Consists of wire, insulators, lead-in, and instructions.
Model AN-5 ..... $ 8.80

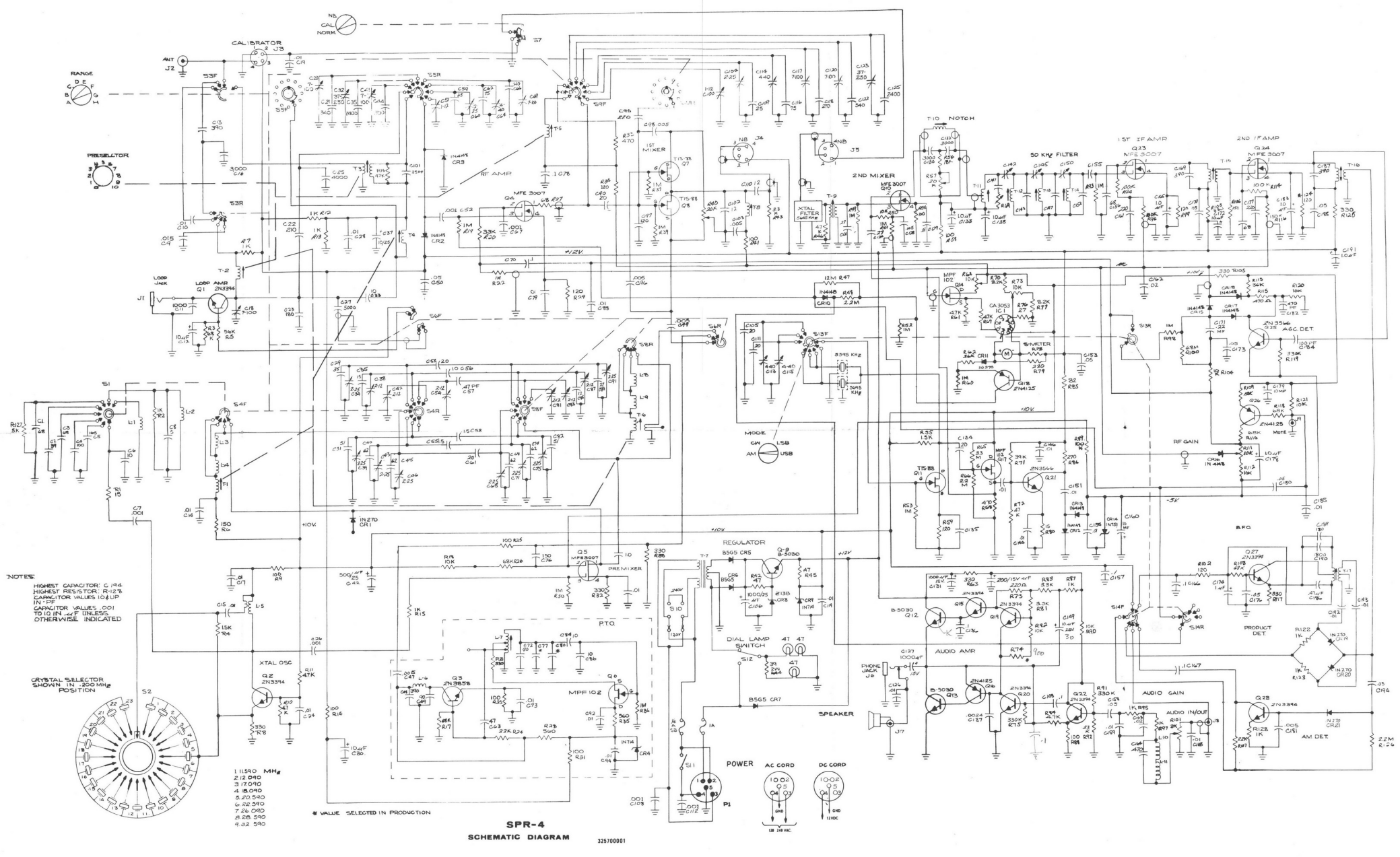
DC POWER CORD - Plugs into cigarette lighter in an automobile, allows SPR-4 to be used on 12 volts DC supply.
Model DC-PC ..... $ 5.00

TRANSCEIVE ADAPTOR - Allows SPR-4 to transceive with T-4B or T-4XB Transmitters. Consists of printed circuit board and connectors. Must be wired into SPR-4 by technician.
Model TA-4 ..... $ 15.00

BATTERY PACK - Fits on bottom of SPR-4 in place of original cabinet base. Uses ten Ni-cad "D" size cells, includes battery charger with shaped current characteristics to protect cells from over charge.
Model BP-4 ..... $ 39.00
Model BP-4 with 10 Type CH4T Ni-Cad cells ..... $ 99.00

TELETYPE ADAPTOR - Allows reception of standard teletype tones 2125/2975 Hz and 2125/2295 Hz by remote shifting BFO.
Model RY-4 ..... $ 10.00

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE


SPR-4
SCHEMATIC DIAGRAM
325700001
NOTES:
HIGHEST CAPACITOR: C194
HIGHEST RESISTOR: R125
CAPACITOR VALUES 10 & UP IN MF
CAPACITOR VALUES .001 TO 10 IN MF UNLESS OTHERWISE INDICATED
CRYSTAL SELECTOR SHOWN IN 200 MHz POSITION
1 11.590 MHz
2 12.090
3 17.090
4 18.090
5 20.590
6 22.590
7 26.090
8 28.590
9 32.590
* VALUE SELECTED IN PRODUCTION
CALIBRATOR
ANT
RANGE
PRESELECTOR
NB
CAL
NORM
RF AMP
1ST MIXER
2ND MIXER
XTAL FILTER
50 KHz FILTER
1ST IF AMP
2ND IF AMP
AGC DET
S METER
RF GAIN
MUTE
PRODUCT DET.
BFO
AUDIO AMP.
AUDIO GAIN
AUDIO IN/OUT
AM DET.
PREMIXER
REGULATOR
PTO
XTAL OSC
DIAL LAMP SWITCH
SPEAKER
PHONE JACK
POWER
AC CORD
DC CORD
MODE
LSB
USB
AM
GN
LOOP JACK
LOOP AMP
NOTCH
+12V
+10V
-5V