

CHAPTER 1

GENERAL DESCRIPTION

1-1. INTRODUCTION.

1-2. This manual contains intermediate operation instructions, maintenance instructions, and parts list for Surveillance Receiver SR-212C, Part Number 171AS566 (figure 1-1).

1-3. PURPOSE OF EQUIPMENT.

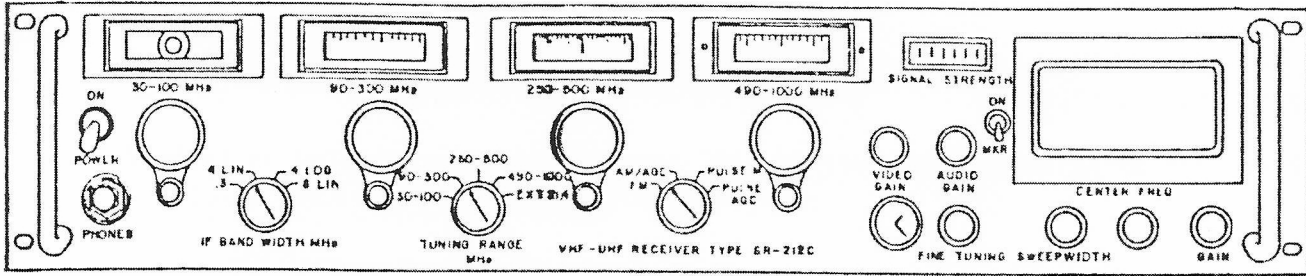
1-4. The solid-state receiver detects AM, FM, or PULSE signals over the VHF/UHF frequency spectrum of 30-1000 MHz.

1-5. DESCRIPTION.

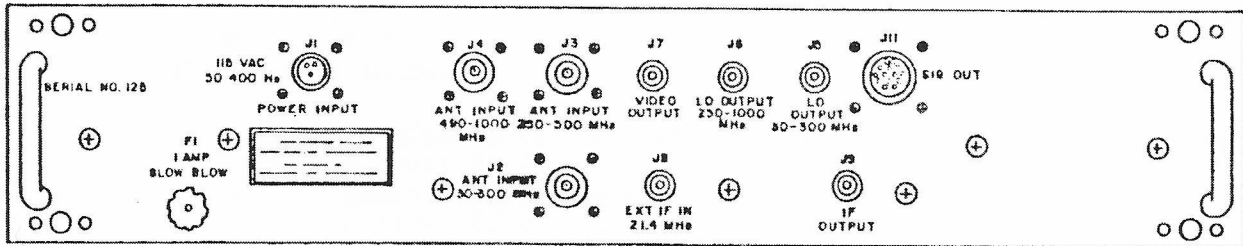
1-6. PHYSICAL. The receiver mounts in a standard 19" electrical equipment rack. Refer to table 2-1 for physical details.

1-7. FUNCTIONAL. Manual (MAN) or Automatic Gain Control (AGC) is applied to the RF and IF Amplifiers in the PULSE MAN or PULSE AGC mode, respectively, while only AGC is available in the AM or FM mode.

1-8. Within the receiver is the Signal Display Unit (SDU) which consists of a Cathode Ray Tube (CRT), associated chassis-mounted circuitry, Input Amplifier (IA-104-1), and IF Amplifier and Sweep Oscillator (IFS-101-9).



FRONT VIEW



REAR PANEL

Figure 1-1. Surveillance Receiver SR-212C

CHAPTER 2
SPECIFICATIONS

2-1. INTRODUCTION.

2-2. The Surveillance Receiver SR-212C specifications are listed in table 2-1.

Table 2-1. Surveillance Receiver Specifications

Parameter	Specification
Frequency Tuning Range	Continuously tunable, 30 to 1000 MHz in 4 bands Band A: 30-100 MHz Band B: 90-300 MHz Band C: 250-500 MHz Band D: 490-1000 MHz
Type of Reception	AM, FM, and PULSE
Noise Figure	Band A: 4.5 dB maximum Band B: 6.5 dB maximum Band C: 10 dB maximum Band D: 12 dB maximum
Intermediate Frequency	Band A and B: 21.4 MHz Band C and D: First IF: 60 MHz Second IF: 21.4 MHz
Intermediate Frequency Rejection	Band A: 53 dB below 40 MHz 60 dB above 40 MHz Band B: 90 dB minimum Band C: 90 dB minimum Band D: 90 dB minimum
Image Rejection	Band A: 60 dB minimum Band B: 50 dB minimum Band C: 65 dB minimum Band D: 80 dB minimum
Local Oscillator Radiation	All Bands: 20 uV minimum into 50-ohm load
Input Impedance	All Bands: 50 ohms nominal
IF Bandwidth	All Bands: 300 kHz, 4 MHz linear, 4 MHz logarithmic, and 8 MHz linear IF are selectable on the front panel

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Table 2-1. Surveillance Receiver Specifications (Cont)

Parameter	Specification
AM Sensitivity	<p>Band A and B 300 kHz Bandwidth: 4 uV input, modulated 50% at 1 kHz rate shall produce 10 dB S+N/N minimum</p> <p>Band C and D 300 kHz Bandwidth: 8 uV input, modulated 50% at 1 kHz rate shall produce 10 dB S+N/N minimum</p> <p>Band C and D 4 MHz Bandwidth: 30 uV input, modulated 50% at 1 kHz rate shall produce 10 dB S+N/N minimum</p> <p>Band C and D 8 MHz Bandwidth: 60 uV input, modulated 50% at 1 kHz rate shall produce 10 dB S+N/N minimum</p>
FM Sensitivity	<p>Band A and B 300 kHz Bandwidth: 4 uV input, modulated at 1 kHz rate with 100 kHz deviation shall produce 21 dB S+N/N minimum</p> <p>Band C and D 300 kHz Bandwidth: 8 uV input, modulated at 1 kHz rate with 100 kHz deviation shall produce 21 dB S+N/N minimum</p> <p>Band C and D 4 MHz Bandwidth: 30 uV input, modulated at 1 kHz rate with 1350 kHz deviation shall produce 21 dB S+N/N minimum</p> <p>Band C and D 8 MHz Bandwidth: 60 uV input, modulated at 1 kHz rate with 2700 kHz deviation shall produce 21 dB S+N/N minimum</p>
Dynamic Range (PULSE MAN mode with 100 mV of noise)	<p>300 kHz Bandwidth: 32 dB minimum</p> <p>4 MHz Bandwidth: 32 dB minimum</p> <p>8 MHz Bandwidth: 32 dB minimum</p> <p>4 MHz LOG: 40 dB minimum, 60 dB nominal</p>
AM Dynamic Range (All Bandwidths)	<p>Band A and B: Less than 7 dB variation for input range of 70 dB above 3.5 uV</p> <p>Band C and D: Less than 7 dB variation for input range of 70 dB above 5.0 uV</p>
FM Dynamic Range (All Bandwidths)	<p>Band A and B 300 kHz and 4 MHz Bandwidths: Less than 2 dB variation for inputs above 2 uV</p> <p>Band C and D 300 kHz and 4 MHz Bandwidths: Less than 2 dB variation for inputs above 4 uV</p>

Table 2-1. Surveillance Receiver Specifications (Cont)

Parameter	Specification
FM Dynamic Range (All Bandwidths) (Cont)	Band C and D 4 MHz or 8 MHz Bandwidths: Less than 2 dB variation for inputs above 13 uV
Audio Amplifier Response	Less than 3 dB variation from 250 Hz to 20 kHz.
Audio Power Output	100 mW nominal into 600-ohm load unbalanced 10 mW nominal at phone jack
Video Amplifier Response	9 MHz Bandwidth at 3 dB
Video Amplifier Output	5 volt peak-to-peak maximum output into a 93-ohm load
Signal Display Unit	CRT size, standard 1" x 3" display
Sweepwidth	From DC to 4 MHz continuously adjustable
Resolution	10 MHz
IF Frequency	First IF: 4.3 MHz Second IF: 455 kHz
Amplitude Response	<u>+2</u> dB within any sweepwidth
Sensitivity	2.5 uV at any RF input produces at least 1" deflection with SWEEPWIDTH Control to approx- imately 50 kHz
Crystal Marker	21.4 MHz center frequency marker
Linearity	5% within sweepwidth
Weight	Approximately 40 pounds
Dimensions	3-1/2" H x 19" W x 17-1/4" D
Power Input	115 <u>+10</u> VAC, 50-400 Hz, single-phase
Power Consumption	30 watts maximum
Finish	Gray enamel

CHAPTER 3

OPERATION

3-1. INTRODUCTION.

3-2. This chapter contains information on front panel controls, indicators, and connectors, rear panel fuse and connectors, and operating procedures. All operating controls are located on the front panel and all input/output connections are located on the rear panel except PHONES jack (J10).

3-3. INDICATORS, CONTROLS, AND CONNECTORS.

3-4. Front and rear panel controls, indicators, switches, meter, and connectors with functions and reference designations are listed in table 3-1. Refer to figure 1-1 for front and rear panel details.

Table 3-1. Indicators, Controls, and Connectors

Reference Designation	Indicator, Control or Connector	Function
J10	PHONES (Connector)	A phone jack for aural monitoring of the receiver's operation.
M1	SIGNAL STRENGTH (Meter)	Indicates relative signal strength of incoming signal.
R1	VIDEO GAIN (Potentiometer)	Adjusts gain of Video Amplifier VA-211 (A11).
R2	AUDIO GAIN (Potentiometer)	Adjusts gain of Audio Amplifier AA-206 (A12).
R4	RF GAIN (Potentiometer)	Adjusts gain of selected RF Tuner in PULSE MAN mode of operation.
R8	FINE TUNING (Potentiometer)	Adjusts tuning of selected RF Tuner.
R13	GAIN (Potentiometer)	Adjusts output of Input Amplifier IA-104-1 (A13). Affects the Signal Display presentation only.
R14	CENTER FREQ (Potentiometer)	Adjusts fixed DC bias in IF Amplifier and Sweep Oscillator IFS-101-9 (A14) to vary the Sweep Oscillator center frequency approximately +250 kHz from the center frequency. Affects the Signal Display presentation only.

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Table 3-1. Indicators, Controls, and Connectors (Cont)

Reference Designation	Indicator, Control or Connector	Function
R16	SWEEPWIDTH (Potentiometer)	Adjusts sweepwidth of the local oscillator in IF Amplifier and Sweep Oscillator IFS-101-9 (A14). Affects the Signal Display presentation only.
S1	POWER (Toggle Switch)	
	ON	Applies 115 \pm 10 VAC, 50-400 Hz, single-phase to circuits.
	Off	Removes all power from circuits.
S2	IF BANDWIDTH MHz (Rotary Switch)	
	.3	Selects IF Amplifier IF-214-300 (A7).
	4 LIN	Selects IF Amplifier IF-214-4000 (A8).
	4 LOG	Selects LIF Amplifier LIF-214-4000 (A9).
	8 LIN	Selects IF Amplifier IF-214-8000 (A6).
S3	TUNING RANGE MHz (Rotary Switch)	
	30-100	Selects 30-100 MHz Tuner (Band A).
	90-300	Selects 90-300 MHz Tuner (Band B).
	250-500	Selects 250-500 MHz Tuner (Band C).
	490-1000	Selects 490-1000 MHz Tuner (Band D).
	EXT 21.4	Selects an external 21.4 MHz IF IN at J8.
S4	Mode Selector (Rotary Switch)	
	FM	Selects FM mode of operation. Only AGC is applied in this mode.
	AM/AGC	Selects AM mode of operation. Only AGC is applied in this mode.

Table 3-1. Indicators, Controls, and Connectors(Cont)

Reference Designation	Indicator, Control, or Connector	Function
S4 (Cont)	PULSE MAN	Selects PULSE mode of operation. Manual gain control is applied in this mode.
	PULSE AGC	Selects PULSE mode of operation. Only AGC is applied in this mode.
S5	MKR (Marker) (Toggle Switch)	
	ON	Supplies -12 VDC to turn on the 21.4 MHz oscillator in the marker generator of input Amplifier (A13). Affects the Signal Display presentation only.
	Off	Removes -12 VDC to turn off the 21.4 MHz oscillator in the marker generator of Input Amplifier (A13). Affects the Signal Display presentation only.
V1	CRT (Display)	Displays detected signal.
-	Frequency Indicating Tape Dials and Associated Tuning Cranks	Four direct-reading frequency indicating tape dials, each recessed behind a transparent protective window. The dials are illuminated according to the position of the TUNING RANGE MHz Switch (S3). A tuning crank is located below each window for frequency tuning.
F1	FUSE	A 1 amp, slow-blow line fuse.
J1	POWER INPUT (Connector)	A 115 +10 VAC, 50-400 Hz, single-phase, three-wire circuit is supplied.
J2	ANT INPUT 30-300 MHz (Connector)	RF input to RF Tuner of Band A (A1) or Band B (A2) as routed through contacts of K3.
J3	ANT INPUT 250-500 MHz (Connector)	RF input to RF Tuner of Band C (A3).

Table 3-1. Indicators, Controls, and Connectors (Cont)

Reference Designation	Indicator, Control or Connector	Function
J4	ANT INPUT 490-1000 MHz (Connector)	RF input to RF Tuner of Band D (A4).
J5	LO OUTPUT 30-300 MHz (Connector)	Local oscillator output provided for connection to frequency monitoring equipment.
J6	LO OUTPUT 250-1000 MHz (Connector)	Local oscillator output provided for connection to frequency monitoring equipment.
J7	VIDEO OUTPUT (Connector)	Video output provided for connection to remote video monitoring equipment.
J8	EXT IF IN 21.4 MHz (Connector)	External 21.4 MHz provided to Converter-Preamplifier CV-221-1 when selected by front panel TUNING RANGE MHz Switch (S3).
J9	IF OUTPUT (Connector)	IF output provided for connection to external equipment.
J11	SIG OUT (Connector)	Outputs consist of EXT, Tuning Meter (100-0-100 μ A), AGC out, and a 600-ohm Audio output.

3-5. GENERAL OPERATING PROCEDURE.

3-6. This procedure applies to any mode of operation.

- a. Connect receiver to 115 VAC power source.
- b. Connect antenna to appropriate RF input of receiver.
- c. Place POWER Switch (S1) to ON. One of the four tape dials will illuminate. Allow selected Tuner 30 minutes to warm up. Allow a few minutes for the Cathode Ray Tube filaments to warm up.
- d. Rotate TUNING RANGE MHz Switch (S3) to select desired frequency band.
- e. Rotate MODE SELECTOR Switch (S4) to desired position.
- f. Select desired frequency with appropriate tuning crank located directly below designated frequency band.

- g. Rotate IF BANDWIDTH MHz Switch (S2) to desired position (.3 for Band A or B).
- h. Adjust AUDIO GAIN Control (R2) for desired level at J11 pins 5 and 6, and PHONES jack (J10).
- i. Adjust VIDEO GAIN Control (R1) for desired level at VIDEO OUTPUT (J7).
- j. The SIGNAL STRENGTH Meter (M1) indicates only the relative level of the carrier and is not calibrated in any special unit.

3-7. Cathode Ray Tube (V1) is part of the Signal Display Unit. It displays the characteristics of the input signal, and the following adjustments are required:

- a. Place MKR Switch (S5) in OFF position for initial operation.
- b. GAIN Control (R13) provides amplitude adjustment of signals displayed on CRT screen.
- c. SWEEPWIDTH Control (R16) determines the sweep oscillator's magnitude of excursion from its center frequency and therefore, the coverage of frequency spectrum as displayed on the CRT screen. As a general practice, set SWEEPWIDTH Control (R16) for maximum sweepwidth (maximum clockwise position) when searching for signals or studying the activities around desired signal. To analyze the modulation of the desired signal (or any adjacent signal), reduce the sweepwidth (by turning the SWEEPWIDTH Control counterclockwise) to a convenient point for observation of the signal.
- d. CENTER FREQ Control (R14) determines the center frequency of the sweep oscillator and therefore, relative position of the incoming signal with respect to the trace. For normal operation, the center of the sweep should correspond to the center of the incoming signal (which is 21.4 MHz). To center the sweep, set MKR Switch (S5) to ON position and adjust CENTER FREQ Control (R14) until the 21.4 MHz marker is at the center of the CRT screen. Reposition GAIN Control (R13) as necessary.

3-8. ANALYSIS OF MODULATION CHARACTERISTICS. An AM signal appears as a deflection of varying amplitude. Upper and lower sidebands start appearing when modulation exceeds 5-10 percent.

3-9. An FM signal appears as a train of deflections corresponding to the carrier and all adjacent pairs of sidebands. Relative amplitude of the carrier and the sidebands depends on the carrier modulation index. At certain deviation indices the carrier disappears. This visual indication of carrier null can aid in calibrating FM signal generators or FM transmitters. In addition, at certain modulation indices, selected sideband pairs will null, permitting more sophisticated FM deviation calibration.

3-10. A pulse signal appears as a single deflection similar to the built-in marker, but possibly with sharper skirts.

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3-11. OPERATING PROCEDURE FOR SPECIFIC MODES.

3-12. AM/AGC MODE.

- a. Rotate MODE SELECTOR Switch (S4) to AM/AGC position.
- b. Rotate IF BANDWIDTH MHz Switch (S2) to desired IF bandwidth.
- c. Turn appropriate RF tuning crank for desired signal.
- d. With the aid of Signal Display Unit, tune signal to center of band. When receiver is correctly tuned in, signal shall be at the center of the CRT (V1) and SIGNAL STRENGTH Meter (M1) shall register a peak indication.
- e. Adjust AUDIO GAIN (R2) and VIDEO GAIN (R1) Controls for desired output levels.

3-13. FM MODE.

- a. Rotate MODE SELECTOR Switch (S4) to FM position.
- b. Repeat steps 3-12b through 3-12e.

3-14. PULSE MODE.

- a. Rotate MODE SELECTOR Switch (S4) to PULSE MAN or PULSE AGC position.
- b. In PULSE MAN position, use RF GAIN Control (R4) to control system response.
- c. Repeat steps 3-12b through 3-12e.