Adams Russell
MICRO-TEL DIVISION

MSR-904A

.03-18 GHz DIGITALLY CONTROLLABLE MICROWAVE SURVEILLANCE RECEIVER

FEATURES

- Portable
- .03 to 18 GHz without plug-ins,
- 18 to 40 GHz with external FE-904
- YIG Preselection .5 to 40 GHz
- Low Group Delay
- High NPR
- .1 to 30 MHz IF Bandwidths standard
- Amplitude Calibrator
- Log and Linear IF - All Bandwidths
- Panoramic Signal Display
- Pulse and CW Auto-Stop
- RFI Shielded
- Expandable to 2904 Automated System

DESCRIPTION

The MSR-904A Microwave Surveillance Receiver is the most recent addition to the very successful MSR-900 Series. Significant features such as small size, reliability and the Removable-Remotable RF Tuner are retained while adding numerous operational improvements, such as digital control capability. The MSR-904A is also the basic unit in the ARS 2904 Automated Surveillance Receiving System.

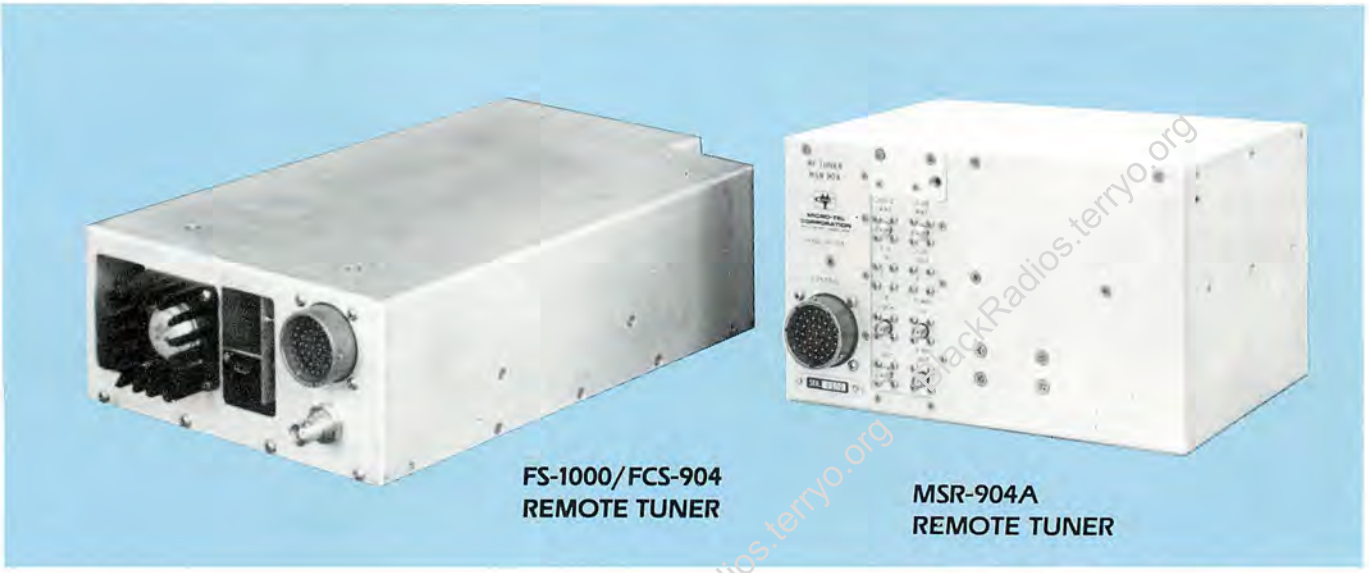
The most visible changes are the replacement of all front panel rotary and toggle switches with lighted push buttons to speed manual control by the operator and provide easy and rapid review of control settings. While benefiting the operator, these changes also reflect internal changes which accommodate its inclusion in systems under computer control.

The MSR-904A is a .5 to 18 GHz scanning superheterodyne receiver employing fundamental mixing and tracked preselection over the entire range. An available option extends the coverage to 30 MHz. The FE-904 Frequency Extender, which interfaces directly to the MSR-904A, provides 18 to 26 GHz and/or 26 to 40 GHz coverage.

Pushbutton selectable bands are .5-2 GHz (optionally .03-2 GHz), 2-4, 4-8, 8-12, and 12-18 GHz plus .5 to 18 GHz with automatic bandswitching. When the FE-904 is included, two additional bands of 18 to 26 and 26 to 40 GHz are added to the band select panel.

The basic MSR-904A employs a series of YIG tuned oscillators to provide fundamental mixing in five bands from .5 to 18 GHz including cross-band operation. Two N type rear panel input connectors cover the .5 to 2 and 2 to 18 GHz ranges.

Either the 250MHz first IF, a 160MHz IF (Option 4B) or a 70MHz (Option 4C) IF is available at the rear panel for external demodulation. Internally, the IF signal is further amplified and demodulated to provide rear panel AM and FM video outputs. The detected video is also coupled to the vertical axis of the Pan



FS-1000/FCS-904
REMOTE TUNER

MSR-904A
REMOTE TUNER

CRT display, and to a front panel 600 ohm audio connector.

Four IF bandwidths of 100 KHz, 1 Mhz, 5 MHz, and 30 MHz are standard but alternate bandwidths in the range of .1 to 50 MHz are available on special order. Log or linear IF response is switch selectable as is the AGC and Manual Gain Control in the linear mode.

The output characteristic is front panel selectable for linear or 70 dB log response. A 99 dB IF attenuator, selectable in 1 dB steps, can be used to maintain the signal within the linear range of the amplifier or alternately, to compare the level of the internal IF reference oscillator to that of an unknown signal. This procedure provides absolute power measurements to an accuracy of plus or minus 1 dB with calibration chart.

REMOTABLE RF UNITS...

Can be removed from equipment and installed at the antenna site. Pictured are remote units from .03 to 18 GHz with synthesis.

PULSE/CW AUTO-STOP

This function uses a front panel or computer-controlled threshold detector operable in all swept modes. Any signal exceeding the threshold will halt the sweep which is performed with 5 MHz IF bandwidth so that it will be near the center frequency of a pulsed signal. The receiver automatically switches to the 30 MHz IF bandwidth when the sweep stops. Dwell time is a nominal 500 milliseconds to allow auxiliary equipment to record signal parameters.

Four internal tuning modes and an external tuning mode are selectable by lighted pushbuttons:

CW: The two-speed main tuning control provides analog tuning across the selected band. Frequency is displayed to an accuracy of plus or minus 0.5% by the five digit GHz Display.

ΔFO: The receiver sweeps about the selected frequency with a dispersion of 0 to ± 5% of the band at a scan rate adjustable from .1 to 30 Hz.

F_1-F_2: Scan limits anywhere within the selected band are set with the F_1 and F_2 controls. Scan rate is adjustable from .1 to 30 Hz and a frequency marker adjustable by the main tuning control is available. In the 0.5-18 band (crossbanding) the sweep rate is automatically set for an optimum display.

BAND: The receiver scans the selected band at an adjustable 0.1 to 30 Hz rate. A tuning marker is available.

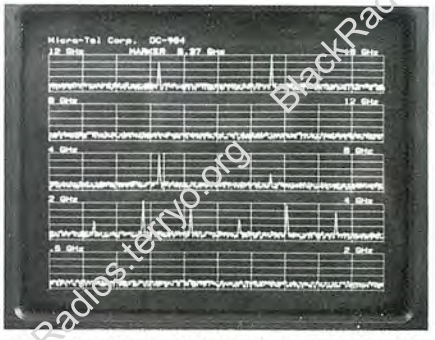
EXTERNAL: Tuning is accomplished by an external 0 to plus 10 volt analog signal. Band Select, IF Bandwidth, and IF Attenuation are selected by digital commands.

PERIPHERAL EQUIPMENT

ARS 2904 COMPUTER-CONTROLLED SURVEILLANCE RECEIVING SYSTEM

Logic control lines are brought to the rear panel of the MSR-904 for the functions listed in the specification. The I0-1000 Interface Unit is available as an external accessory to convert the receiver to IEEE-488 bus operation. In addition the I0-1000 contains an A-D converter to convert the video output to a digital format. Alternatively, the I0-1000 may be incorporated within the Micro-Tel MPC-1100 Computer/Controller which is part of the automated 2904 System.

The Pulse-CW Auto-Stop feature threshold setting is manually adjustable or set remotely by the computer.



MULTI-BAND CRT DISPLAY MD-904

MULTI-BAND CRT DISPLAY MD-904

A storage oscilloscope may be connected to show all bands simultaneously in a vertical, sequential band-by-band display. For this purpose, the MSR incorporates a video output with voltage offset for each band.

DIGITALLY REFRESHED CRT DC-904

The DC-904 is a digitally refreshed display with alphanumerics and several modes of operations including multi-band scan display, single scan display and an internally generated 160 MHz SDU display. (Requires Option 4B if the DC-904 Option 1 is selected.)

18 TO 40 GHz COVERAGE FE-904

Frequency coverage from 18-40 GHz

SPECIFICATIONS (Continued)

Digital Control Capability with I/O-1000 -904 IEEE-488 Bus Adaptor	Frequency, Band Select, Mode, IF Bandwidth, IF Mode (Log/Lin), IF Attenuation, IF Reference, Auto-Stop Threshold, Auto-Stop Dwell, Start F_1-F_2 Sweep.
Temperature (°C)	0 to 50
Cooling	Forced Air
Size (Inches)	5¼ x 17 x 19
Weight (Pounds)	40
Power Requirements	115/230 VAC ±10%, 50-400 Hz., 120VA

ORDERING INFORMATION (Please see latest price list.)

MSR-904A
Microwave Surveillance Receiver
.5-18 GHz Includes Digital Control, Automatic Bandswitching, Pan CRT, 21.4 MHz (Previously Option 4A), and AUTO-STOP (Previously Option 7).

Option 2	LO sample for Synthesizers or Counters
Option 3	Low Frequency Coverage—.03 to 500 MHz
Option 4B	160 MHz IF Output phase lockable with synthesizer
Option 4C	70 MHz IF Output—phase lockable with synthesizer
Option 5	Special IF Bandwidths—Contact Factory
Option 6	IF Reference—Measure RF Amplitude to 1 dB with calibration chart
Option 8	Provision for 18-40 GHz

FCS-904
Frequency/Counter Synthesizer
.03-40 GHz
(MSR-904A must have Option 2-LO Sample)

Option 1	100 Hz Resolution—(Required for 18-40 GHz)
Option 4	Remote Tuner Operation

MPC-1100
Computer Controller

IO-1000-904
IEEE-488
Bus Interface Unit
Option 1 — Real Time Battery Backed-Up Clock

AP-904
Antenna Pre-Amplifier
.03-18 GHz
(Requires Opt 8 For MSR-904A)
Requires Option 8 — Provisions for 18-40 GHz. This option provides band information to the AP-904

DC-904
Digitally Refreshed Display
MSR-904A must have Option 4B-160 MHz IF

NOTES

SPECIFICATIONS (Continued)

External	External tuning voltage input from accessory synthesizer or other device, 0-10 Volts tunes the selected bands.
Preselection	Tracked YIG filter in all tuning modes above .5 GHz; low-pass filter below .5 GHz.
Tuning Indicator	9 segment bar display.
3RD Order Intercept	+5 dBm
AFC	10:1 correction
Signal Level Indicator	10 segment bar display.
Antenna Conducted LO	-70 dBm maximum. -60 dBm above 12GHz.
Radiated and Conducted Noise	Fully RFI-shielded.
Image Rejection	70 dB minimum. 60 dB above 12 GHz.
IF Rejection	80 dB minimum.
LO Sample	-10 dBm nominal.
RF Inputs	(2) Type N; 50 ohms nominal. (.03-2 GHz and 2-18 GHz)
IF Gain Control	60 dB range, Automatic or Manual
IF Bandwidths	.1, 1, 5, 30 MHz; other bandwidths optionally available.
Log-All bandwidths	70 dB, Linear within 2 dB over 70 dB range.
IF Outputs:	
Remote Tuner Output	250 MHz with a 40 MHz Bandwidth (Pre-selector limited) minimum, +5dBm maximum output
RF/IF GAIN	0 dB
21.4 MHz	Leveled Output, -20 dBm ±3
Dynamic Range	50 dB Range
160 MHz (Option 4B)	Internal 250/160 MHz converter may be phase locked
Bandwidth	20 MHz - (wider BW's available upon request)
RF/IF GAIN	9 dB nominal
Demodulator Outputs:	
AM	DC coupled, low impedance with post detection bandwidths of one-half the selected IF bandwidth. 2 Volt peak at 50 ohms.
FM	DC coupled, low impedance with post detection bandwidths of one-half the selected IF bandwidth. 2 Volt peak at 50 ohms. Output level 2 Volts peak-to-peak at 50 ohms with deviation equal to IF bandwidth.
Audio	5.0 mw, 600 ohms phone jack, variable with audio gain control.
SCAN Rate	Variable 0.1 to 30 Hz in octave bands. 250 msec to sweep .03 to 18 GHz.
External-Oscilloscope Outputs	Sweep: 3 Volts P-P DC coupled 1000 ohms. Blanking: +10 Volts pulse at 5000 ohms.
IF Attenuator	99 dB in 1 dB steps.
IF Reference	RF Level measurement to ± 1 dB accuracy with calibration chart.
Digital Control	Parallel data, TTL compatible.

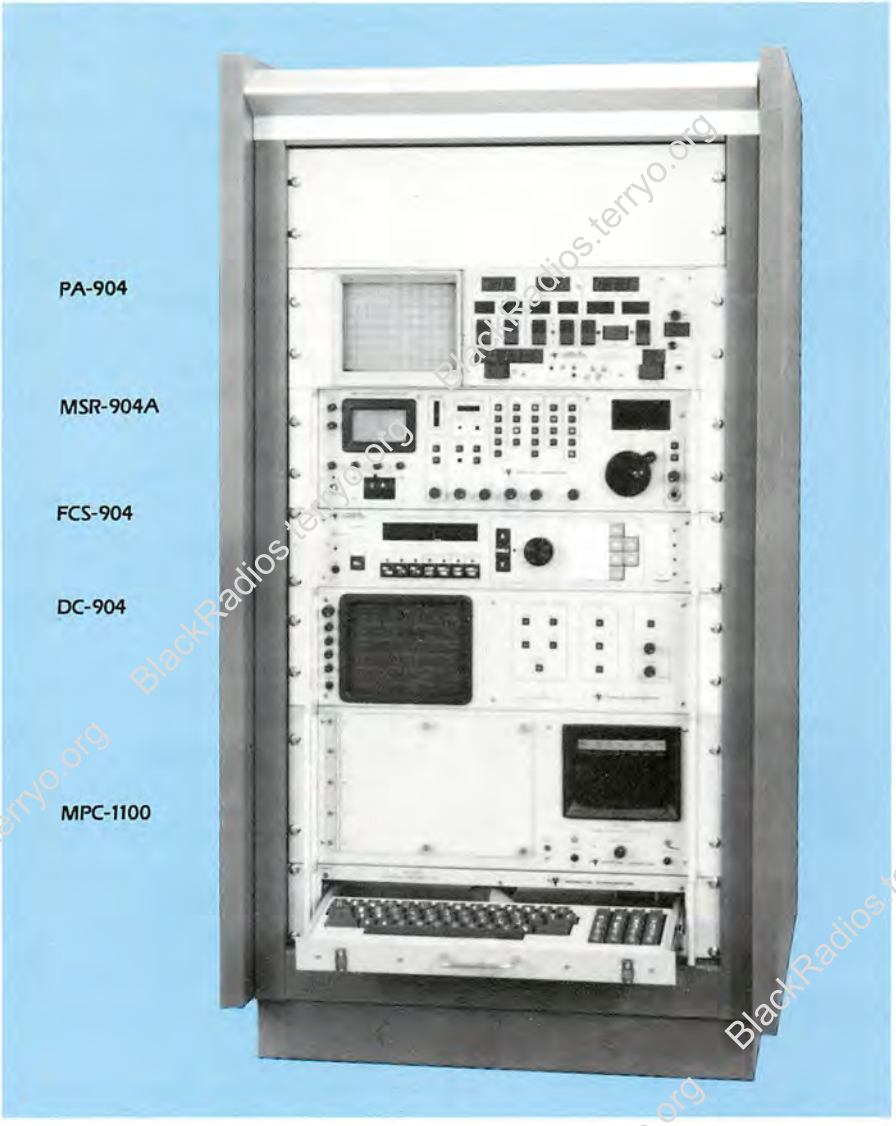
is provided by the FE-904 Frequency Extender which provides fundamental mixing, preselection, and operation with the FS-1000 Frequency Synthesizer.

The MSR-904A controls the FE-904 which can be remoted up to 200 feet. Operation in conjunction with the Removable-Remotable RF Unit (.03-18 GHz) of the MSR-904 is very convenient.(Requires Option 8)

FREQUENCY COUNTER SYNTHESIZER FCS-904

The FCS-904 Frequency Counter Synthesizer serves a dual function. It provides precise frequency control of the MSR-904 Receiver in selectable increments as small as 100 Hz over the frequency range from .03-18 GHz and 10 KHz increments from 18-40 GHz. Secondly, it operates as a frequency counter to identify incoming signal frequencies to crystal reference accuracies. (Requires Option 2)

In a typical application, with the FCS-904 operating as a part of the ARS-2904 Automatic Receiving System, the FCS-904 sweeps the MSR-904A in a linear fashion until a threshold level is penetrated by an incoming signal. When the FCS-904 receives a "threshold penetrated" signal, the FCS-904 interval microprocessor initiates a sequence to identify the frequency of the incoming signal and makes the frequency available at both the front panel display and at the GPIB interface.



ARS-2904
AUTOMATIC RECEIVING SYSTEM

SPECIFICATIONS

	[2]					[3]	[4]	[4]
Frequency (GHz)	.03-2	2-4	4-8	8-12	12-18	.03-18	18-26	26-40
Noise Figure (dB)[1]	20	20	20	20	20	20	22	22

[1] Typical over 90% of band, add 3 dB for maximum noise figure
[2] Option 3 adds 30 to 500 MHz
[3] 0.5 to 18 GHz with automatic band-switching is standard
[4] Requires FE-904 Frequency Extender

Frequency Indication	1 MHz resolution direct reading LED display. Accuracy ± 1%.
Tuning Method	Electronic.
Tuning Modes: CW	Dual-speed control of receiver frequency.
ΔFo	Variable, 0 to ± 5% of band centered about frequency set by main tuning control.
F_1-F_2	Scan limits set by the F_1 and F_2 controls. Variable marker.
Band	Scan of push-button selected band with frequency marker.

ORDERING INFORMATION (Continued)

ARS-2904 **Automatic Receiving System** .03-40 GHz		Contact the Factory for Software DATA

FS-1000 **Frequency Synthesizer** .03-40 GHz (MSR-904A must have Option 2-LO Sample)	Option 1	100 Hz Resolution—(Required for 18-40 GHz)
	Option 2	Parallel BCD Frequency Control
	Option 3	Optical Encoder Tuning
	Option 4	Remote Tuner Operation

FE-904K/Ka **Frequency Extender** 18-40 GHz	Option 1	Pre-Selection
	Option 2	LO SAMPLE (Required for FCS-904/FS-1000 Operation)
	Option 3	Waveguide Input 18-26.5 GHz

DC-904 **Digitally Refreshed CRT**	Option 1	160 MHz SDU Display (Requires MSR-904A Option 4B - 160 MHz IF)

MD-904
Multi-Band Variable Persistence Display

WARRANTY

All Micro-Tel products are unconditionally warranted for a period of one year except for physical damage, provided the equipment is returned to the plant in Hunt Valley.

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