

AM Antenna Phasing Equipment

- Individually designed systems
- Adjustable under power
- Cabined or open-panel construction
- Rotary-adjustable inductors



RCA antenna phasing and branching systems are built to the specific requirements of each antenna situation. RCA built its first antenna phasor before World War II and literally hundreds of systems carry the RCA monogram. Most systems use the "Jeep-Coil" design although "Ohm's-Law" phasors are available as well.

Where appropriate, RCA equipment uses front-panel-controlled rotary inductors to provide independent control of the current to each antenna tower. This affords increased system flexibility. The systems use "lagging-T" networks to phase the currents. The two series legs of each phasing network may be ganged rotary inductors with a single front-panel control. Networks provide wide-range, independent phase adjustment for each tower current with precise impedance match. The system uses series-resonant circuits for economy and stability. All controls can be motorized for remote control.

Tower Impedance Matching

Line-terminating units perform the impedance match between the transmission line and the antenna tower.

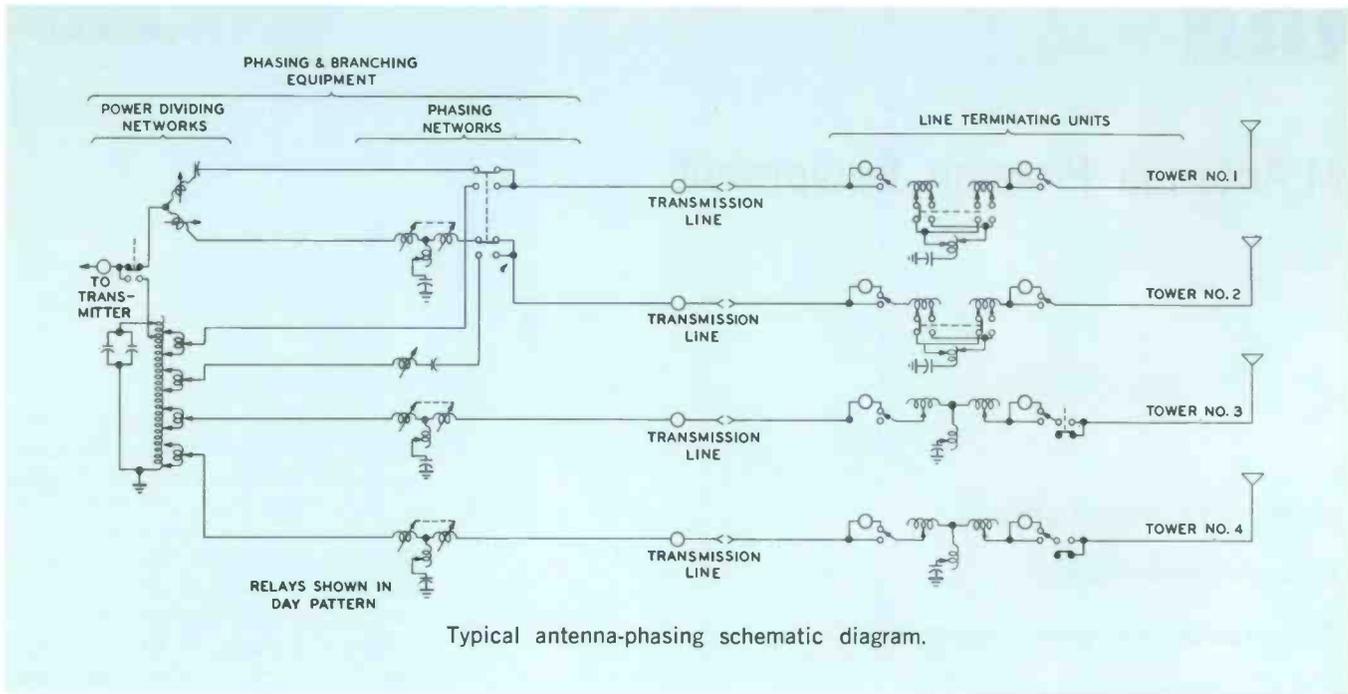
Reliable Switching Facilities

Indispensable for the changeover from daytime to nighttime patterns, the switching system use positive-latch relays wherever appropriate in the power-divider networks, the arms of the line terminator units and in the phasor networks. These relays have pilot-contacts which can be wired to lighted status indicators.

Cabined or Wall-Mounted Units

Phasing equipment is available mounted in cabinets that match current RCA AM transmitters or on open panels which are intended for wall mounting. Wall mount provides extra accessibility to the phasor and the line terminators.

When the system is cabined, the number of cabinets is proportional to the number of towers and system complexity. Most systems, however, fit into a cabinet 44 inches wide, 34 inches deep and 77 inches high (1118 x 865 x 1956 mm).



How to Order

RCA quotes price and delivery for phasing systems on an individual basis. The answers to the questions below provide the information needed for the preparation of a quote:

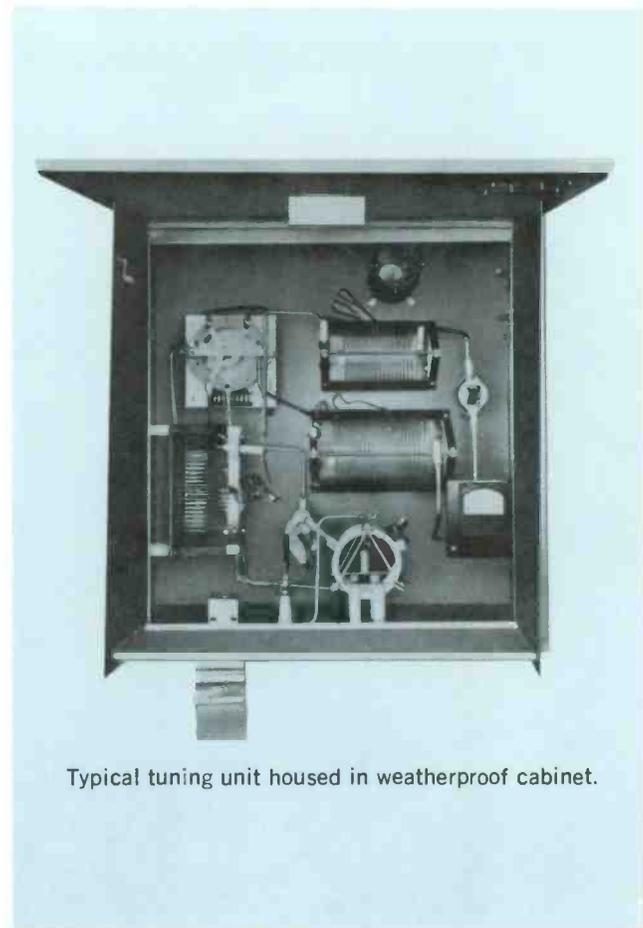
1. Assigned frequency _____ kHz
2. Operating power: Day _____ kW; Night _____ kW
3. No. of elements in array _____
4. Element description _____
5. Element spacing _____ feet
6. Element self-impedance _____ ohms
7. Current required in each element:

#1 _____ A	#2 _____ A	#3 _____ A
#4 _____ A	#5 _____ A	#6 _____ A
8. Phase Angle required in each element:

#1 _____ °	#2 _____ °	#3 _____ °
#4 _____ °	#5 _____ °	#6 _____ °
9. Length of transmission line to each element:

#1 _____ ft.	#2 _____ ft.	#3 _____ ft.
#4 _____ ft.	#5 _____ ft.	#6 _____ ft.
10. Characteristic impedance of transmission line (s) _____ ohms
11. Pattern-switching requirements (non-directional day-time; different patterns, night and day; etc.)

12. Cabineted unit desired? Yes No
13. Antenna-current-sampling system preferred: _____
14. Motorized controls desired? Yes No





AM Antenna Phase Monitors, Types AM-19 (204), PM-19

- Two to twelve towers, entirely self-contained
- Analog or digital readout
- Ratio resolution: 0.1 percent
- Pushbutton tower selection
- All solid state electronics

An integrated system to fulfill the antenna monitoring requirements of any AM array of two to twelve towers, the Type AM-19 (204) makes no compromise in monitoring. The monitor is available with analog or digital readout, with or without remote readout. (The "204" in parentheses in the type number indicates the FCC approval number.)

For situations where extra precision and measurement repeatability is important, the PM-19 System is offered. This system uses the AM-19 (204) with an adapter that increases precision significantly.



Analog Readout Phase Monitor, Type AM-19 (204)

- Absolute accuracy: ± 1 degree
- Loop current accuracy: ± 2 percent
- Long-life, mercury-wetted relay contacts
- Pushbutton tower selection
- Entirely maintenance-free

The AM-19 (204) provides an absolute phase measurement accuracy of plus-or-minus one degree with a one-half degree resolution. Loop current indications are accurate to within 1.5 percent with a resolution of one-half percent. The meters are individually calibrated to assure a tracking accuracy of one-half percent and minimize error introduced by variations in meter

characteristics within production tolerances. Modulation on the carrier has no effect on phase measurement.

Easy Operation

Pushbutton switches permit tower sample selection in any order, without need for a special sequence. The phase-angle meter is calibrated in degrees to eliminate

interpretation and the loop-current meter calibration displays percentage of reference tower current. No calibration is required to obtain valid phase-angle and loop-current readings. A front-panel switch makes selection of day/night reference levels a matter of button pushing.

Mercury-Wetted Relays

Long-term relay dependability is the result of mercury-wetted contacts. This reduces contact wear almost to the vanishing point. Combined with all silicon transistorized electronics, this fact gives the AM-19 (204) optimum reliability and high-temperature stability. The meter movements are "taut-band" devices immune to pointer binding as the meter ages.

DA-1, DA-2 or DA-3 Patterns

The AM-19 (204) monitors the three directional patterns in arrays of two to twelve towers. The unit occupies only seven inches (178 mm) of rack space. A remote indicator unit, Type RMP-19 and a remote switching panel, Type RSA-19 are available (see *Accessories*) for control and indication at a point away from the monitor unit itself.

The AM-19 (204) provides outputs for automatic logging equipment.



Specifications

Operating Frequency Range	150 to 2000 kHz
Phase Angle Range (Lead or Lag)	0 to 180 degrees
Phase Angle Accuracy	± 1 degree
Phase Resolution	0.5 degree
Current-Ratio Range (of reference)	0 to 110 percent ¹
Current Ratio Accuracy	± 1.5 percent
Current Ratio Resolution	0.5 percent
Available Patterns	DA-1 (DA-N), DA-2, DA-3
Number of Towers	12 max.
RF Input Impedance	50 or 72 ohms ²
RF Input Level	0.5 to 20 Vrms
Input Connector(s)	Type UHF 50-239
Input Level from Ref. Tower (For 100% loop current reference)	2Vrms min.
Analog Outputs (Local and Remote):	
Phase (0-180 degrees) (Adjustable)	0 to 5Vdc
Loop Current (0-100 percent) (Adjustable)	0 to 5Vdc
Audio (50-15000 Hz, ± 1 dB; 1% THD ⁴ ; 600 ohms)	7Vrms
Remote Metering Circuit Resistance	11 kohms max.
Remote Control Relays	24 Vdc or contact closure
Power Requirements	105-130V, 50/60 Hz, 50W
Environmental Requirements	0 to 50°C (32-120°F), 0-95% RH

Dimensions	7" H; 19" W; 12 $\frac{3}{4}$ " D (178, 483, 324 mm)
Finish	Paint (Color: Fed. Std. 595-26555 ³)

¹ Higher ranges available on special order.

² Other impedances available on special order.

³ Other colors available optionally, at extra cost.

⁴ Total harmonic distortion.

Accessories

Remote Metering Panel	Type RMP-19
Remote Switching Panel	Type RSA-19
Sampling Line Connector	PL-259

Ordering Information

Antenna Phase Monitor, Analog ReadoutType AM-19 (204)

Please specify station call; number of towers in array; sampling line type (Helix, RG-8 etc.) and impedance; pattern type (DA-1, DA-2 etc.); reference tower number for each pattern and type of remote control system used, if any. For DA-3 pattern, please provide a tower configuration diagram and reference tower number for each pattern. For DA-N patterns, please provide the tower number used in the omni pattern.

Digital Readout Phase Monitor, Type AM-19D

- Digital readout
- Phase resolution: 0.1 degree
- Ratio resolution: 0.1 percent
- Ready for remote control
- Two to six towers, entirely self-contained

The Type AM-19D is, essentially, an AM-19 (204) with digital readouts instead of analog. The digital unit operates within a narrower frequency band, provides a wider range of current-ratio readout at increased accuracy and resolution, handles arrays with two to six towers, delivers less audio output and requires a narrower

range of environmental conditions than the AM-19 (204). The great advantage is the digital readout which eliminates the interpretation (and interpolation) analog readout requires. Both readouts are four-place "LED" (light-emitting diode) numeric displays with indication of over-range condition.



Specifications

Display	Four place, numeric, LED ¹
Display Accuracy	0.05% of full scale readout
Frequency Range	540 to 1600 kHz
Phase Angle Range (Lead or Lag)	0 to 180 degrees
Phase Angle Accuracy	±1 degree
Phase Resolution	0.1 degree
Current Ratio Range (of reference)	5 to 190 percent
Current Ratio Accuracy	1 percent ²
Current Ratio Resolution	0.1 percent
Available Patterns	DA-1 (DA-N), DA-2, DA-3
Number of Towers	6 max.
RF Input Impedance	50 to 72 ohms ³
RF Input Level	0.5 to 2Vrms
Input Connector(s)	Type UHF 50-239
Input Level from Ref. Tower (For 100% loop current reference)	2Vrms
Analog Outputs (Local and Remote):	
Phase (0-180 degrees) (Adjustable)	0 to 5Vdc
Loop Current (0-100 percent) (Adjustable)	0 to 5Vdc
Audio (50-15000 Hz, ±1 dB, 1% THD, 600 ohms)	0.4Vrms
Remote Control Relays	24Vdc or contact closure
Power Requirements	105 to 125V, 50/60 Hz, 65VA

Environmental Requirements	10 to 50°C (50 to 104°F), 0 to 95% RH
Dimensions	7" H; 19" W; 12¾" D (178, 483, 324 mm)
Finish	Paint (Color: Fed. Std. 595-26555 ⁴)

¹Readout includes indicator for overrange condition.

²Plus carrier shift with modulation.

³Other impedances available on special order.

⁴Other colors available optionally, extra cost.

Accessories

Remote Readout Panel, Analog	Type RMP-19
Remote Readout Panel, Digital	Type RMP-19D
Remote Switching Panel	Type RSA-19
Sampling Line Connector	PL-259

Ordering Information

Antenna Phase Monitor, Digital ReadoutType AM-19D
Please specify station call; number of towers in array; sampling line type (Helix, RG-8 etc.) and impedance; pattern type (DA-1, DA-2 etc.); reference tower number for each pattern and type of remote control system used, if any. For DA-3 pattern, please provide a tower configuration diagram and reference tower number for each pattern. For DA-N patterns, please provide the tower number used in the omni pattern.

Precision Antenna Monitoring System, Type PM-19 (204)

- Increased precision and stability
- Analog and digital readout
- Calibration facilities included
- Adaptable to any array



The PM-19 system uses the AM-19 (204) Antenna Monitor as a base and adds to it a PMA-19 Precision Monitor Adapter. The combination of the two units increases resolution and repeatability to one-tenth degree for phase angle and one-tenth percent for current deviation measurements. The system reads out loop current ratios directly. The system provides both analog and digital readout of all three parameters.

Specifications

All specifications identical to those of AM-19 (204) except:

Phase Resolution0.1 degree

Current Ratio Range0 to 190 percent

Current Deviation Range ± 25 percent

Current Deviation Resolution0.1 percent

Digital Output¹ Four column (1-2-4-8) BCD code
(Logic 0 = 0.4V max., 5 mA; Logic 1 = 2.3V min. Also 625 kHz serial code.)

Power Requirements105-130V, 50-60 Hz, 80W

Environmental Requirements10 to 45°C (50 to 112°F),
0-95% RH

Dimensions14" H; 19" W; 16" D (356, 483, 407 mm)²

¹ Digital Display Adapter, Type DDA-19 optional at extra cost see "Accessories",
² Allow 3 1/2 inches (89 mm) behind for cables.

Accessories

Digital Display AdapterType DDA-19

Remote Metering PanelType RMP-19

Remote Switching PanelType RSA-19

Ordering Information

Precision Antenna Monitoring SystemType PM-19

Please specify station call; number of towers in array; sampling line type (Helix, RG-8 etc.) and impedance; pattern type (DA-1, DA-2 etc.); reference tower number for each pattern and type of remote control system used, if any. For DA-3 pattern, please provide a tower configuration diagram and reference tower number for each pattern. For DA-N patterns, please provide the tower number used in the omni pattern.



catalog RA.6511A

(Replaces B.6316)

Transistorized Field-Intensity Meter, Potomac Instruments Types FIM-21 and FIM-41

- Stable over wide temperature range
- Long battery life—standard D-cells
- High adjacent-channel rejection
- Ganged oscillator/receiver tuning
- Illuminated meter and dial
- Front-panel speaker



Precision instruments for measuring electromagnetic fields in the 535 to 1605 kHz and 540 kHz to 4.8 MHz frequency spectrums, the Types FIM-21 and -41 indicate intensities between $10 \mu\text{V/m}$ and 10V/m on a direct-reading, front-panel meter. They use ordinary size-D flashlight batteries which are replaced easily without instrument disassembly. The FIM-21 operates only in the 535 to 1605 kHz spectrum while the FIM-41 handles the frequencies between 540 kHz and 4.8 MHz (in two bands) so as to measure the field strengths of the fundamental and harmonics of transmitters operating in the broadcast (medium wave) band. Each unit weighs less than 12 lbs. (5.4 kg) with batteries installed.

The FIM-21 is a precision field-intensity meter for the frequency spectrum between 535 and 1605 kHz. It measures field intensities at all levels between 10 $\mu\text{V}/\text{m}$ and 10 V/m and displays the level on a direct-reading meter on the front panel. The instrument is housed in a rugged, drawn-aluminum case with a brown-suede finish. It operates from a self-contained battery of six size-D zinc-carbon or alkaline dry cells. The entire assembly weighs less than 12 lbs. (5.4 kg).

Special Features

The FIM-21 uses a printed-circuit loop antenna enclosed in the instrument cover. As the cover reaches the vertical position, a pair of rhodium-plated contacts connect the loop to the receiver input. An interlock switch prohibits operation while the cover is closed to prevent inadvertent exhaustion of the battery. The receiver's excellent selectivity is the result of a ceramic filter which maintains IF pass-band characteristics over a wide range of ambient temperature. The instrument even regulates battery voltage to offset

the drop in terminal voltage as the battery approaches end-life.

Simplified Calibration

The instrument includes a tuned oscillator for gain calibration. Coarse tuning of this oscillator is achieved with a mechanical coupling to the receiver tuner. The receiver-oscillator frequency resolves easily on an expanded-scale, lighted dial. A vernier adjustment trims oscillator frequency to the precise frequency. This arrangement avoids the cumbersome back-and-forth switching of earlier units to calibrate the receiver.

Tap-less Meter

The FIM-21 uses a "taut-band" meter which eliminates the familiar sticky-pointer problem and the tapping to nudge the pointer to the final indication. A front-panel loudspeaker is included for signal identification. The tuning dial and meter are lighted for extra convenience after dark.

Doubles As Tuned Voltmeter

The FIM-21 includes a shielded RF-

input in addition to the built-in loop. This input allows use of the instrument as a tuned RF voltmeter in RF-bridge circuits and other situations. The instrument offers two modes of operation: "Linear" and "Logarithmic". In the "Log" mode, the instrument accommodates a dynamic range in excess of a decade; in "Lin" mode, the meter provides a linear indication of the energy appearing at the input.

The FIM-41 is an expanded version of the FIM-21 described. This more-useful unit covers the frequency spectrum between 540 and 4,800 kHz in two bands and includes a special, high-Q, double-filtered input circuit. The additional frequency coverage is most useful in the measurement of AM-transmitter harmonics. The double-filtered input circuit rejects the fundamental frequency to minimize the generation of spurious signals in the instrument circuitry.

The FIM-41 is, in all other ways, an FIM-21.

Specifications, Type FIM-21

Frequency Range	535 to 1605 kHz
Field Intensity Range	10 $\mu\text{V}/\text{m}$ to 10 V/m
Calibration Accuracy*	1%
Attenuator Range Accuracy	2%
Selectivity:	
Bandwidth (6 db points)	7 kHz min.
IF Rejection	75 dB min.
Image Rejection	80 dB min.
Adjacent Channel Rejection (± 10 kHz)	50 dB min.
Meter Linearity	2%
Antenna	Shielded Loop (in cover)
Audio Outputs	Headphone jack; hi or lo z
Recorder Output	0.4 to 4 Vdc across 2 k ohms
Illumination	Dial and Meter, front-panel switch
Power Supply	Six size-D zinc-carbon or alkaline dry cells
Expected Battery Life	500 to 1000 measurements
Ambient Operating Temperature	-10 to 130° F (-23 to 54° C)
Dimensions	8.75" H; 11.5" W; 5.13"D (3.88" cover open) (222, 292, 130, 98 mm)
Weight (Approx.)	11.5 lbs. (5.2 kg)

*Referenced to NBS Standard Field. Calibrated at 220 mV/m.

Specifications, Type FIM-41

Identical to Type FIM-21 with these exceptions:

Frequency Range	540 to 1610 kHz; 1.58 to 4.8 MHz
Image Rejection (min.)	80 dB @ 540 kHz; 50 dB @ 4.8 MHz
Harmonic Measurement Capability (Below fundamental)	80 dB min.

Accessories

Carrying (or Shipping) case
Unipod

Ordering Information

Broadcast Band Field Intensity Meter	Type FIM-21
Two-Band Field Intensity Meter	Type FIM-41