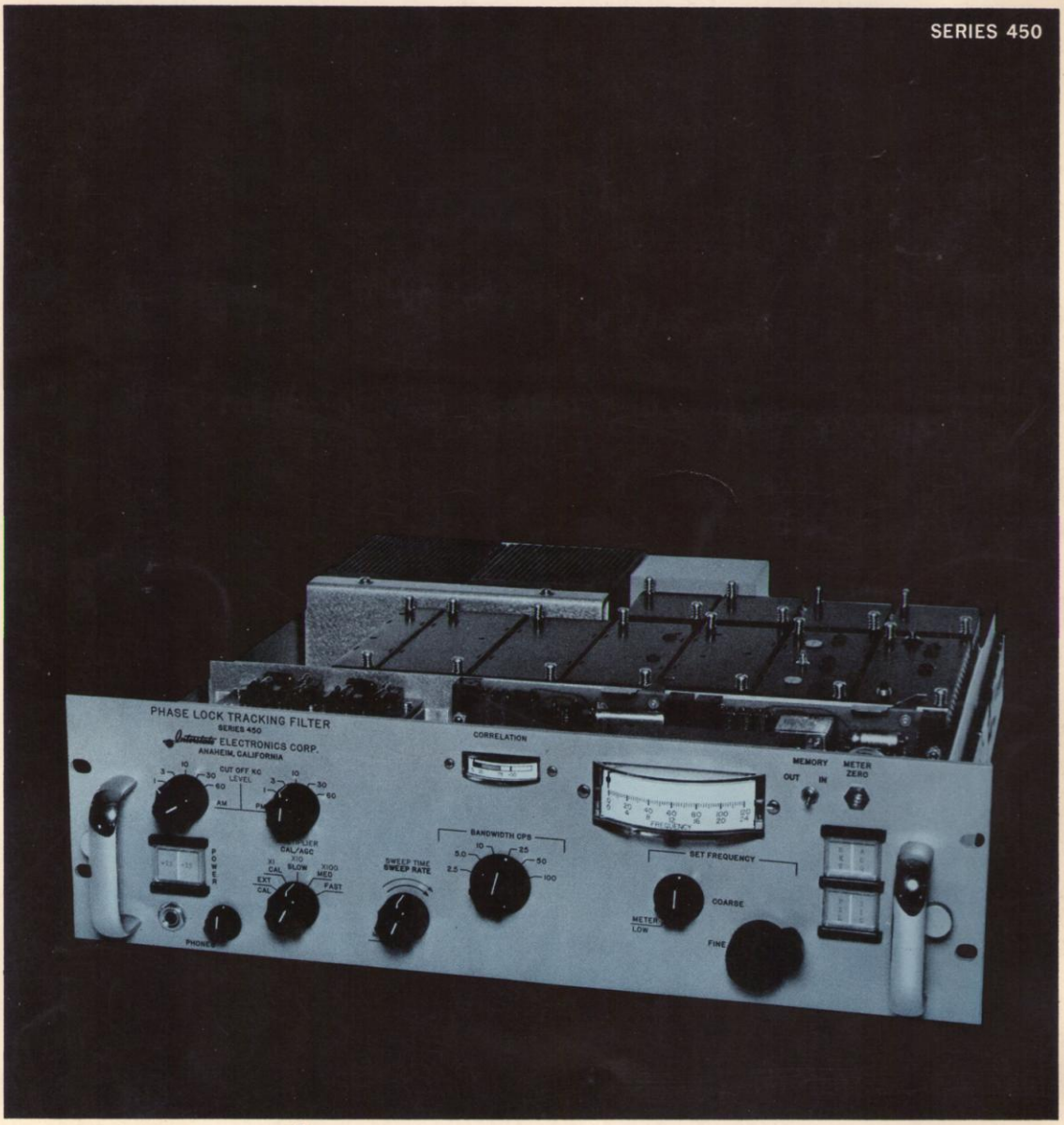
AUTOMATIC SIGNAL TRACKING FILTER

SERIES 450



ANOTHER Interstate SOLID – state INSTRUMENT

AUTOMATIC SIGNAL TRACK

PHASE-LOCK

±10 VDC FREQUENCY ANALOG

2½-100 CPS BANDWIDTH

100-120,000 ~ SPECTRUM

-38 db S/N

AM & PM demodulation

MULTIPLIER OUTPUTS X10 & X100

3RD ORDER FILTER

The Interstate Series 450 Signal-Tracking Filters are basically bandpass filters whose center frequencies are electronically servoed to the frequency of the input signal. Bandpass is adjustable from 2.5 cps to 100 cps.

Output of this reliable solid-state instrument is an artificially-generated replica of the input signal, delivered at constant 1-volt signal strength. Several optional outputs are available and may be included originally or added later as a factory modification. One optional output is a d.c. analog of the input signal frequency; another is the tenth or hundredth multiple of the input frequency phase locked to the input.

The Filter automatically tracks any periodic signal as it moves across the frequency spectrum from 100 cps to 120 kc. It is particularly useful where noise exists over this frequency range and the signal level is less than the average noise level. The instrument literally picks a signal "out of the mud" and follows it through the noise spectrum. If the signal is momentarily lost, the Interstate Filter searches about the last known frequency point to reacquire the signal.

The Series 450 Filter will capture an elusive signal at −38db below noise level when the bandwidth is set to 2.5 cps. At its broadest bandwidth of 100 cps, the filter will track a desired signal at −22db S/N ratio.

A versatile data processing instrument that can be used for correlated AM or PM demodulation, the Tracking Filter is useful in doppler frequency tracking. *It is* applicable to low level and high level data recovery problems, as well as in vibration analysis, data rate multipliers, land line data receivers and a number of instrumentation system installations.

HOW IT WORKS

A number of modes of operation are possible with the Series 450 Filters. Signal acquisition can be manual or either of two automatic modes. In the pilot mode, the Filter is phase locked to an external pilot frequency; then when the signal reaches that frequency, the Filter acquires it, phase locks itself to the true signal, and tracks it through the spectrum. Bandwidth and AGC time constants can be set on the front panel, as well as sweep time and rate for the "search and re-acquire" feature. Coarse and fine frequency controls maximize the ease of manual signal acquisition. A special low-range meter scale provides excellent resolution of frequencies below 24kc.

Phase-locked signal output is created within the instrument by mixing the output of an internal voltage-controlled oscillator and the reference frequency. The output signal is available unfiltered or filtered by a built-in low pass network. Loop phase detectors can be driven by the self-contained 250 kc crystal oscillator or by an external source (this feature is especially significant in precision applications at multiple filter installations).

The block diagram shows how the basic system operates.

SPECIFICATIONS

STANDARD ON ALL MODELS

Input Frequency Range	100 cps to 120 kc
Tracking Bandwidth	2.5, 5, 10, 25, 50 or 100 cps (selectable)
Input Signal Level	Approx. 1.0 v rms (Signal plus Noise)
Input Impedance	10,000 Ω approx.
Output Signal Level	1 volt rms min.
Output Impedance	500 Ω
Power Requirement	105-125 or 210-250 V AC 50-400 ~ 75 watts or less (depending on options)
Dimensions	19-inch rack mounted 17¼ inches deep excluding connectors and handles 5¼" High
Controls (standard)	Sweep (time and rate) Set Frequency (coarse and fine) Bandwidth Set/Acquire Memory Out/In Calibrate/AGC
Input Connectors	BNC Coaxial

Misc. Inputs	External Calibrate Freq. (0.1 v rms; 10k Ω) External Reference Freq. (0.1 v rms; 1000 Ω)
Internal Calibration Oscillator Freq.	20 kc (crystal osc)
Other Outputs (BNC Coax)	
Main Phase Detector Monitor	0.5 v; 0.5 M Ω
Correlation Amplifier	−4 v @ 100%; 5k Ω
AGC Voltage	−8 v max.; less than 1 ohm Output impedance with min. 10k load
Reference Oscillator	250 kc; 0.1 rms; 500 Ω
VCO Frequency	1 v rms; 500 Ω
Phones	2 v rms; 2000 Ω
Correlation Relay	C-Type Contacts; AN Connector (mating connector supplied)
Front Panel Indicators	
Frequency Meters	0-120 kc 0-24 kc
Correlation Meter	0-100%
Set/Acquire Lights	
Memory Lights	in/out
Signal Lock Lights	Lock/Drop Lock

OPTIONS

PILOT ACQUISITION CONTROL

Input Frequency Range	0-120 kc
Input Level	Approximately 0.5 volt rms. Internal level control provided.
Input Impedance	Approximately 5000 ohms.
Front Panel Control Indicators	Pushbutton selector switch with Lock/Drop Lock Lights.
Pilot Frequency Acquisition	Manual or automatic; transfer to signal acquisition mode is automatic upon pilot acquisition. In event of signal drop lock in automatic mode, filter will search for signal when memory is "In" and search for pilot frequency when memory is "Out."

CORRELATED AM & PM DEMODULATORS

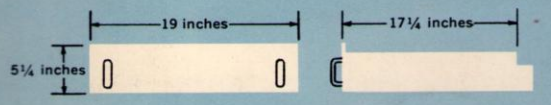
Bandwidths (identical for AM and PM)	Front panel adjustable: 1, 3, 10, 30 and 60 kc, ±5% Roll-off, 30 db/octave.
Output Levels (identical for AM and PM)	Front panel adjustable, 0.1 volt for 0.3 radian phase modulation or 30% amplitude modulation.
Output Impedance (identical for AM and PM)	Less than 1 ohm; requires minimum load of 2000 ohms.
Calibration	Front-panel-controlled, internal calibration signals provided for alignment and checkout of both AM and PM

FREQUENCY ANALOG

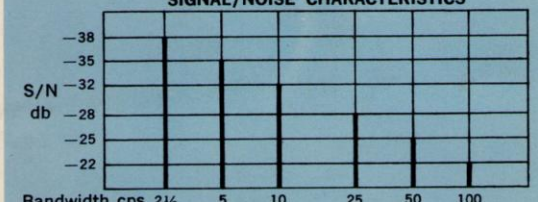
Output Level	−10 volts to +10 volts for 0 to 120 kc (0 volts at 60 kc)
Output Impedance	Less than 1 ohm; requires minimum load of 2000 ohms
Linearity	±3% of full scale

The various options may be selected by specifying Model Number per the chart below.

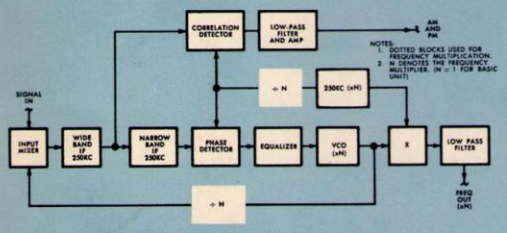
RTMA STD RK PANEL ..... 5¼" PANEL
WEIGHT ..... 40 LBS. MAX.
POWER REQUIREMENTS ... 75 WATTS OR LESS DEPENDING ON OPTIONAL FEATURES



SIGNAL/NOISE CHARACTERISTICS



Based on ⅓ radian rms tracking error



SERIES 450 TRACKING FILTERS — BASIC BLOCK DIAGRAM

SERIES 450 TRACKING FILTERS MODEL INFORMATION CHART

OPTIONAL FEATURES	x1 STANDARD 100 LINE	x10 FREQ MULT 200 LINE	x100 FREQ MULT 300 LINE
None	PL100	PL200	PL300
Correlated AM/PM Demodulators	PL101	PL201	PL301
Pilot Acquisition Control	PL102	PL202	PL302
Frequency Analog	PL103	PL203	PL303
Frequency Analog and Correlated AM/PM Demodulators	PL104	PL204	PL304
Pilot Acquisition Control and Correlated AM/PM Demodulators	PL105	PL205	PL305
Frequency Analog and Pilot Acquisition Control	PL106	PL206	PL306
Pilot Acquisition, Frequency Analog and Correlated AM/PM Demodulators	PL107	PL207	PL307

REPRESENTATIVES

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