

Accuphase

Quartz Lock Synthesizer FM Tuner

T-105

- Six Preset Tuning
- Manual Pulse-Controlled Tuning
- Easy-to-Read, Multi-Function Meter



The Accuphase T-105 is a new quartz-locked synthesizer FM tuner which incorporates the latest microprocessor technology. Unlike conventional tuning by which a variable capacitor is rotated mechanically, the T-105 employs electronic tuning to receive desired stations with a quartz controlled accuracy of $\pm 0.002\%$. A Quartz-Crystal/Reference Oscillator that locks tuned frequency channels at 50kHz intervals across the FM band forms the heart of this synthesizer tuning system.

The T-105 tuner provides three tuning methods, namely, (1) "Memory Tuning" for instant recall of preset stations; (2) "Manual Tuning" with an electronic pulse tuning system that assures the same "feel" as turning a variable capacitor knob; and (3) "Scan Tuning" at a touch of a button that permits rapid scanning of the FM band for quick station selection. Any of these three tuning methods can be employed instantly without switching, which means that automatic or manual tuning can be used at will with the T-105.

The T-105 also boasts a very low distortion ratio which is equivalent to that of audio amplifiers. Among the contributing factors for this is its ability to completely eliminate adjacent station interference with its double-tuned, front-end; its use of new bulk wave filters with outstanding flat characteristics for group delay time; and its employment of a Phase Conversion Discriminator which has superior linear phase characteristics.

Sit back, relax and enjoy clear, distortion-free FM reception with the T-105 FM tuner which has been developed with the most up to date Accuphase technology.

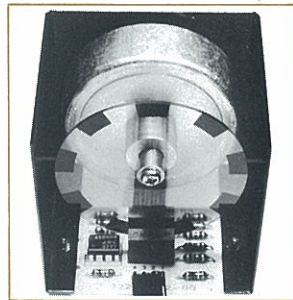
2 MEMORY TUNING, MANUAL PULSE TUNING and SCAN TUNING AVAILABLE

In addition to "Memory Tuning" by which preset stations are recalled by push-buttons as in most conventional synthesizer tuners, the T-105 provides "Manual Tuning" which preserves the "feel" of turning a variable capacitor knob. This is the result of employing a newly developed optical pulse generator that is inserted within the tuning knob, whose output is used to control the synthesizer, and change its tuned frequencies.

Six buttons are provided for presetting stations which can be recalled instantly with "Memory Tuning."

"Scan Tuning" is also provided by which a press of a button causes rapid scanning so that all stations can be tuned in quickly.

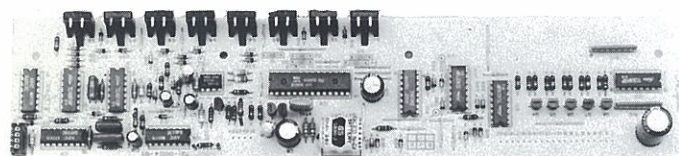
Any one of the above three ways of tuning can be used instantly, without switching, making possible both automatic or manual tuning at will.



Pulse Tuning Mechanism

1 THE QUARTZ-LOCKED FREQUENCY SYNTHESIZER SYSTEM

The Quartz-Locked Frequency Synthesizer tunes the front-end exactly to the desired signal by using the standard reference frequency of a quartz crystal oscillator which, together with Phase-Locked Loop (PLL) circuitry and a programmable Frequency Divider, can supply all required tuned frequencies for presetting. Such a completely electronic system is known as a "Digital Synthesizer System," or merely as a "Synthesizer System." Tuning is not continuously variable as with a variable capacitor, but tuned frequency channels are locked accurately at 50kHz intervals, with minimum distortion at all times. The T-105's frequency accuracy is within $\pm 0.002\%$ since it is crystal-controlled by the quartz oscillator, which assures continuous high performance.



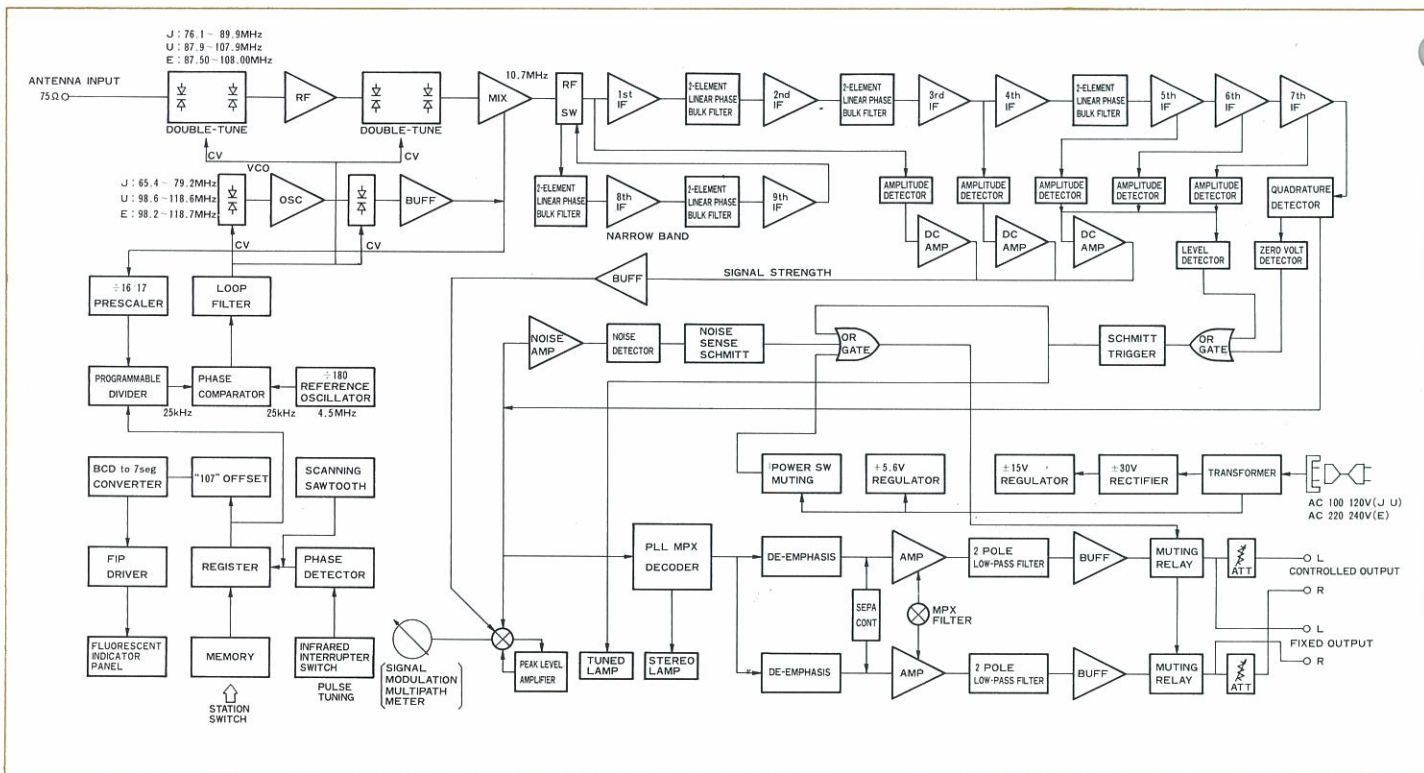
The "HEART" of synthesizer: Microprocessor and Interface

3 DOUBLE-TUNED FRONT-END COMPLETELY REJECTS INTERFERENCE AND INTERMODULATION

The front-end is virtually the "Heart" of any tuner. It selects the input signal, amplifies it and generates and delivers the intermediate frequency signal of 10.7MHz to the discriminator. The design of this section determines its sensitivity and interference rejection capabilities, as well as the quality of that tuner. A great improvement in suppressing RF intermodulation, which is of great importance, was achieved in the T-105's front-end by using a genuine electronic control system utilizing Varactor diodes that work together with PLL circuitry, in addition to two stages of double-tuned RF circuitry and a tuned buffer amplifier.

4 IF CIRCUITRY FEATURES LINEAR PHASE BULK WAVE FILTERS

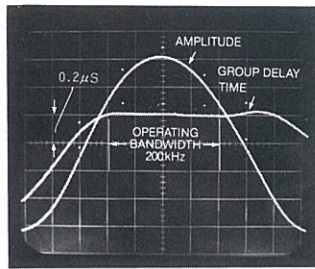
The 10.7MHz IF signal generated in the front-end passes through the IF section where it undergoes amplification, amplitude limitation and adjacent station rejection before it is fed to the Discriminator. A most important feature of the T-105's IF section is the use of newly developed Bulk Wave Filters which have superior selectivity and group delay time characteristics to reconcile the high selectivity and low distortion requirements of this section.



Accuphase T-105

Quartz Lock Synthesizer FM Tuner

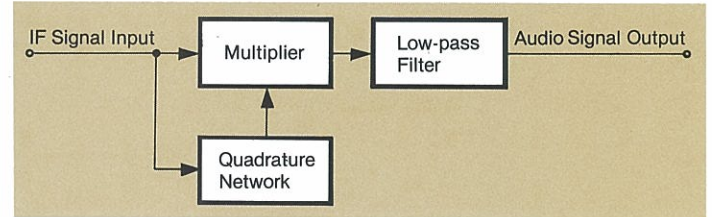
The group delay time characteristic curve which dominates the IF section's low distortion performance should be as flat as possible. The photo shows that the T-105's group delay time is less than 0.06 microseconds throughout the operating bandwidth of 200kHz, which, when converted, means a distortion ratio of within 0.01%. In other words, distortion from the IF amplifier section of this tuner is less than 0.01%, which compares favorably with distortion ratios of higher grade audio amplifiers.



Group Delay Time and Amplitude characteristics of the IF Filter

A Selectivity Control Switch, which varies IF selectivity, as needed, to reject adjacent station interferences is provided. Even when it is set at NARROW, a very low distortion ratio is maintained together with high selectivity, thanks to a special Bulk Wave Filter provided for this purpose.

Diagram, below, shows a block diagram of the T-105's Linear Phase Conversion type discriminator.



Linear Phase Conversion type Discriminator

5 LOW DISTORTION, LINEAR PHASE FM DISCRIMINATOR

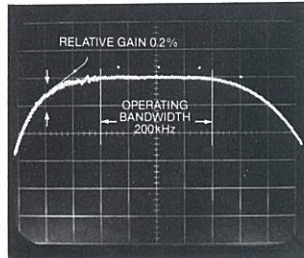
The FM discriminator derives audio amplitude signals from frequency modulated input signals. Its output amplitude variations must be linear with the frequency variations of the input for low distortion performance.

Linearity is checked as follows. A weakly modulated signal is swept and fed to the discriminator input. The output differential gain derived from the frequency variations is recorded and plotted to measure the flatness of the differential gain characteristics which reveals its distortion ratio.

The circuit employed in the T-105 is a phase conversion type discriminator that derives the audio signal by multiplying the input "original" signal by the phase-shifted signal which comes through the quadrature network. Because of this newly designed wideband, linear phase shifter, practically no distortion occurs in the T-105 discriminator circuit.

Photo shows the differential gain characteristics of this discriminator circuit and reveals its amazingly low distortion ratio of less than 0.005% within the operational bandwidth of 200kHz.

Moreover, each unit is perfectly adjusted on the factory production line with differential gain visual measuring equipment before shipment.



Differential Gain characteristics of the Discriminator

6 PLL (Phase-Locked Loop) DEMODULATOR WITH PILOT CARRIER CANCELLING CIRCUIT

A most advanced design PLL demodulator circuit which functions to separate the left-right composite signals for stereophonic reproduction is employed in the T-105. It features a new pilot carrier cancelling circuit, which, together with the Linear Phase IF Filter and wideband discriminator, account for the very excellent specifications of 50dB channel separation at 1kHz, 45dB at 10kHz and distortion ratio of less than 0.04% at 1kHz stereo, which place this tuner in the highest grade class.

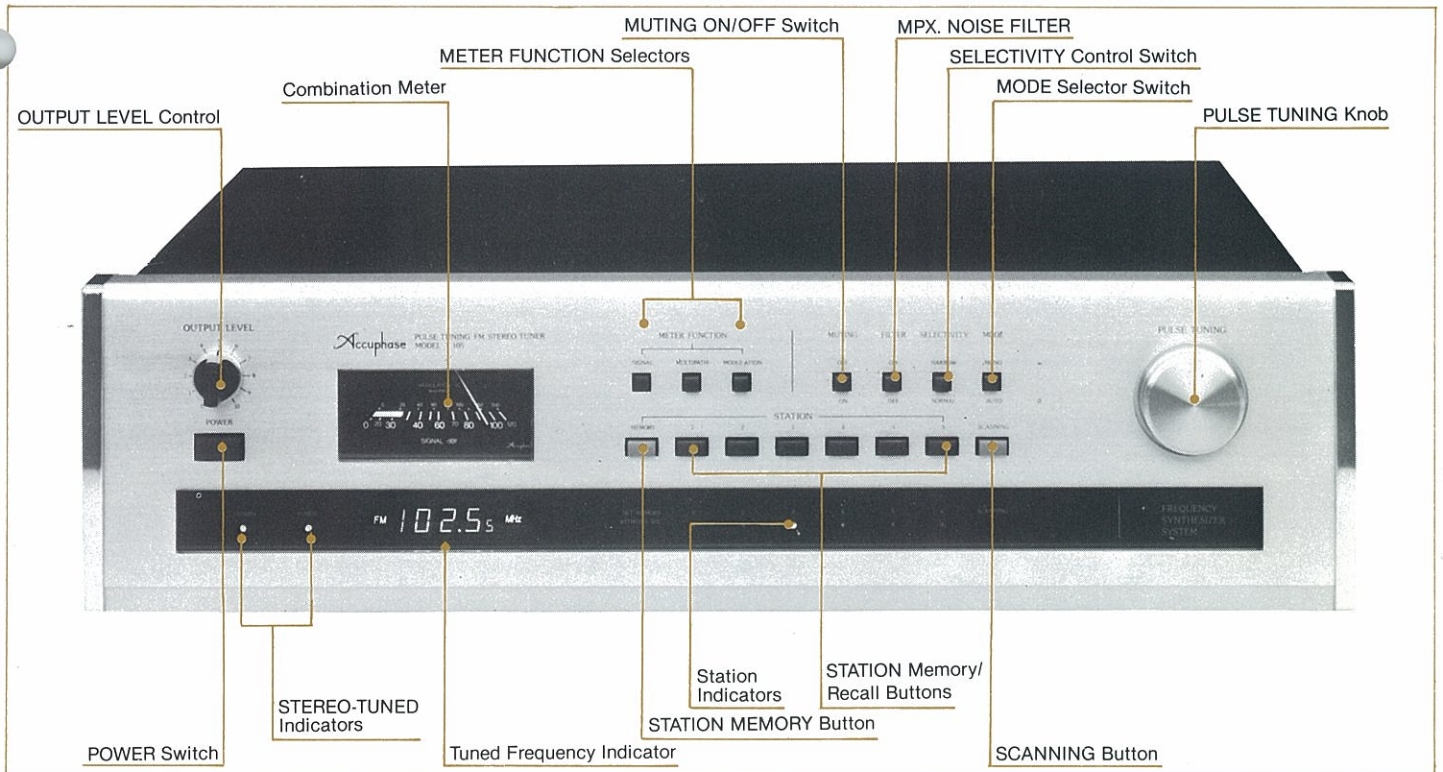
7 EASY-TO-READ, MULTI-FUNCTION METER

An easy-to-read Multi-Function Meter is provided on the front panel. Used with a Meter Selector Switch, it provides three functions, namely, signal strength indication, peak reading modulation indication and multipath detection.

Direct readings of incoming signal strength are available in dBf. Modulation is calibrated at 200% for full scale. The degree of multipath interference, and how it affects sound quality, can be judged by observing pointer movements in relation to the "All Clear" indication range of the Multipath Meter.

8 OTHER FUNCTIONS

Other functions that are available include a Noise Filter to reduce noise that may accompany very weak FM stations, Mode Switch to select stereo or mono listening modes, Muting Switch to eliminate interstation noise, and Output Level Control to equalize the tuner output level with other program sources, etc.



GUARANTY SPECIFICATIONS

PERFORMANCE GUARANTY:

All Accuphase product specifications are guaranteed as stated.
All specifications are measured in accordance with the new IHF measurement method.
(*old IHF methods at 300 ohms)

MONOPHONIC PERFORMANCE

SENSITIVITY:	Usable Sensitivity: 11.2dBf (2.0 μ V*)
	50dB Quieting Sensitivity: 17.3dBf (4.0 μ V*)
VOLTAGE STANDING WAVE RATIO:	1.5
SIGNAL TO NOISE RATIO AT 65dBf (1mV*):	80dB
DISTORTION:	with SELECTIVITY switch set to "NORMAL" 100Hz 1,000Hz 6,000Hz 10,000Hz 65dBf (1mV*) input at ± 75 kHz deviation: 0.04% 0.04% 0.08% 0.04% will not exceed 0.01% (Antenna input 65dBf (1mV*), ± 75 kHz deviation, 14kHz and 15kHz=1:1)
INTERMODULATION DISTORTION:	+0, -0.5dB 10Hz to 16,000Hz
FREQUENCY RESPONSE:	with SELECTIVITY switch set to "NORMAL" "NARROW" Alternate Channel: 60dB 100dB Adjacent Channel: 8dB 22dB
SELECTIVITY:	
CAPTURE RATIO:	1.5dB
RF INTERMODULATION:	80dB
IMAGE RESPONSE RATIO:	80dB
IF/2 SPURIOUS RESPONSE RATIO:	100dB
AM SUPPRESSION RATIO:	80dB, at 65dBf (1mV*) input
SUBCARRIER PRODUCT RATIO:	70dB
SCA REJECTION RATIO:	80dB
OUTPUT:	1.0 Volt, at ± 75 kHz deviation,

STEREO PERFORMANCE

SENSITIVITY:	40dB Quieting Sensitivity: 28.8dBf (15 μ V*)
	50dB Quieting Sensitivity: 37.3dBf (40 μ V*)
SIGNAL TO NOISE RATIO AT 65dBf (1mV*):	75dB
DISTORTION:	with SELECTIVITY switch set to "NORMAL" 100Hz 1,000Hz 6,000Hz 10,000Hz 65dBf (1mV*) input at ± 75 kHz deviation: 0.04% 0.04% 0.08% 0.08% will not exceed 0.03% (Antenna input 65dBf (1mV*), ± 75 kHz deviation, 9kHz and 10kHz = 1:1)
INTERMODULATION DISTORTION:	+0, -0.5dB 10Hz to 16,000Hz
FREQUENCY RESPONSE:	
STEREO SEPARATION:	100Hz 1,000Hz 10,000Hz 50dB 50dB 45dB
STEREO AND MUTING THRESHOLD:	19.2dBf (5 μ V*)

GENERAL

FREQUENCY RANGE:	87.9MHz—107.9MHz in 200kHz step for North American Continent 87.50MHz—108.00MHz in 50kHz step for other countries
TUNING SYSTEM:	Quartz-lock Frequency Synthesized Tuning System/ Manual Pulse-controlled Tuning System Preset Tuning: 6 stations
FREQUENCY ACCURACY:	$\pm 0.002\%$
OUTPUT IMPEDANCE:	Audio Output Fixed: 200 ohms Audio Output Controlled: 1.25k ohms max.
FM ANTENNA INPUT:	75-ohm unbalanced
METER:	Signal Strength/Multipath/Modulation (Combination Meter)
POWER CONSUMPTION:	25W 50/60Hz operation (100V, 117V, 220V and 240V)
SEMICONDUCTOR COMPLEMENT:	26 Trs., 3 FETs, 24 ICs, 73 Diodes, 2 Opto-Couplers
DIMENSIONS:	445mm (17-1/2 inches) width, 128mm (5-1/16 inches) max. height, 370mm (14-9/16 inches) depth
WEIGHT:	8.4kg. (18.5 lbs.) net, 12.4kg. (27.3 lbs.) in shipping carton

