

# Accuphase

FM STEREO TUNER

# T-109V

- Ultra-precise electronic tuning
- Front end with double-tuned antenna circuit easily handles high signal levels
- High-performance adjustment-free Advanced DGL Detector
- Extremely stable stereo decoder
- 32-station memory also stores reception settings
- Manual rotary knob with pulse tuning system
- Balanced audio outputs





**Rediscover the joy of music — with this top-flight FM stereo tuner featuring advanced RF technology. The front end can handle even extremely high input signals, the Advanced DGL Detector assures top-quality reception performance, and the stereo decoder employs a ceramic resonator for utmost stability. Pulse tuning recreates the ease and feel of manual tuning in addition to the convenient 32 station memory.**

Among the great variety of program sources available today, such as CDs, MDs, and DVDs, FM broadcasts still play a special role, since they cover the entire spectrum from live performances of time-honored classical works to the latest hits. The FM band provides a rich choice of music all day long. The FM tuner therefore is an important component in a stereo system designed to enlighten and entertain. The FM Stereo Tuner T-109V from Accuphase was conceived for the music lover who accepts no compromises when it comes to sound quality. It is based on the highly renowned model T-109, providing even further refined sonic characteristics and performance. Externally, the front panel has been redesigned to match the styling of recent Accuphase components. The PLL electronic tuning system pulls in any desired station with pin-point precision and total reliability. A convenient memory function lets you store as many as 32 stations including sensitivity and filter on/off settings, and the pulse tuning principle developed by Accuphase blends digital accuracy with the familiar feeling of operating an analog tuning knob. The front end employs a dual-stage design that can handle even extremely high input signals without cross modulation problems, and the Advanced DGL Detector assures high performance and rock-stable reception. The stereo decoder takes sophisticated circuit topology to new heights, with its reference frequency provided by a ceramic resonator for utmost stability. To avoid diluting the outstanding sonic virtues of this tuner further down the signal path, a balanced output stage sends the audio signal to the next component without any sound quality deterioration. A remote commander is also supplied, and the champagne gold front panel blends perfectly with any listening room.

**Ultra-precise electronic tuning**

The T-109V tunes to the station frequency by means of a quartz crystal oscillator that operates with extreme precision and is virtually free of time or temperature induced drift. It precisely locks the tuner to the reception point that yields minimum distortion and maximum sensitivity. Electronic tuning also means that the T-109V is not susceptible to modulation and other noise caused by external vibrations.

**Front end with dual-stage demodulator handles high input signals easily**

Each FM tuner has a front end that picks just the desired station out of the crowded FM band and convert the radio frequency into an intermediate frequency. The design of this stage is highly crucial, since it must discern and select minute signals, while at the same time being able to withstand the very high levels that can occur when a strong station is broadcasting nearby. Freedom from interference and distortion is what makes the difference between a run-of-the-mill product and a sophisticated high-class FM tuner.

Figure 1 shows the circuit diagram of the front end employed in the T-109V. Accuphase has long been advocating the "double-tuned antenna circuit principle", whereby a high selectivity circuit precedes the antenna signal amplifier stage. This prevents intermodulation distortion and other undesirable side effects which can occur if a strong signal is amplified directly. The RF amplifier stage uses FET devices configured as a low-feedback cascode amplifier. The input stage gate features a PIN-diode attenuator that is switched on or off by a microprocessor, depending on the antenna input level. This assures high-quality reception, free from interference and distortion, even in areas close to strong broadcast stations that could otherwise overload the front end.

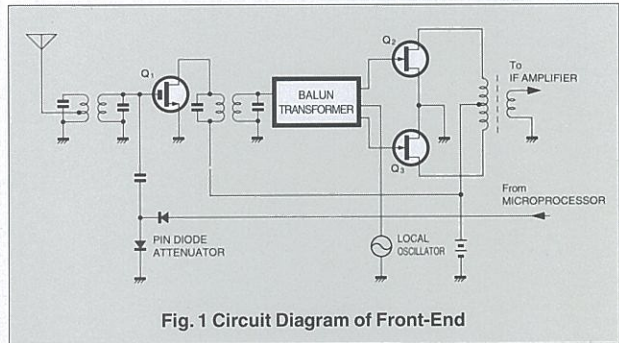
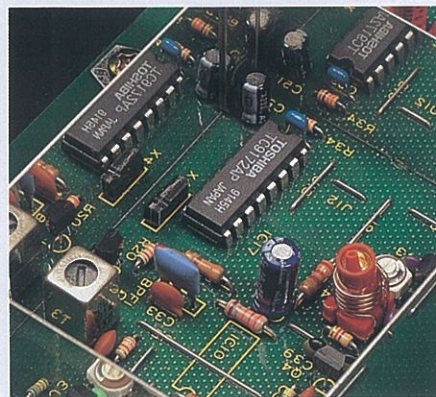
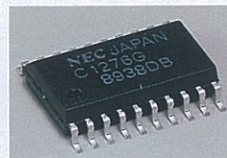


Fig. 1 Circuit Diagram of Front-End



**High-Performance Advanced DGL Detector**

Accuphase originally developed the DGL (Differential Gain Linear) detector, featuring low distortion, high S/N ratio, low capture ratio, and reliable, adjustment-free performance. For the T-109V, Accuphase has further developed and refined the DGL principle, resulting in the Advanced DGL Detector.

Figure 2 (A) shows the circuit principle of the Advanced DGL Detector. The input stage uses a high-speed comparator as a broadband 2.4 MHz amplifier to prevent beat interference. The delay circuit consists of 24 high-speed CMOS ICs.

Figure 2 (B) illustrates the DGL operation principle. The delay circuit takes the slight output delay of high-speed logic ICs into consideration. An arrangement of 24 ICs delays the phase angle by 114 degrees to assure minimum distortion and maxi-

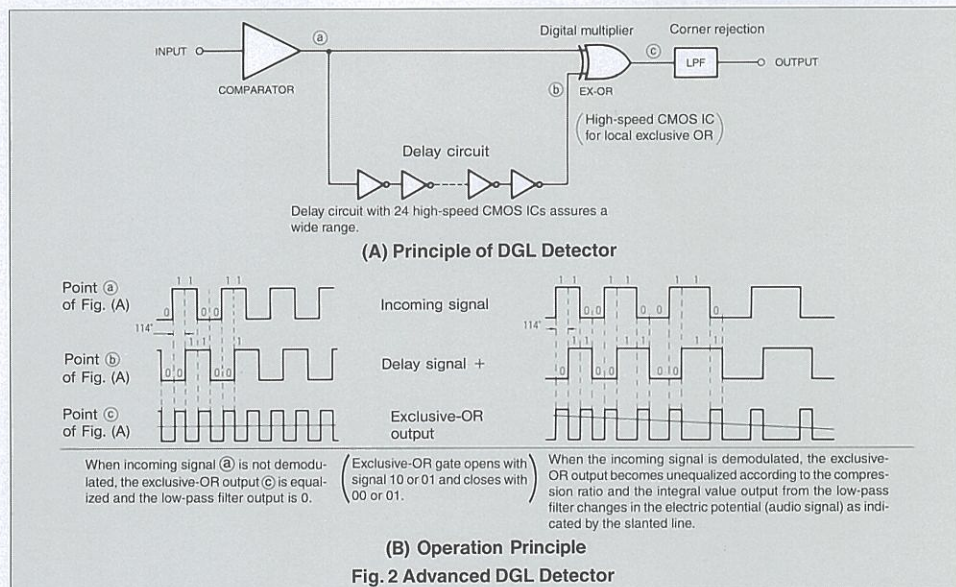


Fig. 2 Advanced DGL Detector



■ Supplied remote commander RC-12  
For station selection and control of other functions



imum S/N ratio. The delayed signal (b) is then compared to the input signal (a) by an EXCLUSIVE OR circuit which switches the circuit on and off according to the electric potential between the two signals. The resulting density modulation is detected digitally (c) and extracted as the audio signal. Thanks to this approach, linearity of the delay circuit is maintained over a very wide range ( $\pm 2.5$  MHz), and adjustment is not required, assuring excellent long-term reliability. Another advantage is outstanding differential gain linearity.

#### Switchable IF bandwidth (NORMAL, NARROW)

FM broadcasts have an audio frequency range of up to 15 kHz and S/N ratio of about 80 dB. To make the most of this impressive quality potential, the T-109V normally uses an IF stage with wide bandwidth (NORMAL) to receive broadcasts. However, if there are strong neighboring stations which might impair reception, the IF bandwidth can be switched to NARROW. In this position, distortion and stereo separation are slightly worse, but selectivity is maximized to ensure sharp reception.

#### Stereo decoder controlled by a solid resonator for ultra-low distortion and excellent long-term stability

The right and left channel information of the FM stereo signal is encoded by means of a 38 kHz subcarrier. To decode this information, the tuner must produce a signal that is perfectly synchronized with the subcarrier, allowing a switching circuit to extract the right and left signal components at exactly the right time. Otherwise, stereo separation and imaging will be notably impaired. To accomplish this task, the pilot signal in the input is used to lock the oscillator of a PLL circuit in the tuner to the required frequency, as shown in Figure 3 (A).

In the T-109V, the internal PLL oscillator employs a ceramic resonator, as shown in Figure

3 (B), in conjunction with a reactance circuit that can be switched between positive and negative reactance by a control voltage. This allows accurate switching in a narrower locking

frequency range than is possible with conventional circuits. The circuit also assures superior long-term stability without the need for adjustment.

#### Balanced audio output

The balanced signal transmission principle prevents sound quality deterioration caused by externally induced noise. The T-109V offers a set of balanced XLR connectors along with conventional RCA-type phono jacks.



#### 32-station memory also stores reception settings

The T-109V allows the user to quickly store and recall up to 32 stations. There are 16 station buttons which control two memory slots each. Selecting the first or second station number of a button is easy: just keep the button depressed for more than one second to select the second station number (the station number flashes once). When storing a station, the T-109V memorizes not only the broadcast frequency but also parameters such as filter and selectivity settings. This lets you receive any station at the touch of a button in optimum condition.

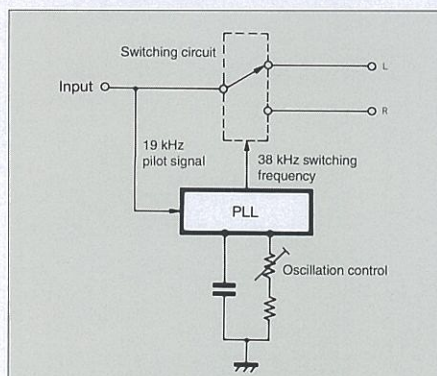


Fig. 3(A) Trimmer Type Stereo Demodulator

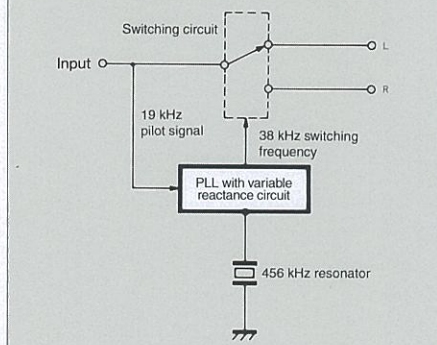
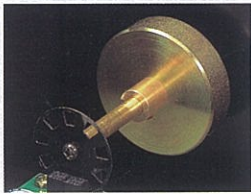


Fig. 3(B) Stereo Demodulator of T-109V

**Innovative pulse tuning system developed by Accuphase allows manual tuning with that traditional "tuner feeling"**

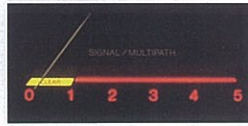
The T-109V not only offers the capability to instantly memorize and tune in a station at the touch of a button, it also possesses a tuning knob that makes it possible to hunt for broadcast stations with the familiar feeling of an analog tuner. A disc with radial slits is mounted on a shaft that is turned by the knob. Knob rotation is translated into a series of pulses which are



used by a microprocessor to control the PLL tuning frequency. Low-level beep tones can be heard when the knob is turned, indicating the frequency change.

**Multi-function meter also indicates multipath**

The meter of the T-109V can be switched to show either the antenna input level (field strength) or multipath condition. Multipath distortion occurs when the broadcast signal is reflected by buildings, mountains etc. and arrives at the antenna in multiple instances (similar to ghost

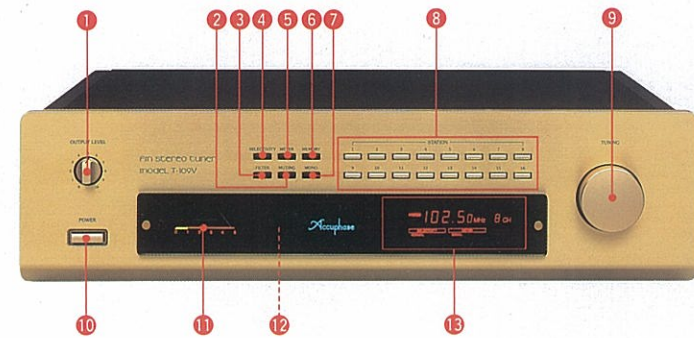


images on a TV screen). To minimize multipath, it is essential to select the best transmitter station and optimize antenna orientation, a task that is made easy by the multipath indication mode of the meter on the T-109V.

**Other features**

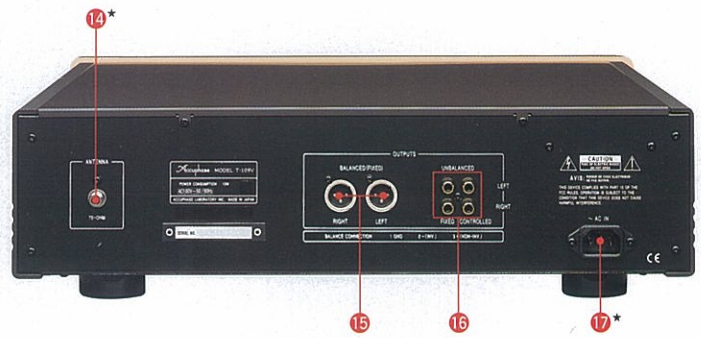
The T-109V offers many other desirable features, including a switchable Noise Filter that is useful to reduce noise on stereo broadcasts from weak stations, a Muting Switch to eliminate noise during manual tuning, a Mono Switch, and an Output Level Control that allows matching the tuner's output level to that of other components in the system.

**Front Panel**



- 1 Output Level Control
- 2 Muting Button
- 3 Stereo Noise Filter On/Off Button
- 4 Selectivity Control Button
- 5 Meter Function Selector Button
- 6 Station Memory Button
- 7 Mono Button
- 8 Preset Station Memory Buttons
- 9 Tuning Knob
- 10 Power Switch

**Rear Panel**



- 11 Meter (Signal Strength/Multipath)
- 12 Remote Control Sensor
- 13 Display
- STEREO/MONO SELECTIVITY METER
- FILTER MUTING
- Reception Frequency\* Memory Channel
- 14 Antenna Input Connector\*
- 15 Balanced Output Connectors
- 16 Unbalanced Output Connectors
- FIXED/CONTROLLED

- 17 AC Inlet (For Supplied Power Cord)\*

**Remarks**

- \* The T-109V is available in various versions (120V/220V/230V) for different destinations. Before use, make sure that the voltage marked on the rear panel matches the AC voltage used in your area.
- \* Depending on the model, the reception frequency range, antenna jack type, and shape of the supplied power cord may be different.

**T-109V Guaranteed Specifications** [Guaranteed specifications are measured according to EIA standard RS-490.]

**Frequency Range:**

Europe	87.50MHz - 108.00MHz (in 50-kHz channel steps)
USA	87.5MHz - 108.0MHz (in 100-kHz channel steps)
Asia	87.5MHz - 107.9MHz (in 200-kHz channel steps)

**MONOPHONIC PERFORMANCE**

- **Sensitivity:** Usable sensitivity: 11dBf (IHF)  
50dB Quieting Sensitivity: 17dBf (IHF)
- **Voltage Standing Wave Ratio:** 1.5
- **Signal-to-Noise Ratio at 80dBf:** 90dB (A-Weighted)
- **Total Harmonic Distortion:** With SELECTIVITY switch set to NORMAL 80dBf input at ±75kHz deviation
 

20Hz	0.02%
1000Hz	0.02%
10,000Hz	0.02%
- **Intermodulation Distortion:** Will not exceed 0.01% (Antenna input 80dBf, ±75kHz deviation)
- **Frequency Response:** +0, -1.0dB, 10Hz to 16,000Hz
- **Selectivity: (IHF)** With SELECTIVITY switch set to NORMAL or NARROW
 

Interference Wave	NORMAL	NARROW
400kHz	70dB	100dB min.
300kHz	30dB	100dB
200kHz	10dB	40dB

- **Capture Ratio:** 1.5dB
- **RF Intermodulation:** 80dB
- **Spurious Response Ratio:** 120dB

- **Image Response Ratio:** 80dB
- **AM Suppression Ratio:** 80dB at 65dBf input
- **Subcarrier Product Ratio:** 70dB
- **Output:** 1.0 Volt at ±75kHz deviation

**STEREOPHONIC PERFORMANCE**

- **Sensitivity:** 40dB Quieting Sensitivity: 29dBf (IHF)  
50dB Quieting Sensitivity: 37dBf (IHF)
- **Signal-to-Noise Ratio at 80dBf:** 85dB (A-Weighted)
- **Total Harmonic Distortion:** With SELECTIVITY switch set to NORMAL 80dBf input at ±75kHz deviation
 

20Hz	0.04%
1000Hz	0.04%
10,000Hz	0.04%
- **Intermodulation Distortion:** Will not exceed 0.03% (Antenna input 80dBf, ±75kHz deviation)
- **Frequency Response:** 0, -1.0dB, 10Hz to 16,000Hz
- **Stereo Separation:** 100Hz 50dB  
1000Hz 50dB  
10,000Hz 40dB
- **Stereo and Muting Threshold:** 20dBf

**GENERAL**

- **Antenna Input:** 75-ohm unbalanced
- **Tuning System:** Quartz-lock frequency synthesized tuning system  
Preset tuning random memory for 32 stations
- **FM Detector:** DGL (Differential Gain Linear) Detector

- **Output Impedance:** BALANCED, XLR type: 200 ohms (100 ohms/100 ohms)  
UNBALANCED  
Audio output FIXED: 200 ohms  
Audio output CONTROLLED: 1.25 kohms max.

- **Meter:** Multipath/Signal strength (selectable)
- **Power requirements:** 120V/220V/230V (Voltage as indicated on rear panel) AC, 50/60Hz
- **Power consumption:** 15 W
- **Dimensions:** 475mm (18-11/16") width,  
140mm (5-1/2") height (max.),  
402mm (15-15/16") depth
- **Weight:** 9.5kg (20.9 lbs.) Net  
12.0kg (26.4lbs.) In shipping carton
- **Supplied Remote Commander RC-12**  
Remote Control System: Infra-red Pulse  
Power Supply: 3V DC (Two IEC R6 batteries)  
Dimensions: 64mm (3-1/2") width,  
149mm (5-7/8") height,  
18mm (11/16") depth  
Weight: 145g (0.3 lbs) including batteries

**Supplied accessories**

- AC power cord
- Audio cable with plugs
- Remote commander RC-12
- F type connector (only with models equipped with F type antenna jack)

\* Specifications and design subject to change without notice for improvements.



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