Accuphase

SYNTHESIZER FM STEREO TUNER

T-11

Using state-of-the-art technology, the Accuphase T-11 tuner has achieved an unsurpassed level of perfection. It includes a double-tuned front end capable of rejecting even strong interference, a DGL detector providing high stability and low distortion, carefully selected linear phase IF filters, and a highly stable, resonator-controlled stereo demodulator.

The proliferation of CDs, music tapes, videotapes, and laser discs has been giving increasing variety to music program sources. The result of this is that there is a wide variety of music genres being presented by the broadcasting media around the clock. Listeners can hear the latest music, live overseas programs, local performances, and exquisite pieces of music from the past. Many of these will include pieces that are not available for purchase and can, therefore, only be heard over the radio.

It can be said that the radio is an integral part of modern life. It enhances the level of our culture and helps to ease our mind. Among the various broadcasting modes, FM radio broadcasting provides almost flawless audio transmission. FM radio is able to bring live performances into your home with a sound quality comparable to that of CDs.

The high quality Accuphase FM Stereo Tuner T-11 is designed especially for music lovers who are keen on sound performance. In anticipation of the increasing number of FM stations, the T-11 has a memory which is capable of storing 16 preset FM stations, the FM bandwidth, and the filter settings. Accuphase's newly developed pulse-tuning system allows listeners to use a traditional tuning knob to tune in to their desired station.

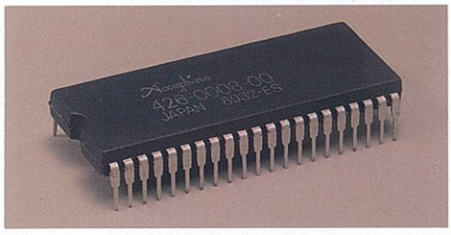
A tuner with a sophisticated, balanced output circuitry has been attained for the first time by the 11. A remote control unit worthy of such a distinct tuner is provided as an accessory to the T-11.

1 Electronic Tuning System Gives Outstanding Accuracy

The highly accurate electronic tuning system in the T-11 receives desired signals with quartz-controlled precision. The tuned frequency channels can be locked-in, with minimum distortion, at the point of highest sensitivity. There is almost no frequency drift over time or due to changes in temperature. Because of the electronic tuning, almost no modulation distortion or noise is caused by external shocks.

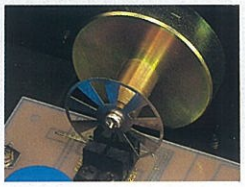
2 16-Station Random Memory

In preparation for increasing number of FM stations, the T-11 is equipped with a memory that can preset 16 different FM stations at random. Any one of these can then be instantaneously tuned-in at the press of a button. With weak radio signals, it may sometimes be necessary to use the additional filtering or to change the FM bandwidth. In such cases, the T-11 memory can be programmed with the preset filter and sensitivity levels required to meet the signal conditions of the station.



3 Accuphase's Newly Developed Pulse-Tuning System with Traditional, Manual Tuning Knob

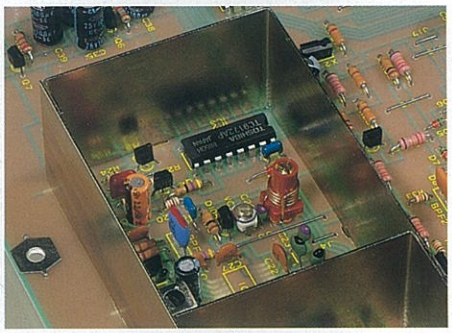
In addition to the 16-station random memory, the T-11 is equipped with a traditional tuning knob, which allows users to manually tune to the desired station. We call this the pulse-tuning system. It has been developed especially for manual electronic tuning. In this system, the tuning frequency is controlled by a pulse count, generated by the radial slits on the knob shaft. The operation of the pulse-tuning system may be, so to speak, compared to driving a car with a manual transmission.

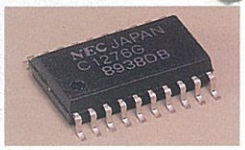


4 Interference Rejecting, Double-Tuned Front-End

In any tuner, the front-end is virtually its "heart." It performs the critical functions: it selects the input signal, amplifies it, generates the intermediate frequency signal, and delivers it to the detector. As one might expect, it is often necessary for the front-end to process a weak signal. Doing that successfully is not the only requirement of a quality tuner. A sophisticated tuner is also expected to have a front-end that can reject interference and signal distortion. These are the absolute requirements for good signal reception and audio quality.

Fig. 1 is the circuit diagram of the T-11's front-end. Double-tuning of the input-signal at the input and amplification stages enables the front-end to reject even strong interference. This is further enhanced by a frequency converter which incorporates a mixer composed of a differential-FET balanced modulator and a balun transformer. The PIN diode attenuator in Fig. 1 is a variable attenuator that can minimize the effect of excessively strong signals radiated from an adjacent transmission tower. This attenuator enables the T-1 be used in almost any location without interference or signal distortion.





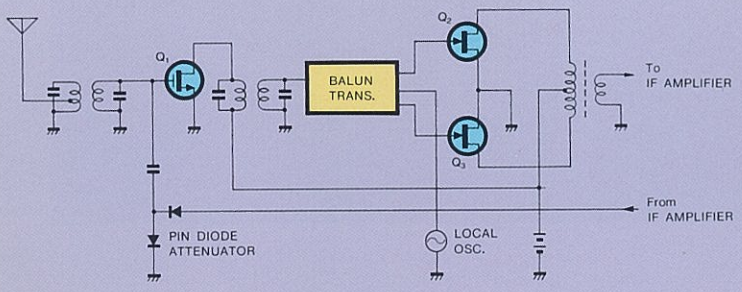


Fig. 1 Circuit Diagram of Front-End

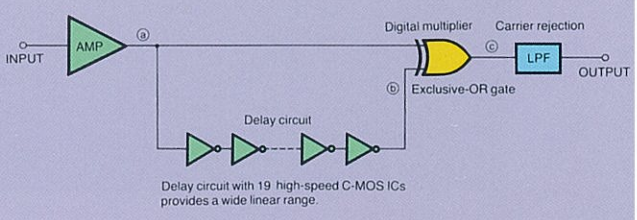
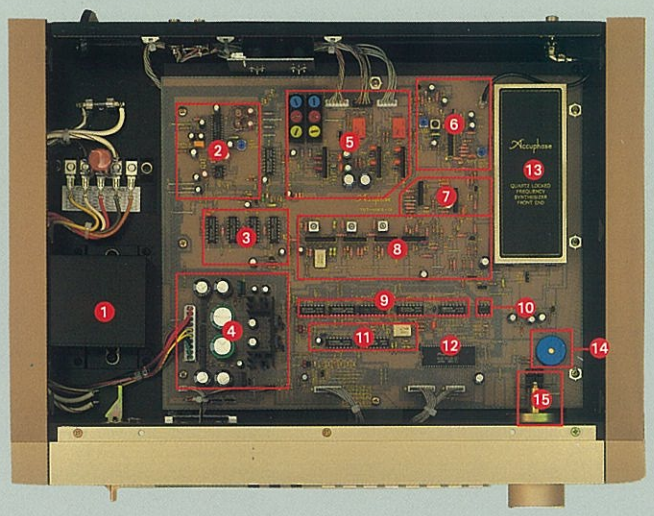


Fig. 2 Principle of DGL Detector



■ **Internal Layout**

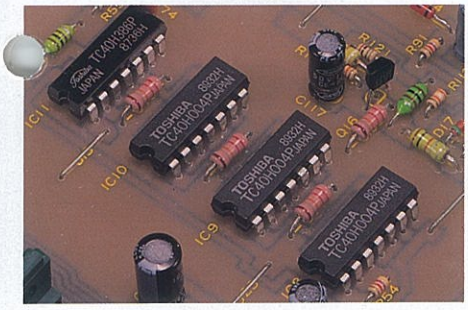
1. Power transformer
2. Resonator-controlled stereo demodulator
3. ICs for DGL (differential gain linear) detector
4. Regulated power supply circuit
5. Audio amplification circuit
6. IF amplifier for meter circuit
7. IF amplifier for narrow selectivity
8. IF amplification circuit
9. Exclusive OR circuit
10. Non-volatile memory
11. Basic oscillation circuit
12. 4-bit microcomputer
13. Double-tuned front end
14. Speaker for buzzer
15. Rotor for pulse-tuning

5 Newly Developed Differential Gain Linear FM Detector and IF Filters with Flat Group-Delay Characteristics

The T-11 has achieved stable tuning characteristics with minimum distortion and an excellent capture ratio by combining the newly developed DGL (differential gain linear) detector and specially selected intermediate frequency filters with flat group-delay time characteristics.

The DGL detector incorporates 19 high-speed C-MOS ICs connected in series, as shown in Fig. 2. The phase angle is delayed by 114° to minimize distortion and to obtain the best signal-to-noise ratio. The delay signal that results and the input signal are applied to an exclusive OR circuit. The gate circuit is then closed (with 11 or 00) or opened (with 10 or 01), according to the electric potential difference between the two signals. The compression ratio of signals produced by modulation is thus detected digitally (that is, logical multiplication is performed), and sound signals are obtained (Fig. 3). Since the linear range of the delay circuit is extremely wide (±2.5MHz) and the circuit requires no adjustment, stable and high-grade linear differential gain characteristics can be obtained.

Two IF filters are provided: NORMAL and NARROW. Should radio interference be strong, the NARROW IF filter can be selected by the front panel switch, thus allowing clearer reception due to the greater selectivity.



6 Rejection of Signal Distortion Using a Stable, Resonator-Controlled Stereo Demodulator

For FM broadcasting, stereo signals are transmitted with a 38-kHz subcarrier by alternately switching left- and right-channel signals. Therefore, in an FM tuner, generation of matching signals that perfectly synchronize with this 38-kHz subcarrier is necessary to separately demodulate the received left- and right-channel signals. This is done using a switching circuit. If a phase difference exists between the tuner's signals and those of the transmitted subcarrier, chan el separation degrades and components of the left channel signals mix with those of the right-channel signals or vice versa. The result is narrower channel separation and diminished sound quality.

To realize the near-perfect performance characteristics of the FM stereo demodulator, the tuner's internal oscillation circuit is locked by the PLL circuitry using the synchronizing pilot signals contained in the input signals (see Fig. 4). In this way, accurate 38-kHz switching signals are obtained. For its internal oscillation circuit, the T-11 employs a combination of a ceramic resonator with a variable reactance circuit governed by the control voltage (see Fig. 5). This means that accurate switching signals can be obtained in a locked frequency range which is narrower than conventional ranges.

This stereo demodulator circuit has the following features:

(a) No adjustment of the stereo demodulator circuit is required and initial performance characteristics are maintained over a long period of time.
(b) Stereo channel separation is relatively unaffected by temperature changes, line voltage fluctuations, etc.
(c) Its locked frequency range (capture range) is narrower than conventional ranges, reducing distortion due to beat interference at high frequencies.

From the above, it can be seen that near-perfect stereo demodulation characteristics have been attained.

7 Newly Developed Balanced Output Circuit

Audio quality may deteriorate as a result of RF interference, or noise caused by ground loops between components. Balanced transmission systems, commonly used in music studios and in professional equipment, can effectively prevent this kind of audio quality deterioration. All of our audio amplifiers, including the T-11, use an adaption of the balanced transmission system. This enables the T-11 to effectively prevent the deterioration of audio quality due to interference from transmission lines.

8 Double-Function Meter

The meter can be set to indicate the strength of the incoming radio signal or to detect the amount of multipath reception. When the MULTIPATH function is specified, good reception conditions are indicated if the pointer stays within the "CLEAR" range.

9 Other Features

Other features include a multiplex noise filter to reduce noise when receiving a weak FM stereo station; a muting switch to eliminate interstation noise; a monaural switch to select monophonic output signals; and a level control to equalize the tuner output level with other program sources.

10 Remote Commander

The inclusion of remote controls with most CD players has led to an expectation that other audio equipment should have similar facilities. To meet this trend, the T-11 comes with its exclusive remote controller, the Remote Commander.

11 Coordinating System Components

As can be seen from the photograph, the T-11 has been designed to match other Accuphase audio system components (the power amplifier P-11, the preamplifier C-11, and the CD player DP-11), allowing you to set up a coordinated system that makes your listening room look as refined as it sounds.

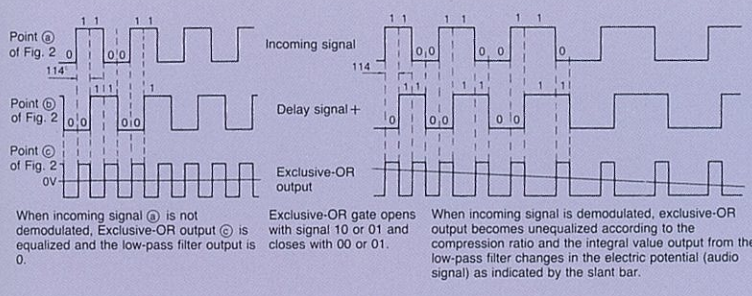


Fig. 3

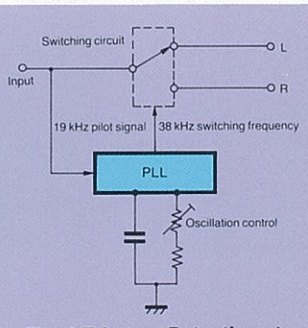


Fig. 4 Trimmer Potentiometer Type Stereo Demodulator

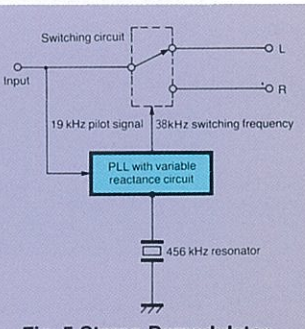
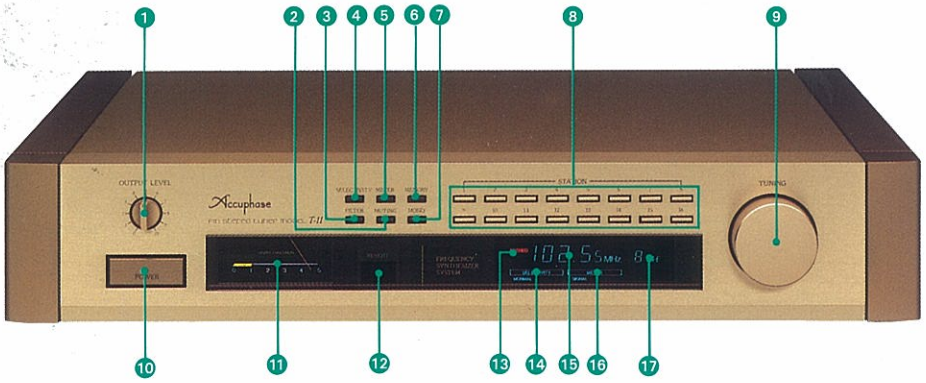


Fig. 5 Stereo Demodulator of the T-11



■ Front Panel

1. Output level control
2. Interstation noise silencing switch
3. Multiplex noise filter switch
4. Selectivity control switch
5. Meter function switch
6. Station memory switch
7. Monophonic switch
8. Preset station selector switches
9. Pulse-tuning knob
10. Power switch
11. Multipath/signal meter
12. Remote sensor
13. Stereo indicator
14. Selectivity indicator
15. Frequency indicator
16. Meter indicator
17. Station number indicator

■ Remote Commander RC-6 (Optional)

The RC-6 Remote Commander can be used to control the C-11 Preamplifier and the DP-11 CD Player, as well as the T-11 FM Tuner.

Remote Control System: Infra-red pulse
Power Supply: 3V DC (Two IEC R14 batteries)
Dimensions: 237mm (9-5/16″) width, 39mm (1-1/2″) height, 175mm (6-7/8″) depth
Weight: 1.4 kg (3.1 lbs) including batteries

GUARANTY SPECIFICATIONS

Performance Guaranty:
All Accuphase product specifications are guaranteed as stated.

MONOPHONIC PERFORMANCE

- **Frequency Range:**
  Europe 87.50MHz – 108.00MHz (with 50-kHz channel steps)
  USA 87.5MHz – 108.0MHz (with 100-kHz channel steps)
  Asia 87.9MHz – 107.9MHz (with 200-kHz channel steps)
- **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	1,000Hz	10,000Hz
0.02%	0.02%	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:** 100dB
- **AM Suppression Ratio:**
  80dB at 65dBf input
- **Subcarrier Product Ratio:** 70dB
- **SCA Rejection Ratio:** 80dB
- **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	1,000Hz	10,000Hz
0.04%	0.04%	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:**

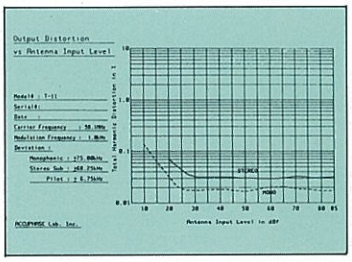
100Hz	1,000Hz	10,000Hz
50dB	50dB	40dB

- **Stereo and Muting Threshold:** 20dBf

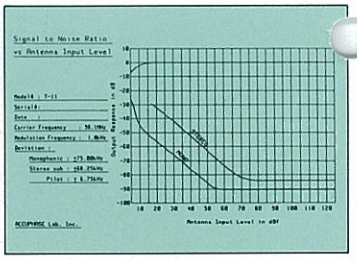
GENERAL

- **Antenna Input:**
  75-ohm unbalanced (with 300-ohm balanced converter)
- **Tuning System:**
  Quartz-lock frequency synthesized tuning system
  Preset tuning at random memory for 16 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)
- **Semiconductor Complement:**
  15 Tr's, 5 FETs, 32 ICs, 36 Di's
- **Power Supply and Power Consumption:**
  Compatible to 100, 117, 220 and 240V, 50/60Hz operation
  Consumption: 15 Watts
- **Dimensions:**
  445mm (17-1/2″) width, 95mm (3-3/4″) height (max.), 325mm (12-13/16″) depth
- **Weight:**
  9.3kg (20.5 lbs.) net
  13.4kg (29.5 lbs.) in shipping carton

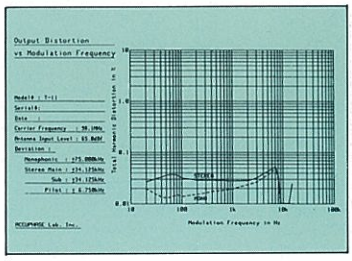
Supplied Remote Commander RC-5
Remote Control System: Infra-red pulse
Power Supply: 3V DC (Two IEC R6 batteries)
Dimensions: 64mm (3-1/2″) width, 149mm (5-7/8″) height, 18mm (11/16″) depth
Weight: 145 g (0.3 lbs) including batteries



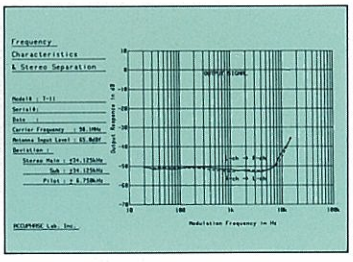
- Output distortion vs. antenna input level



- Signal-to-noise ratio vs. antenna input level



- Output distortion vs. modulation frequency



- Frequency characteristics and stereo separation

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