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# **AO-3001C**

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***AUDIO OSCILLATOR***

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***OPERATOR'S MANUAL***

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**GoldStar Precision Co., Ltd.**

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## Test Instrument Safety

### WARNING

Normal use of test equipment exposes you to a certain amount of danger from electrical shock because testing must often be performed where exposed voltage is present. An electrical shock causing 10 milliamps of current to pass through the heart will stop most human heartbeats. Higher voltages pose an even greater threat because such voltage can more easily produce a lethal current. However, voltage as low as 30 volts DC or AC RMS should be considered dangerous and hazardous since it can produce a lethal current under certain conditions.

Your normal work habits should include all accepted practices that will prevent contact with exposed high voltage, and that will steer circuit away from your heart in case of accidental contact with a high voltage you will significantly reduce the risk factor if you know and observe the following safety precautions:

1. Don't Expose High Voltage needlessly. Remove housing and covers only when necessary. Turn off equipment while making test connections in high voltage circuits.
2. Use an insulated floor material or a large insulated floor mat to stand on, and an insulated surface on which to place equipment : And make certain such surfaces are not damp or wet, where insulated floor surface is not available, wear heavy gloves.
3. On test instruments or any equipment with a 3-wire AC power plug, use only a 3-wire outlet. This is a safety feature to keep the housing or other exposed elements at earth ground.
4. If possible familiarize yourself with the equipment being tested and the location of its high voltage points However, remember that high voltage may appear at unexpected points in defective equipment.
5. Also remember that line voltage is present on some power input circuit points such as on-off switches, fuse, power transformers, etc., Even when the equipment is turn off.
6. Never work alone. Someone should be near by to render aid if necessary. First aid training is highly recommended.

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## INTRODUCTION

The AO-3001C sinewave oscillator oscillated the audio signal in frequency from 10Hz to 1MHz in 5 overlapping ranges.

In most measurements, this oscillator can be used without a external frequency counter because the output frequency is direct readout by 4digit green L.E.D display.

The oscillator has a push button key S.W for range selection and the easy operable step attenuator.

This compact and light weight instrument is very useful for R&D laboratories, factory, and field service of various electronic equipment as a signal source for high performance audio instruments.

## ELECTRICAL SPECIFICATIONS

FREQUENCY RANGE : 10Hz to 1MHz, IN 5 decade steps, variable.  
control 10 : 1(overlapping ranges.)

× 1 RANGE : 10Hz to 100Hz  
× 10 " : 100Hz to 1KHz  
× 100 " : 1KHz to 10KHz  
× 1K " : 10KHz to 100KHz  
× 10K " : 100KHz to 1MHz

FREQUENCY ACCURACY : 4 digit  $\pm 1$  count

### ■ SINE WAVE CHARACTERISTICS

OUTPUT VOLTAGE : 8Vrms or more(open circuit)  
OUTPUT IMPEDANCE : Approx. 600 $\Omega$  or 50 $\Omega$ , selectable. ( $\pm 5\%$ )  
(UNBALANCED)

FREQ. CHARACTERISTICS :  $\pm 0.2$ dB for 10Hz to 100KHz  
(REF. 1KHz) :  $\pm 0.5$ dB for 100KHz to 1MHz

DISTORTION FACTOR : 500Hz-100KHz : 0.1%  
: 50Hz-500KHz : 0.5%  
: 10Hz-1MHz : 1.5%

### ■ SQUARE WAVE CHARACTERISTICS

OUTPUT VOLTAGE : 10V p-p or more.  
OVERSHOOT : 2% or less(at 1KHz, MAX. output)  
RISE AND FALL TIME : 200 nSec or less(at MAX. output)  
DUTY RATIO : 50%  $\pm 5\%$ (at 1KHz, MAX. output)

# GENERAL INFORMATION

## EXTERNAL SYNCHRONIZATION CHARACTERISTICS

SYNCHRONIZING RANGE :  $\pm 1\%/V_{rms}$   
 MAX. INPUT VOLTAGE : 10Vrms  
 INPUT IMPEDANCE : Approx. 10K $\Omega$

## OUTPUT ATTENUATOR (MIN. 100dB)

4 STEP ATTENUATOR : 0dB, -10dB, -20dB, -40dB(Accuracy  $\pm 1$ dB)  
 VARIABLE : -60dB or more

## FREQUENCY COUNTER CHARACTERISTICS

FREQUENCY RANGE : 10Hz to 1MHz  
 DISPLAY : 4 digit green L.E.D display  
 SENSITIVITY : KHz RANGE : 100mV, MHz RANGE : 300mV  
 INPUT IMPEDANCE : 1M $\Omega$ //25pF  
 MAX. INPUT VOLTAGE : 150 Vrms(at 1KHz)  
 TIME BASE : 3.579545 MHz  
 ACCURCY : TIME BASE ERROR  $\pm 1$ COUNT

\*Display and Decimal point position

SENSITIVITY	RANGE	DISPLAY	UNIT
100mV	$\times 1, \times 10$	9999	Hz
	$\times 100, \times 1K$	99.99	KHz
300mV	$\times 10K$	999.9	KHz

Table(1)

**SPECIAL FUNCTION** : 400Hz, 1KHz (usable in audio and modulation)  
 Accuracy  $\pm 0.5\%$

## SUPPLIED ACCESSORIES

1. Operator's Manual..... 1
2. BNC to BNC cable ..... 1
3. Power Cord ..... 1
4. Spare fuse..... 1

\* Specifications are subject to change without notice.

## INTRODUCTION

This section provides all information necessary to install the AO-3001C. Covered in this section are initial inspection, preparation for use, operating environment, and repacking for shipment.

## INITIAL INSPECTION

Inspect the shipping container for damage, if the shipping container or cushioning material is damaged, it should be kept until the content of the shipment have been checked for completeness and the shipment has been checked mechanically and electrically.

If the contents are incomplete, if there is mechanical damage or defect, notify the nearest GOLDSTAR representative.

If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the GOLDSTAR representative.

Keep the shipping material for the carrier's inspection.

## PREPARATION FOR USE

The AO-3001C requires a power source of 100V/120V/220V/240V AC  $\pm 10\%$ , 50Hz/60Hz single phase, power consumption is 15 VA maximum.

## LINE VOLTAGE SELECTION

### CAUTION

**Before switching on this instrument, make sure the instrument it set to the voltage of the power source.**

**The voltage at which the unit has been factory set, is indicated on the rear panel voltage selector.**

1. Disconnect the power cable.
  2. Pull out the fuse holder FIG. (2).
  3. Select operation voltage by orienting fuse holder to position desired voltage according to  $\nabla$  mark on the AC INLET.
  4. Re-insert the fuse holder AC INLET. Be careful to select correct fuse value.
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# INSTALLATION

OPERATING VOLTAGE	FUSE
100V OR 120V	0.5A 250V
220V OR 240V	0.2A 250V

Table. (2)

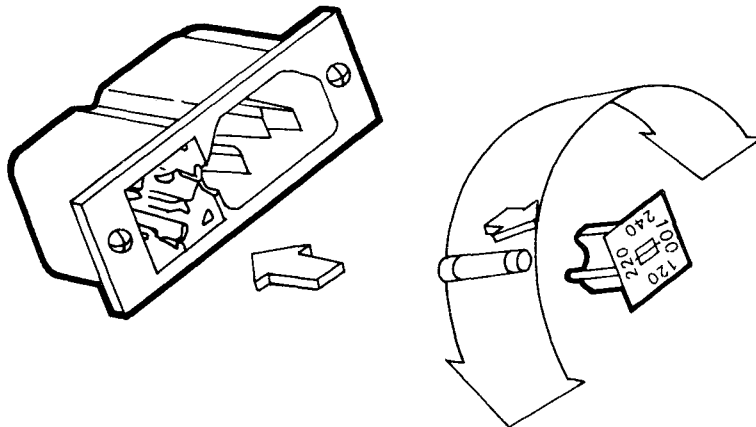


FIG. (1). VOLTAGE AND FUSE SELECTION

## CAUTION

**Make sure that only fuses for the required rated current and of the specified type are used for replacement.**

## OPERATING ENVIRONMENT

- (1) **TEMPERATURE** : The instrument may be operated in temperatures from 0°C to + 40°C
- (2) **HUMIDITY** : The instrument may be operated in environments with relative humidities to 85% to 40°C. However, the instrument must be protected from temperature extremes which cause condensation within the instrument.

## STORAGE ENVIRONMENT

The instrument may be stored or shipped in environments within the following limits.

- (1) **TEMPERATURE** : -20°C to +70°C
- (2) **HUMIDITY** : below 85% RH

PANEL CONTROL  
FRONT PANEL AND INDICATOR

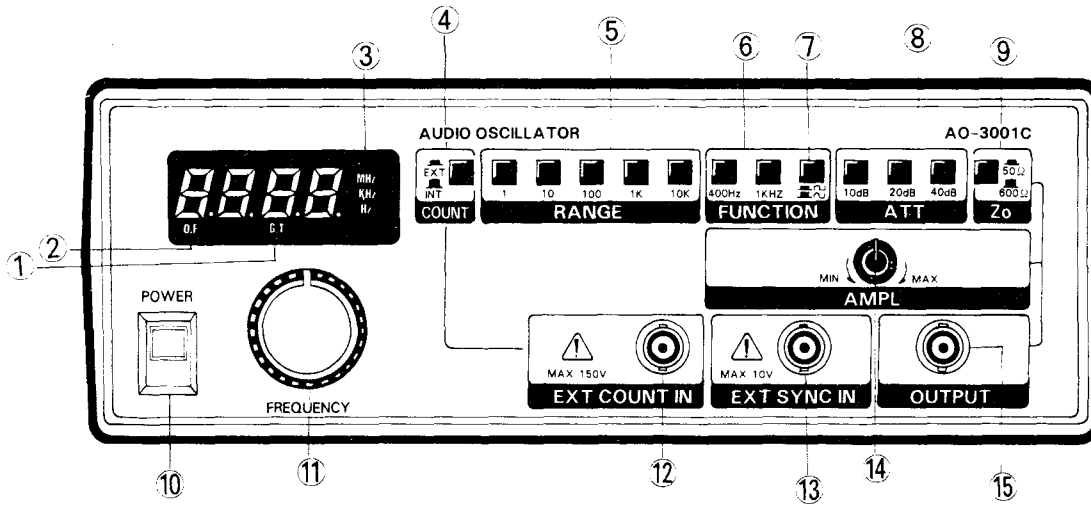


FIG.(2). FRONT PANEL OPERATOR'S CONTROLS

- ① GATE TIME INDICATOR.  
The indicator show gate time of INT/EXT frequency counter.
- ② OVERFLOW INDICATOR.  
The overflow indicator will be lighting when desired measuring frequency range is overflowed.
- ③ Hz, KHz INDICATOR : Frequency counting unit.
- ④ INT/EXT FREQUENCY COUNTER SELECT S.W.  
Push in : External frequency counter  
Push out : Internal frequency counter.
- ⑤ FREQ. RANGE S.W. : Frequency range select switch.
- ⑥ PROGRAMED S.W.(400Hz, 1KHz)  
When pressed to the switch, to be continuously output for programed frequency without frequency range and variable.
- ⑦ WAVEFORM SELECTOR S.W.  
Output waveform selector switch, when Push out "■", output signal is sinewave, when Push in "■", the signal is square wave.



## OPERATION

⑧ ATTENUATOR.

4-position output attenuator select attenuations of 0 dB to -70 dB.

⑨ OUTPUT IMPEDANCE. ( $Z_o$ )

Push in : output impedance is  $50\Omega$ .

Push out : output impedance is  $600\Omega$ .

⑩ POWER S.W. : Rocker type switch turn on the power when pressed.

⑪ FREQUENCY DIAL. : This dial adjust oscillating frequency.

⑫ EXT. COUNTER INPUT BNC.

This input BNC can be use of external frequency counter.

⑬ EXT. SYNC. INPUT. BNC.

External synchronizing signal input BNC for connection of synchronizing signal to AO-3001C.

⑭ AMPLITUDE VR.

Amplitude adjust to continuously vary the amplitude of output voltage.

⑮ OUTPUT BNC. : Output BNC used for both sinewave and squarewave.

### ■ REAR PANEL DISCRIPTIONS

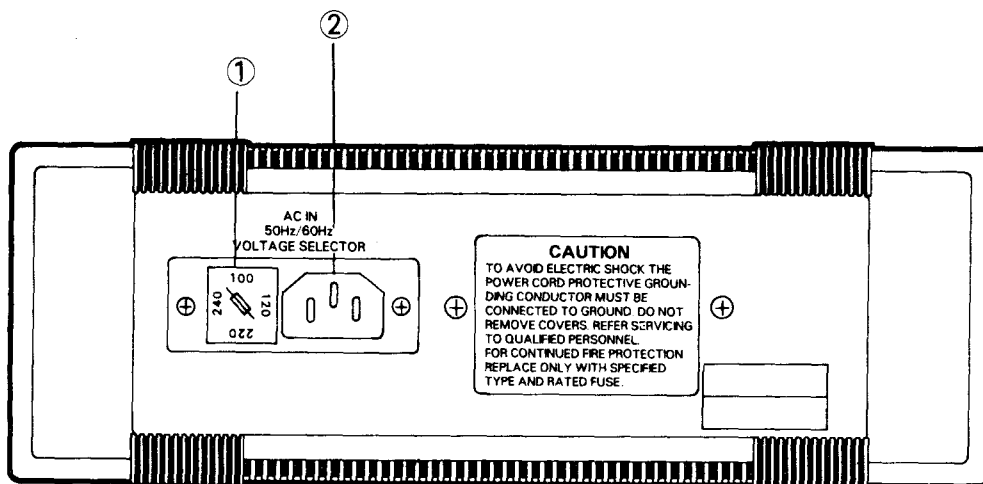


FIG.(3). REAR PANEL

① VOLTAGE SELECTOR WITH FUSE HOLDER.

AC power of 100V, 120V, 220V, 240V may be used by changing the position of the selector.

② AC INLET.

For connection of the supplied AC power cord.

### OPERATING INTRODUCTIONS

This test will allow you to check the functions of unit at certain time intervals without using any special test equipment, to obtain the normal operating temperature, the power switch should be turned on at least 10 minutes before starting the test.

### ■ MEASURING EQUIPMENT REQUIRED

- (1) Oscilloscope, Bandwidth  $\geq 20\text{MHz}$
- (2) Frequency Counter bandwidth  $\geq 10\text{MHz}$
- (3) Distortion analyzer
- (4) BNC cable
- (5) Termination( $50\Omega$ ,  $600\Omega$ )

### ■ POWER ON SELF CHECK

- (1) Before switching on the instrument, ensure that the power voltage is matched to the voltage setting of the instrument, the setting voltage is indicated in the voltage selector on the rear panel of the instrument.  
<Refer to FIG.(1).voltage and fuse selection>
- (2) Set frequency range S.W ⑤ to the push on position.
- (3) Select the sine or square waveform output, using the push button switch ⑦.
- (4) Adjust to the amplitude VR medium range.
- (5) Connect BNC cable to the oscilloscope input.
- (6) Press the power switch ⑩ the unit is ready for operation.  
Allow about 10 minutes for the unit to warm up so that it is stabilized.

## OPERATION

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- (7) Press the waveform select switch ⑦ to the "■" position to obtain sine waves.  
Press the switch to the "■" position for square waves.

### ■ FREQUENCY SELECTION

Set the freq. range switch ⑤ to the desired range, then set the frequency dial ⑪ so that indicates your frequency.

EXAMPLE: TO SET THE 5KHz.

- (1) Press the freq. range switch ⑤  $\times 100$ .
- (2) Set the pointer of the frequency dial to "50" on the mid position.  
The frequency thus selected is :  $50 \times 100 = 5\text{KHz}$

### ■ ADJUSTMENT OF OUTPUT VOLTAGE

The output voltage from OUTPUT BNC ⑮, be it sine wave or square wave, can be continuously varied by AMPLITUDE VR ⑭ and stepped by attenuator ⑧.

EXAMPLE : TO ADJUST OUTPUT VOLTAGE TO 10 mVrms PROCEED AS FOLLOWS :

- (1) Connect a voltmeter capable of measuring AC 1 Vrms to output BNC.
- (2) Set the attenuator to (0) dB and then adjust amplitude VR until the voltmeter indicates 1 Vrms. A voltage 1 Vrms will appear at output BNC.
- (3) Set attenuator to -40dB. The voltage of 10 mVrms appears at OUTPUT BNC.

### ■ SPECIAL FUNCTION (PROGRAMED FREQUENCY)

Programed frequency(400Hz, 1KHz) usable in audio mode, and modulation, in this function, frequency is continuously output programed frequency without frequency range switch and variable.

### ■ OUTPUT IMPEDANCE( $Z_o$ )

The AO-3001C provides two output of different impedance the values  $600\Omega$  or  $50\Omega$  respectively allow on easy adaptation to the different measuring applications.

### NOTE

Carefully select the cable used for the output connector  
because some cable cause poor frequency characteristics  
for sine waveform and poor leading edge characteristics for square waveform.

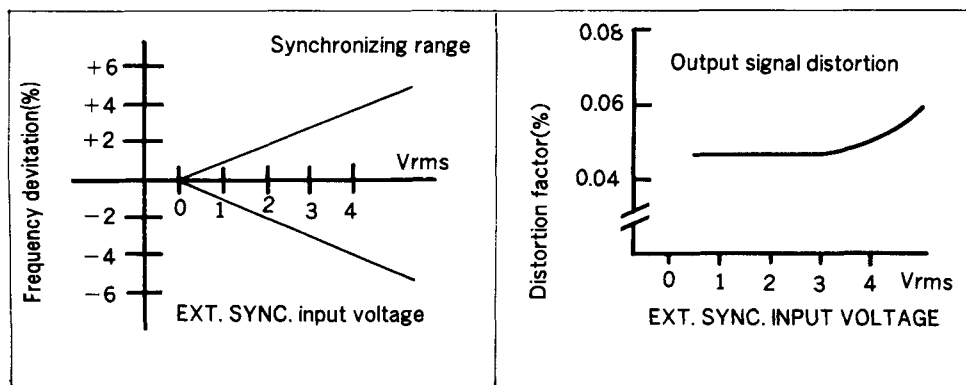
## EXTERNAL SYNCHRONIZING INPUT

By applying an external sinewave signal to EXT SYNC in BNC ⑬, the oscillating frequency of AO-3001C can be synchronized to the external signal. The synchronizing range is increased in proportion as the input voltage is increased as shown in FIG. (4), indicating that the synchronizing range is about  $\pm 1\%$  per input voltage of 1V.

**EXAMPLE :** Suppose that the input signal voltage is 1Vrms and the oscillating frequency of AO-3001C is between 990Hz to 1010Hz ( $1\text{KHz} \pm 1\text{KHz} \times 1\%/V \times 1V = 1\text{KHz} \pm 1\text{KHz} \times 0.01$ ), the frequency can be synchronized with 1KHz of input signal.

### NOTE

Never apply an external voltage of 10V or more (peak value of AC and DC) to the EXT SYNC.IN BNC. It will be affect the amplitude and distortion factor. Also, note that if the synchronizing signal is largely deviated from the frequency of AO-3001C, the synchronization is pulled out which affects the distortion factor, it is therefore advisable that the oscillating frequency be first synchronized with a low input signal voltage (less than 1Vrms) and then the voltage be increased.



**FIG. (4). EXT. SYNC. INPUT V. S FREQUENCY DEVIATION AND DISTORTION**

## OPERATION

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### ■ EXTERNAL FREQUENCY COUNTER

#### USE AS EXTERNAL FREQUENCY COUNTER

You can take INT/EXT selector switch easily, if you want to use, as an external frequency counter, press the push button switch ④

(**■** : EXTERNAL FREQUENCY COUNTER MODE)

Connect external signal source to EXT INPUT BNC⑫, and then input frequency is displayed on 4 digit green L.E.D display.

The overflow indicator ② will be lighting when desired measuring frequency range is overflowed.

In above case, please select higher frequency range switch ⑤.

### CIRCUIT DESCRIPTION

#### (1) WIEN BRIDGE OSCILLATOR

The Wien bridge oscillator circuit elements consist of the capacitance elements, which may be switched over for 5 range by the frequency range switch, excepted programmed 2 range (400Hz, 1KHz), and the variable resistor controlled by the frequency variable.

The elements provide means to vary the oscillating frequency continuously over 10 times if frequency on one range, thus determining any desired frequency within the entire frequency range from 10Hz to 1MHz.

The amplifier circuit for the oscillator circuit is composed of a 2-stage differential amplifier circuit. First stage is a high input impedance circuit with FET while the driver stage is a wide band, high amplification type circuit with transistors featuring high cut-off frequency.

The output stage is a S.E.P.P. circuit using complementary transistors.

The output voltage is feedback with positive polarity through the oscillator elements to form an oscillating circuit, while it is also feedback with negative polarity through the non-linear thermistor to stabilize the amplitude.

#### (2) SQUARE WAVE SHAPING CIRCUIT

The square wave shaping circuit is a Schmidt trigger circuit in which the sine wave signal from the oscillator circuit is shaped into a square wave. It is composed of an emitter coupled Schmidt trigger circuit and a buffer amplifier, thus providing sufficient rising and falling characteristics.

#### (3) OUTPUT CIRCUIT

The output circuit converts the impedance of signal from the OUTPUT control and feeds the signal to the output attenuator at a low impedance.

It is a S.E.P.P. O.C.L circuit employing complementary transistor to provide sufficiently low output impedance characteristics over the range from DC to 1MHz.

#### (4) OUTPUT ATTENUATOR

The 4 position output attenuator selects attenuations of 0dB to -70dB. At the 0dB position with the output amplitude VR control turned fully clockwise, the output voltage (sine wave : open circuit) is more than  $8V_{rms}$

The output impedance is rated for  $600\Omega$  or  $50\Omega$ .

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## **GENERAL DESCRIPTION**

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### **(5) POWER SUPPLY**

The power supply circuit is powered by AC (100V, 120V, 220V, 240V) and delivers DC  $\pm 22V$  sufficiently stabilized by large capacity smoothing capacitors and a voltage stabilizer.

## **APPLICATIONS**

### **■ USE AS SINEWAVE OSCILLATOR**

The AO-3001C can be used as a sine wave oscillator as outlined below.

- (1) The unit features low distortion factor, it can be used for measurement of distortion characteristic of amplifier.
- (2) The unit features wide bandwidth, it can be used for measurement of characteristic of amplifier.
- (3) Can be used as a signal source of impedance bridge.
- (4) The built-in frequency counter direct read out internal frequency and can be used external frequency counter.

### **■ USE AS SQUARE WAVE OSCILLATOR.**

The AO-3001C features excellent rising and falling characteristics.

It has no coupling capacitors in the output stage, so the SAG(deflection of top section) is as low as 5% at 50Hz. By applying such a good square wave to an amplifier input, various characteristics of amplifier can be observed on an oscilloscope.

## **CAUTION**

### **(1) CONNECTING LEADS SHOULD BE AS SHORT AS POSSIBLE.**

Use of a long shield cable will affect high frequency amplitude characteristics because of its own line capacitance.

### **(2) OUTPUT WAVEFORM AFTER SWITCHING ON.**

Because of the use of direct coupled circuits throughout the entire stage, DC voltage will appear about 20 to 30 seconds later when normal output waveform is obtained.

## GENERAL DESCRIPTION

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### (3) OUTPUT VOLTAGE VARIATION DUE TO AMBIENT TEMPERATURE.

A thermistor is used to control the oscillating voltage.

Care should be excessive temperature variation because the thermistor is normally affected by ambient temperature variation.

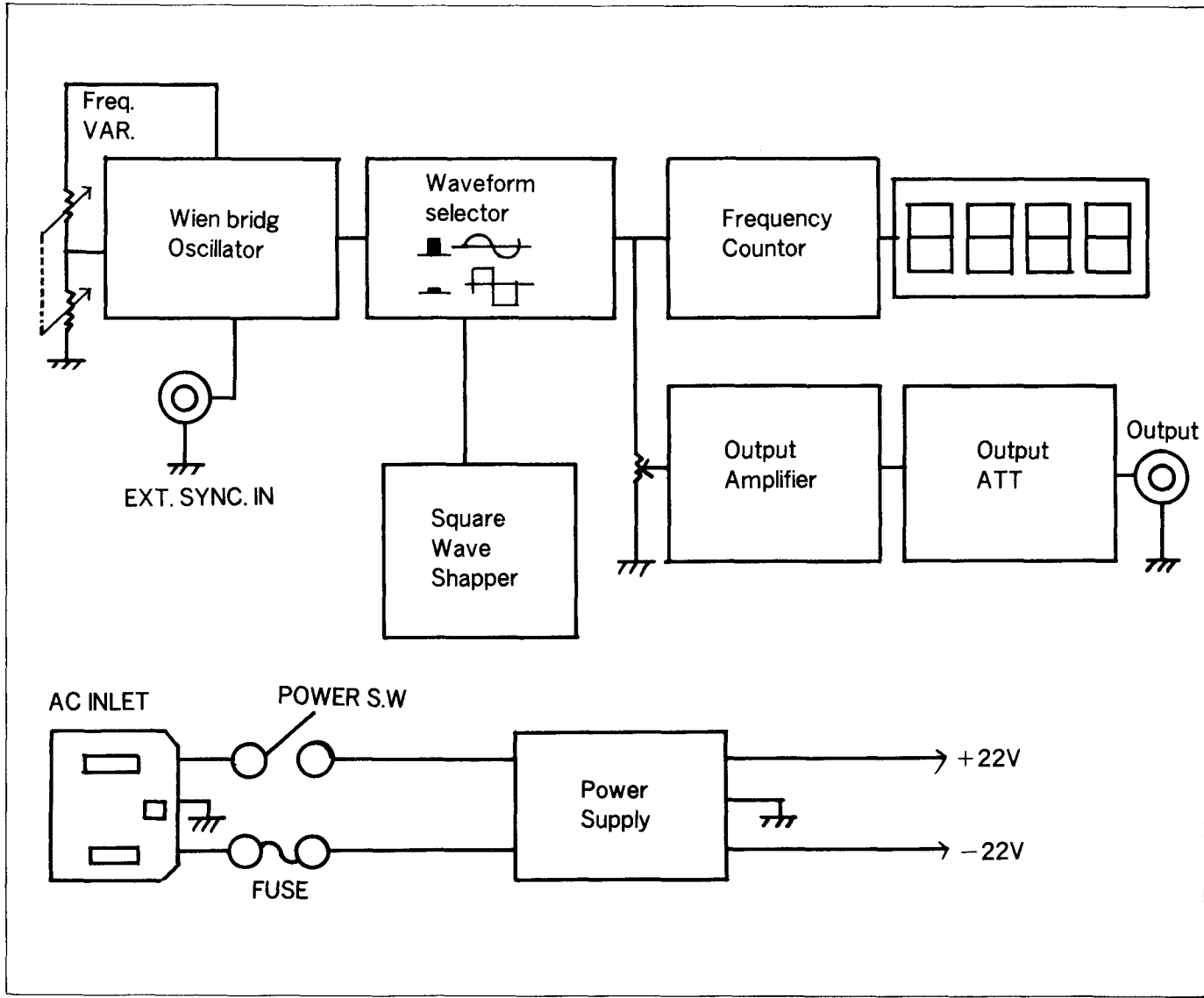
### (4) IMPEDANCE MATCHING.

Any related equipment to be connected to OUTPUT BNC should be checked to see that its input impedance matches the output impedance AO-3001C(600 $\Omega$  or 50 $\Omega$ )



**BLOCK DIAGRAM & COMPONENT LOCATION**

**BLOCK DIAGRAM**



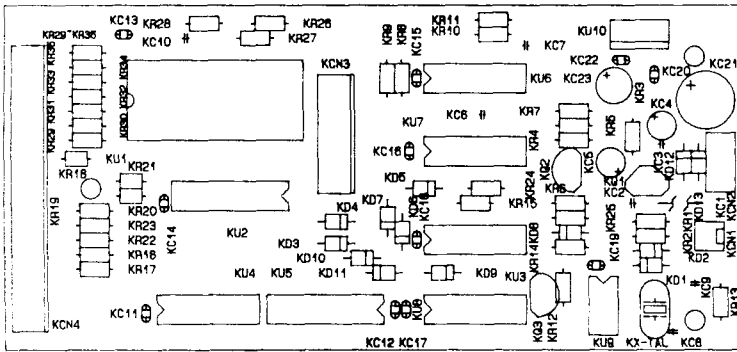
# BLOCK DIAGRAM & COMPONENT LOCATION

## COMPONENT LOCATION

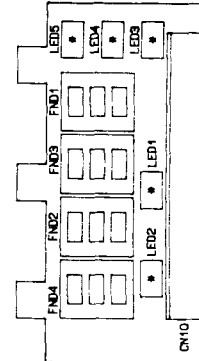
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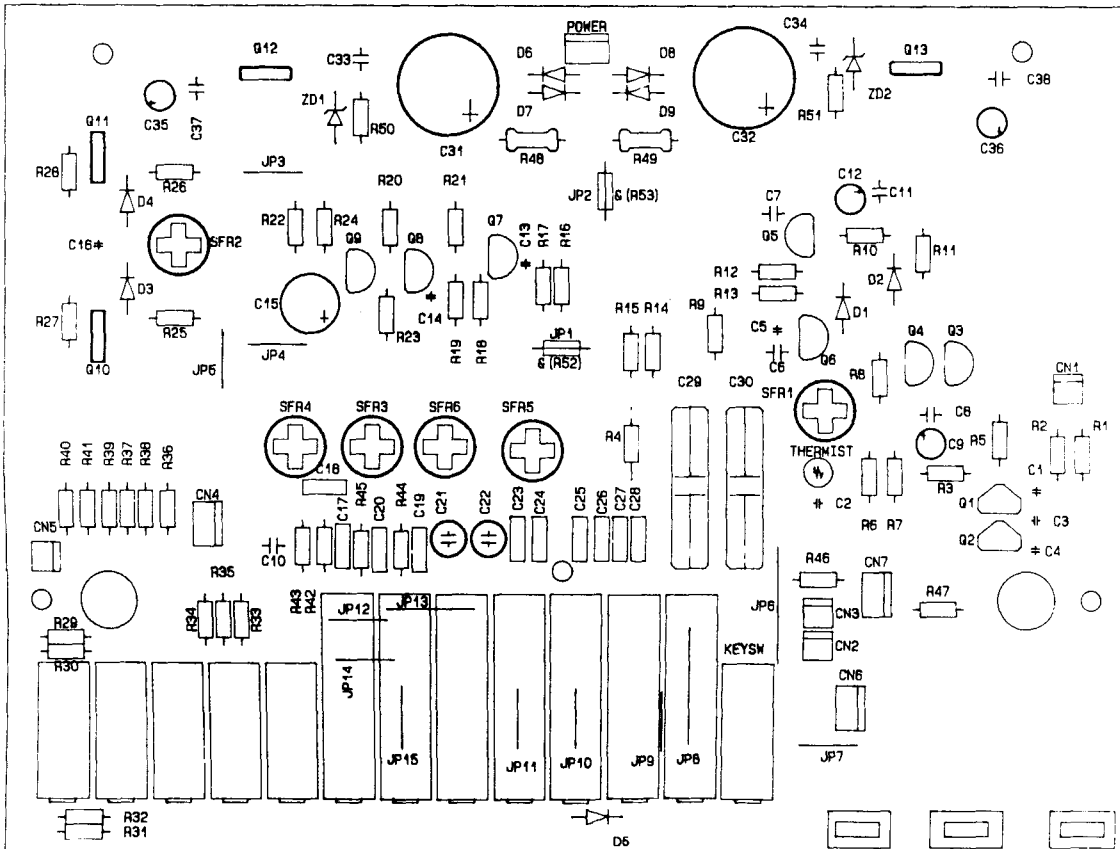
### FREQUENCY COUNTER



### DISPLAY



### MAIN



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