

INSTRUCTION MANUAL

WOW FLUTTER METER

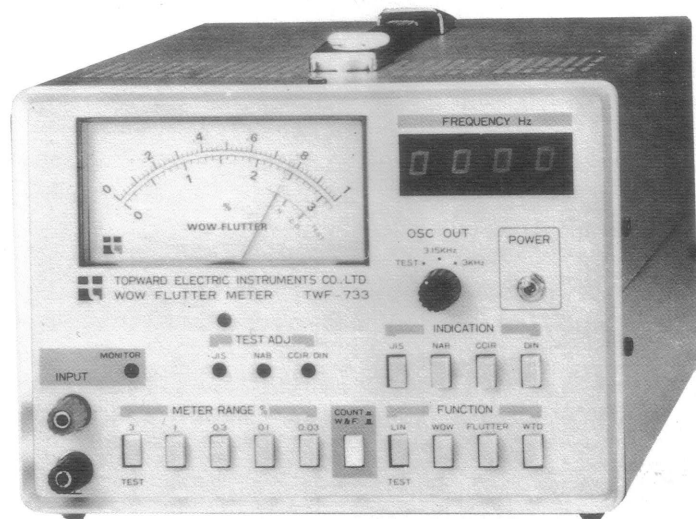
MODEL:TWF-733/736

TOPWARD

TABLE of CONTENTS

Picture of Model TWF-733.....	1
Introduction.....	2
Before We Begin.....	5
Front / Rear Panels of Controls and Connectors.....	6
Front / Rear Panels Functional Descriptions.....	7
Operating Instructions.....	10
Block Diagram.....	13
Circuit Diagrams.....	14
Specifications.....	20

PICTURE of MODEL TWF-733



INTRODUCTION

Application

1. The Model TWF-733 and TWF-736 is designed for test and adjustment of the following equipment.

- A. Tape recorders and tape players.
- B. Video tape recorders.
- C. Disc players.
- D. Playback apparatus of the movies.

2. Measurement Capabilities

The Model TWF-733 and TWF-736 is capable of following measurements.

- A. Wow flutter measurement based on the specification of DIN, CCIR, NAB (National Association of Broadcasters) and JIS (Japanese Industrial Standard).
- B. Tape speed measurement with a built-in 4-digit frequency counter.
- C. Weighted wow flutter measurement based on each specification of DIN, CCIR, NAB or JIS.

D. Separate measurement of wow and flutter.

E. Waveform observation, period measurement and analysis of the cause of wow and flutter with use of an oscilloscope.

Features

1. This instrument contains a wow flutter meter and a frequency counter in one frame, and each function can independently operate by the pushbutton selection.

2. Wow flutter is measured in peak value, average value and rms value based on the specification of DIN, CCIR, NAB and JIS respectively.

3. The TWF-733 and TWF-736 is capable of measuring the weighted wow and flutter characteristics on each standard and the linear wow flutter measurement as well as separate measurement of wow or flutter.

4. With use of an oscilloscope, the waveforms and period of wow and flutter can directly be observed on the screen of CRT.

5. The tape speed can be read on the LEDs display of newly designed flickerless frequency counter.

6. Linear meter indication circuit results in uniformly sealed meter.

7. Ratio FM demodulator circuit to detect $\Delta f/f_i$ is employed.

8. The error of meter can be checked.

Handling Precautions

1. This instrument operates satisfactorily on a line voltage plus or minus 10 percent the rated voltage. Check your line voltage prior to use of this instrument and confirm the voltage is within $\pm 10\%$ of the rated voltage.

2. To avoid damage, any external voltage should not be connected the terminals except for the input connectors.

3. The operating temperature range is from 0°C to 40°C .

4. Allow more than 10 minute warmup time after switch on for the normal use.

BEFORE WE BEGIN

Your Topward TWF-733 and TWF-736 are packed in styrofoam to protect it during shipment. You should keep this material, and the shipping box, in case the unit must be moved or shipped again.

The box should contain the following items:

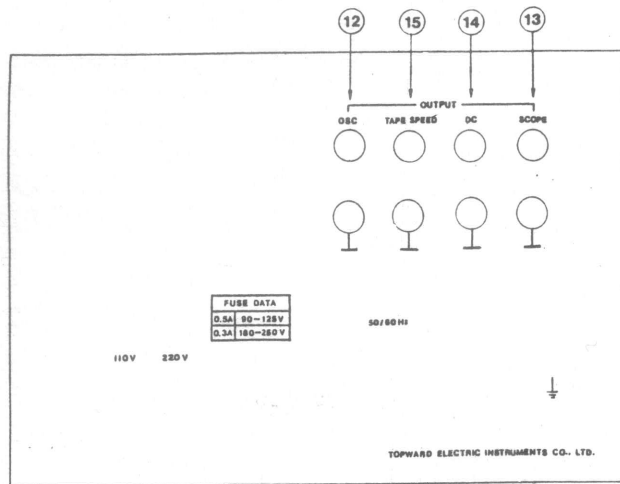
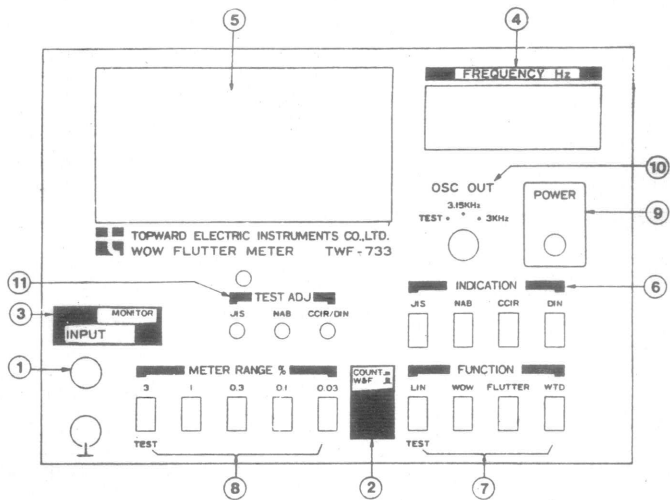
Model TWF-733, TWF-736 Wow Flutter Meter
Removable AC line cord
BNC to Alligator clip cable
Instruction manual

Please check to see that all of the above items are included. You should contact your Topward dealer if anything is missing.

FRONT / REAR PANELS OF CONTROLS AND CONNECTORS

Figure 1

Figure 2



FRONT / REAR PANELS FUNCTIONAL DESCRIPTIONS

The following is an explanation of the function of the front and rear panel controls and connectors. Please refer to figure 1 and 2 for location of each control/connector.

1. INPUT - Connector to apply an input signal to be measured.
2. W & F / COUNT - Pushbutton switch to select wow flutter measurement or frequency measurement.
3. MONITOR - Lamp to monitor the input level. When it lights up in wow flutter measurement or frequency measurement, it shows ready for measurement. When this lamp is not on, the signal selected with the OSC OUT (10) switch is applied to the INPUT (1) connector.
4. FREQUENCY Hz - LEDs to show the frequency of input signal under test. During the measurement of wow and flutter, the tape speed can simultaneously be measured in the bandwidth of $3 \text{ KHz} \pm 200 \text{ Hz}$.
5. WOW % METER - Meter to directly read wow and flutter component.
6. INDICATION
 - A. DIN: To be used for wow flutter measurement based on the specification of DIN.

B. CCIR: To be used for wow flutter measurement based on the specification of CCIR (International Radio Consultative Committee).

C. NAB: To be used for wow flutter measurement based on the specification of NAB (National Association of Broadcasters).

D. JIS: To be used for wow flutter measurement based on the specification of JIS (Japanese Industrial Standard).

7. FUNCTION

A. WTD: To be used for measurement of wow flutter of the weighted signal based on the specification of JIS or CCIR.

B. WOW: To be used for measuring the wow component (0.5 to 6 Hz) separated from the input signal to be measured.

C. FLUTTER: To be used to measure the flutter component (6 to 200 Hz) separated from the input signal to be measured.

D. LINEAR: To be used for measurement of all the components of wow and flutter based on the specification of each standard.

8. METER RANGE - Pushbutton switch to select the most suitable wow flutter range from 0.03, 0.1, 0.3, 1 and 3% full scale in 5 ranges.

9. POWER - Power switch.

10. OSC OUT - Switch to select 3.15KHz or 3KHz which is signal for tape recorders and is available from rear panel OSC OUT (12) terminal. At MOD position FM signal switching 3.15KHz and 3KHz at 5Hz is applied to the INPUT circuit for checking the meter, if there is no input signal to the INPUT (1) connector.

11. TEST ADJ - At TEST position, when the meter indicator deviates from the test scale, bring it on with a potentiometer adjustment.

12. OSC OUTPUT - Signal source for recording.

13. SCOPE OUTPUT - Output terminal for an oscilloscope to observe the waveforms of wow flutter component on the screen of CRT.

14. DC OUTPUT - Approx. 2.5 V DC output is available at the full scale position of the meter, when the INDICATION (6) switch is selected in DIN, CCIR and JIS.

15. TAPE SPEED OUTPUT - At 3 KHz the output is approx. 0 V according to JIS, NAB and CCIR standard. At 3.15 KHz the output is approx. 0 V according to DIN standard. Tape speed deviation is determined by the voltage appearing at this terminal at the rate of 0.4 V per % of deviation.

OPERATING INSTRUCTIONS

1. Prior to connecting an AC power supply cord, set the switches on the front panel as follows.

FUNCTION: WTD or LINEAR
INDICATION: DIN, CCIR, NAB or JIS
METER RANGE: 3%

In case the recording is firstly needed, connect the output cable from OSC OUTPUT (12) on the rear panel to the recorder input.

2. Connect the AC power supply cord to an AC outlet. Push on the POWER (9) pushbutton switch and check the LEDs of the frequency counter light up.

3. To measure wow flutter and tape speed, push out the W & F / COUNT (2) pushbutton switch, and then connect the playback signal obtained from a tape recorder or other recording devices to the INPUT (1) connector.

4. When the connected input signal level is exceeding the rated input level enough to measure wow and flutter component, the MONITOR (3) lamp lights up and it shows ready for measurement.

Even if the MONITOR (3) lamp lights up, the normal measurement is not available unless the FREQUENCY (4) counter shows the frequency of input signal within $3.15\text{KHz} \pm 200\text{Hz}$.

5. For measuring wow and flutter, check if the MONITOR (3) lamp lights up and the FREQUENCY (4) counter display is within $3.15\text{KHz} \pm 200\text{Hz}$. The meter range should be positioned in the most suitable range to meet your requirements.

6. The tape speed can be monitored on the display tubes of the 4-digit counter simultaneously with wow flutter measurement. The tape speed monitoring is available no matter in which positions the switches of FUNCTION (7), INDICATION (6) and METER RANGE (8) may be.

7. To measure wow and flutter separately, set the FUNCTION (7) selector in WOW position for wow component measurement and in FLUTTER position for flutter component measurement.

In this case, the measurement results obtained have no relations with the specification of DIN, CCIR, NAB or JIS, but show peak value, average value or rms value when the INDICATION (6) switch is positioned in DIN, CCIR, NAB or JIS respectively.

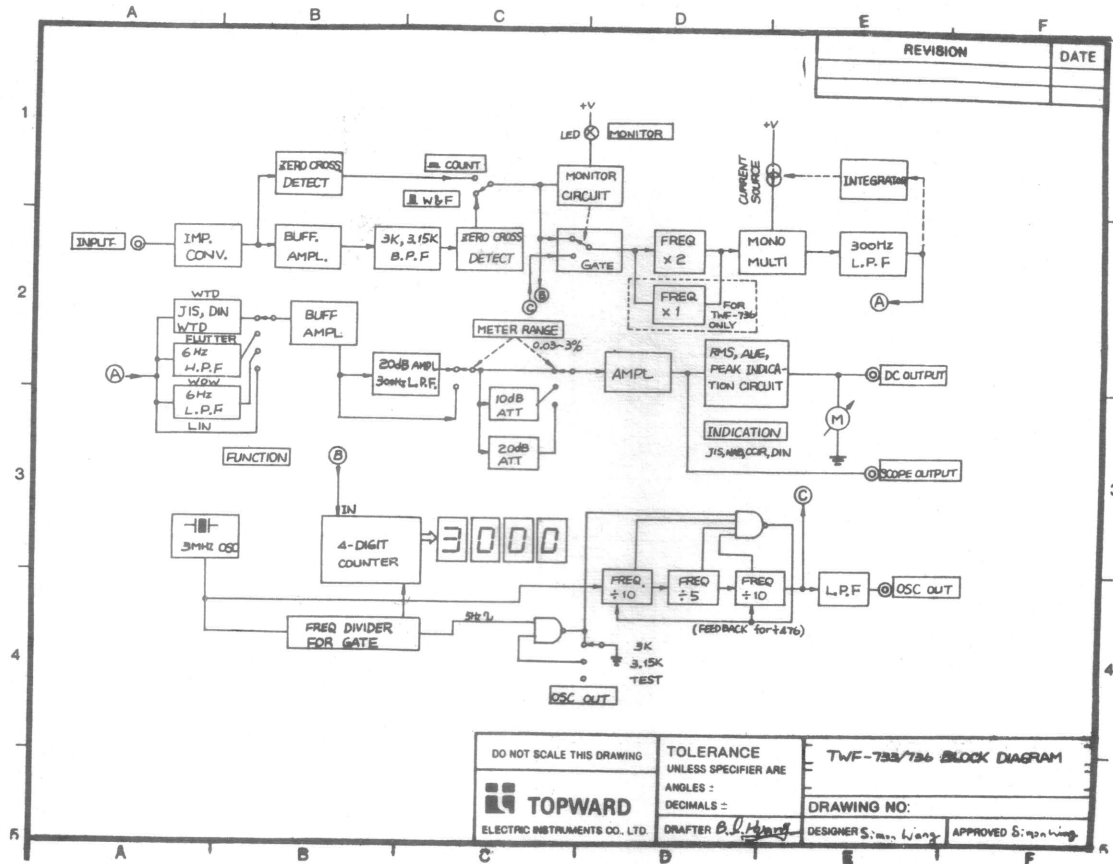
8. Connect a cable from the SCOPE OUTPUT (13) terminal on the rear panel to an oscilloscope to observe waveforms and period.

9. For frequency measurement, set the W & F/COUNT (2) selector pushed in to the FREQ position and apply the input signal to the INPUT (1) terminal.

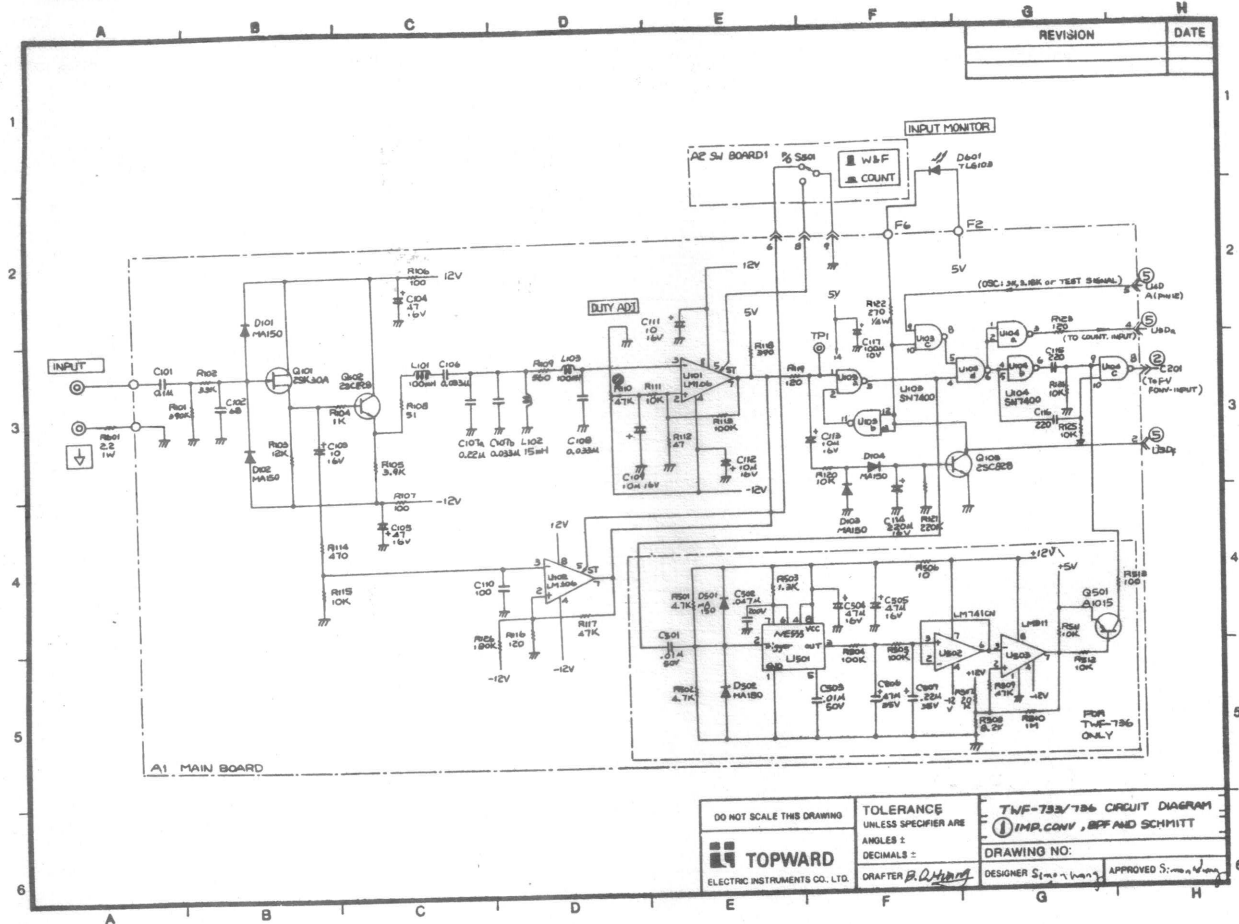
10. The MONITOR (3) lamp lights up for normal operation. The FREQUENCY (4) counter reads the frequency of the signal to be measured in Hz.

11. When the signal with the frequency over 9999 Hz is applied into the INPUT (1) connector, there is no indication for overflow, thus requiring an operator's attention.

BLOCK DIAGRAM

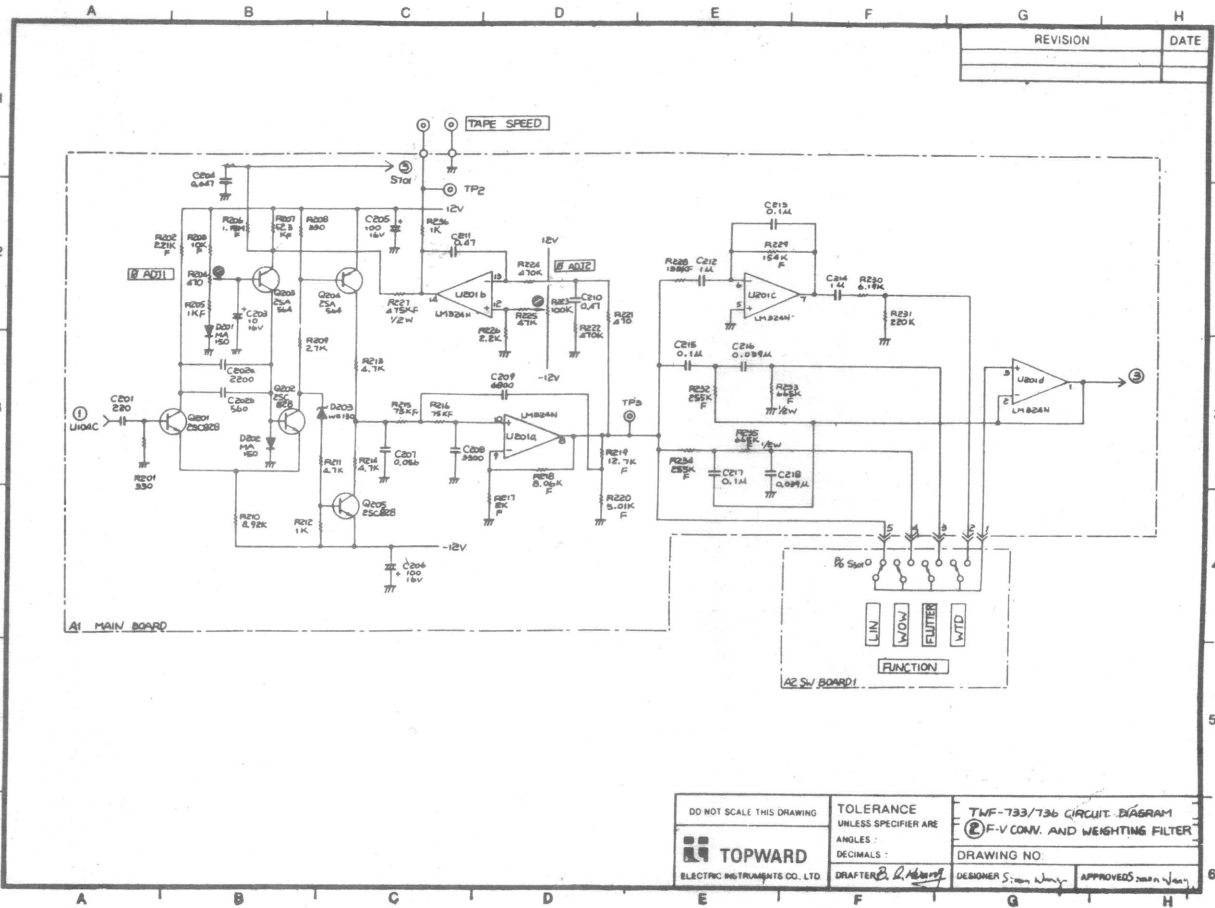


CIRCUIT DIAGRAMS



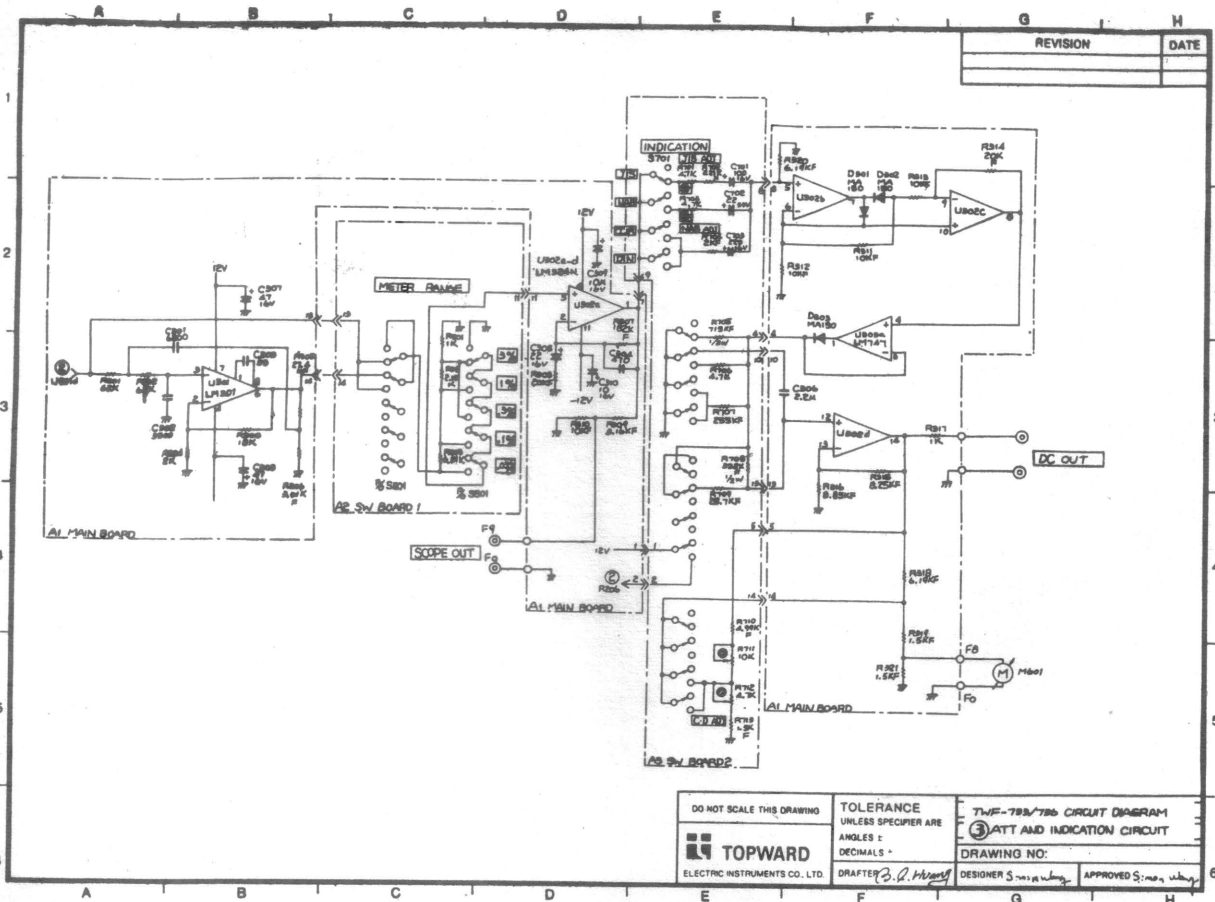
REVISION	DATE

DO NOT SCALE THIS DRAWING	TOLERANCE UNLESS SPECIFIER ARE ANGLES : DECIMALS :	TWF-733/736 CIRCUIT DIAGRAM ① IMP. CONV., BFF AND SCHMITT
TOPWARD ELECTRIC INSTRUMENTS CO. LTD.	DRAFTER <i>B. W. [Signature]</i>	DRAWING NO: [Blank]
	DESIGNER <i>S. [Signature]</i>	APPROVED <i>S. [Signature]</i>



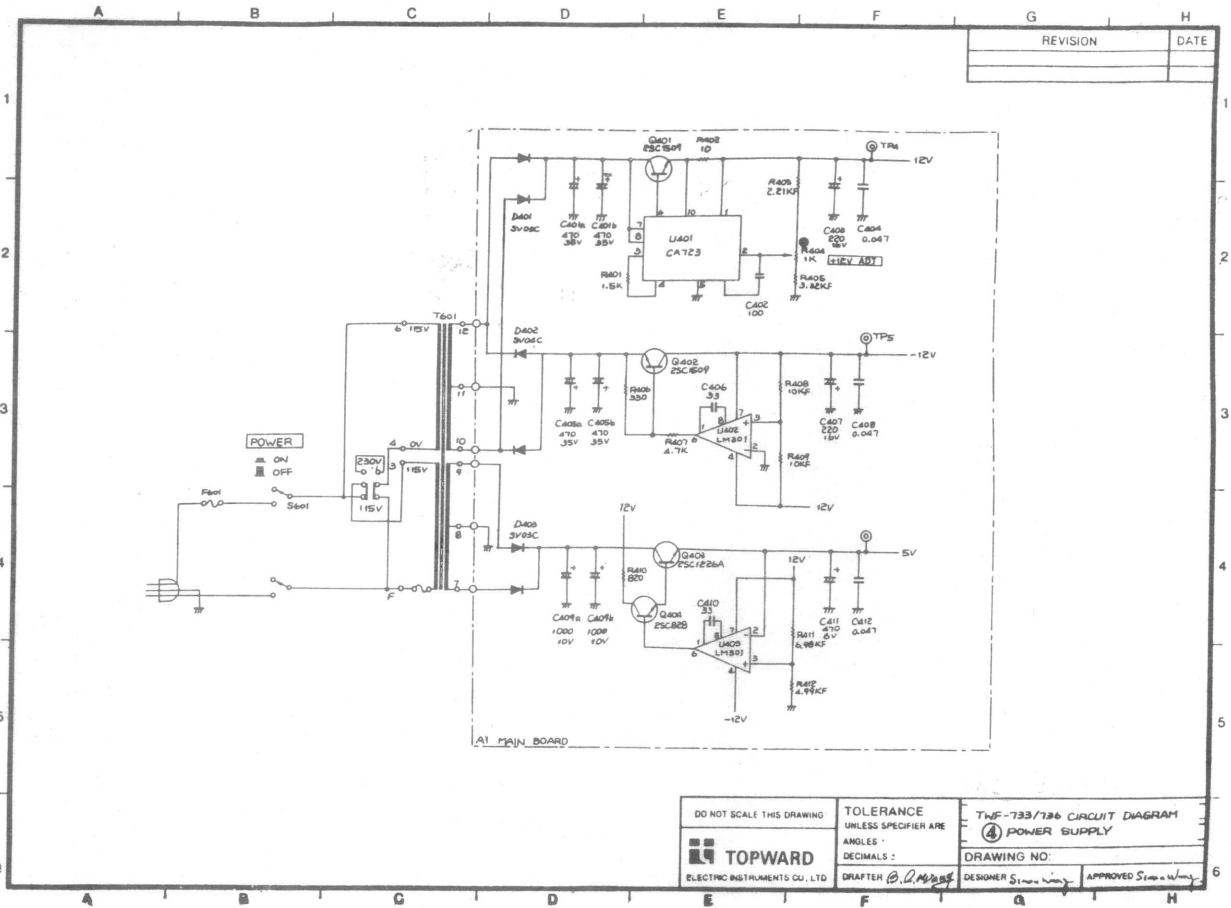
REVISION	DATE

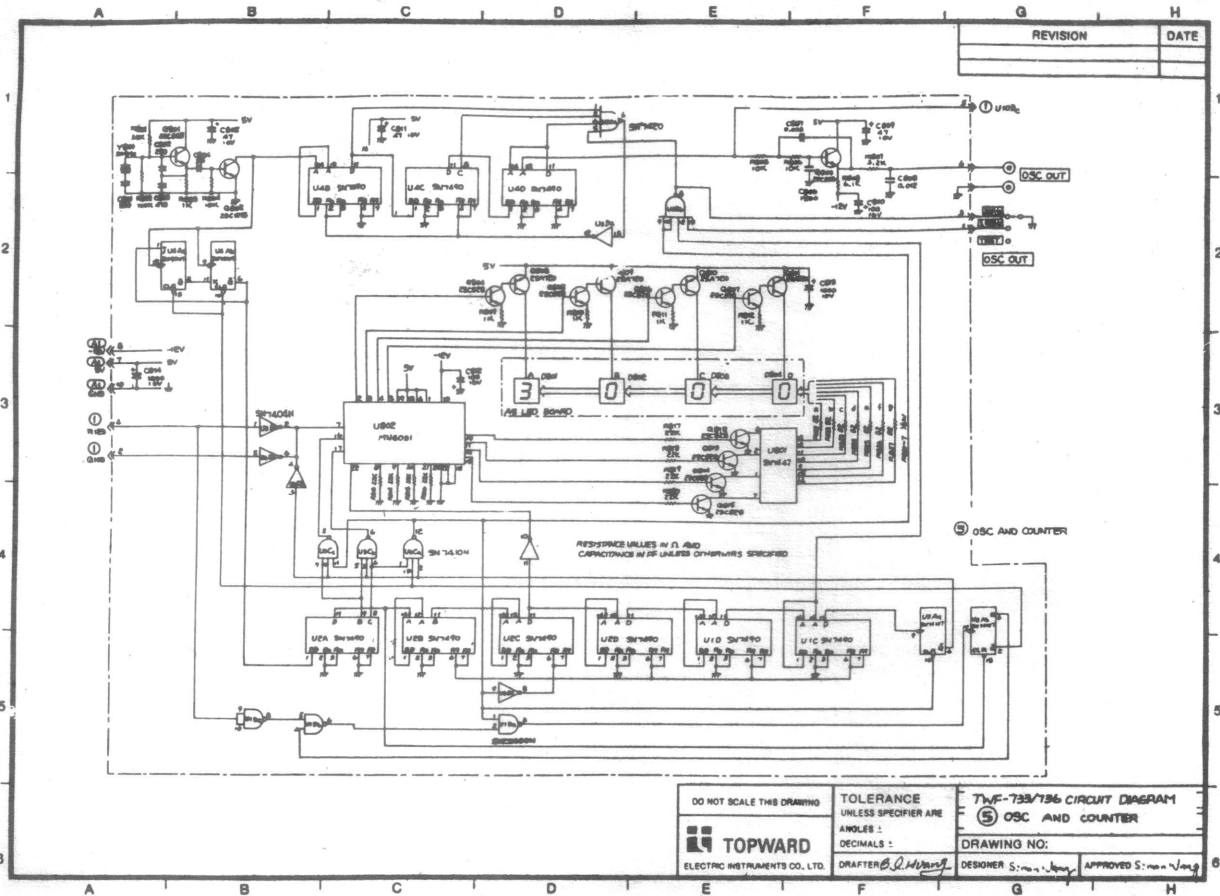
DO NOT SCALE THIS DRAWING	TOLERANCE UNLESS SPECIFIED ARE	TWF-733/736 CIRCUIT DIAGRAM
TOPWARD	ANGLES :	② F-V CONV. AND WEIGHTING FILTER
ELECTRIC INSTRUMENTS CO. LTD.	DECIMALS :	DRAWING NO
DRAFTER: <i>E. R. Adams</i>	DESIGNER: <i>S. W. W. W.</i>	APPROVED: <i>S. W. W. W.</i>



REVISION	DATE

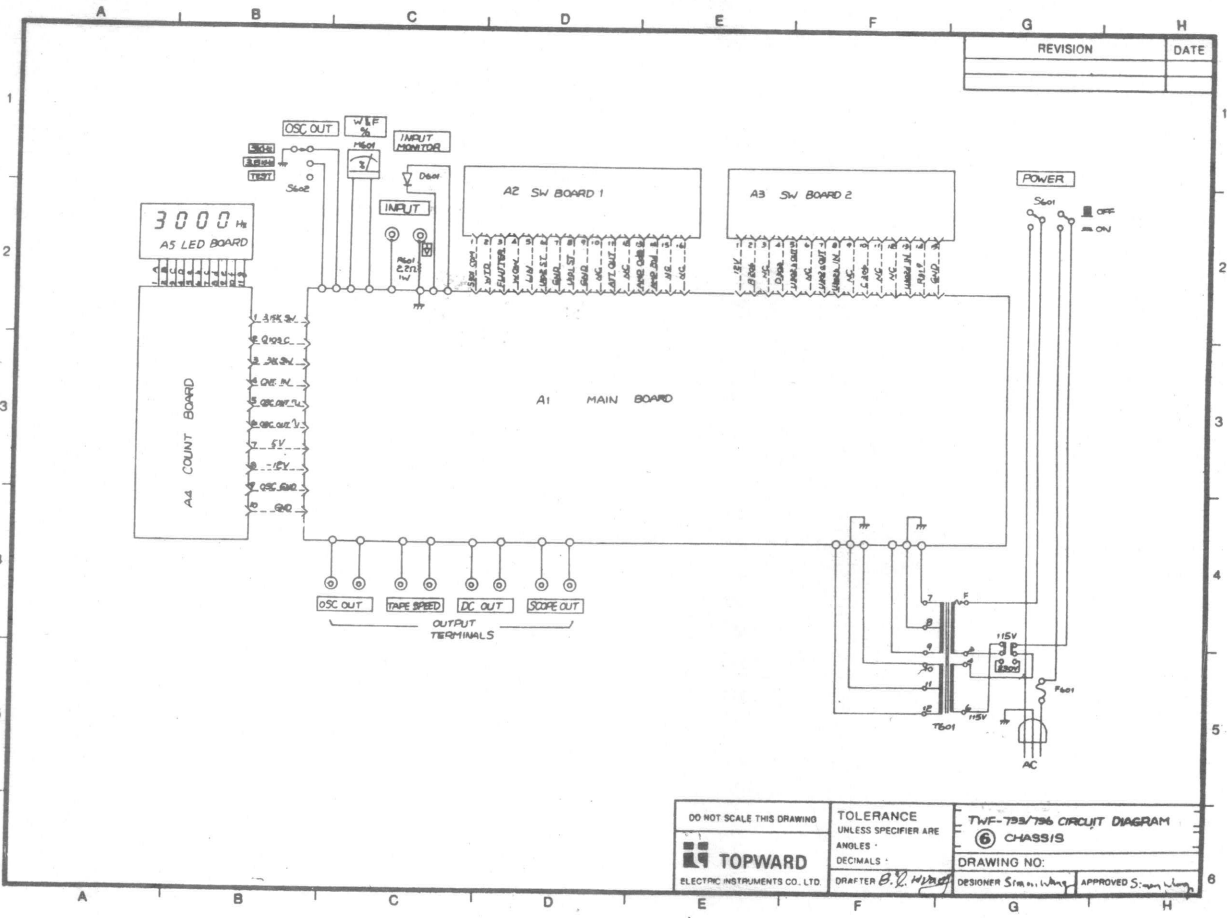
DO NOT SCALE THIS DRAWING TOPWARD ELECTRIC INSTRUMENTS CO. LTD.	TOLERANCE UNLESS SPECIFIED ARE ANGLES ± DECIMALS ±	TWF-783/786 CIRCUIT DIAGRAM ③ ATT AND INDICATION CIRCUIT
	DRAFTER <i>S. J. Murray</i>	DESIGNER <i>S. J. Murray</i>
DRAWING NO:		





REVISION	DATE

DO NOT SCALE THIS DRAWING  TOPWARD ELECTRIC INSTRUMENTS CO. LTD.	TOLERANCE UNLESS SPECIFIED ARE ANGLES : DECIMALS :	TWC-73B/736 CIRCUIT DIAGRAM OSC AND COUNTER
	DRAFTER: <i>S. M. J. J.</i>	DESIGNER: <i>S. M. J. J.</i>



REVISION	DATE

DO NOT SCALE THIS DRAWING	TOLERANCE UNLESS SPECIFIER ARE ANGLES - DECIMALS -	TWF-731/736 CIRCUIT DIAGRAM ⑥ CHASSIS
TOPWARD ELECTRIC INSTRUMENTS CO. LTD.	DRAFTER <i>E. J. H. [Signature]</i>	DESIGNER <i>S. [Signature]</i> APPROVED <i>S. [Signature]</i>

SPECIFICATIONS

Wow Flutter Measurement

Center frequency: 3.15KHz \pm 200Hz, 3KHz \pm 200Hz
6.3 KHz \pm 400Hz, 6KHz \pm 400Hz (for TWF-736)

Input level: 5 mV to 30 V (30 mV to 30 V for 0.03% range)

Input impedance: 300K Ω

Measuring range: 0.03, 0.1, 0.3, 1, 3% full scale in 5 ranges

Indication: peak value for DIN, CCIR
average value for NAB
rms value for JIS

Meter accuracy: within \pm 5% of full scale

Frequency characteristics: weighted characteristics; based on the specification of DIN, CCIR, NAB and JIS.
wow flutter separation characteristics,
wow, 0.5 to 6Hz
flutter, 6 to 200Hz
Unweighted characteristics;
0.5 to 200 Hz

Tape Speed

Indication: 4-digit in-line LEDs display

Range: 3.15KHz \pm 200Hz
6.3 KHz \pm 400Hz (for TWF-736)

Crystal Oscillator

Oscillating frequency: 3.15KHz, 3KHz
Output impedance: less than 5K, unbalanced
Output level: 1 Vrms at open
Distortion: within 5%

Frequency Counter

Range: 10Hz to 9999Hz
Input level range: 100mV to 30Vrms.
Input impedance: over 300 K
Gate time: 1 second
Accuracy: 1 count \pm frequency standard stability
Indication: 4-digit in-line LEDs display
Read out unit: Hz
Frequency standard: 3 MHz crystal oscillator, $\pm 5 \times 10^{-5} / ^\circ\text{C}$

General

Dimension: 210(W)x153(H)x305(D)mm
Weight: approx. 4Kg
Power: 115V/230V \pm 10%, 50/60 Hz, 10VA
Accessory: ACS-001 Banana-Clip Test Lead (1 pcs.)