

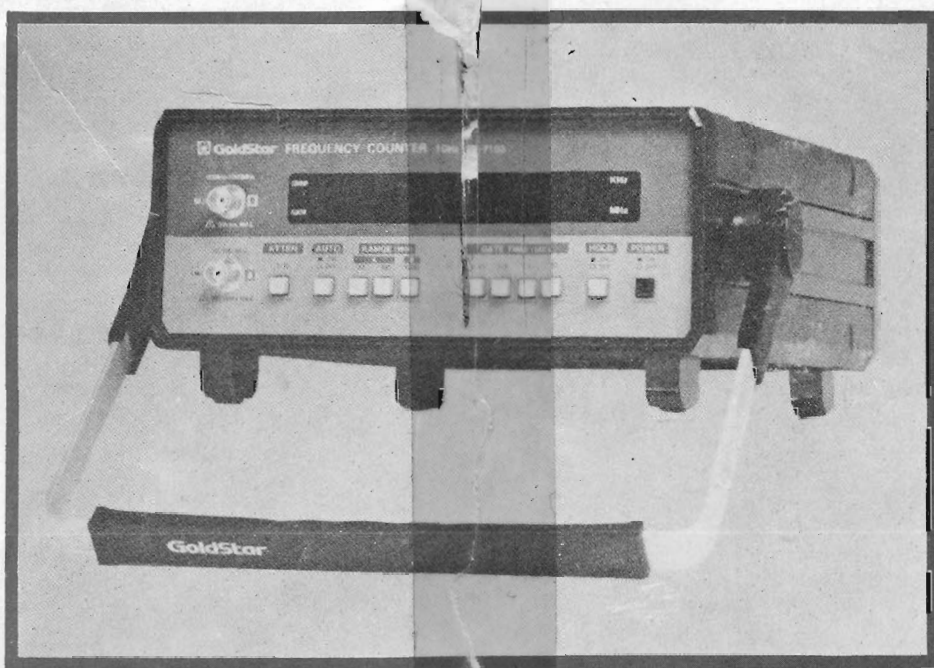
OPERATOR'S MANUAL

FREQUENCY COUNTER

FC-7011, 7012, 7013

FC-7051, 7052, 7053

FC-7101, 7102, 7103



**READ THIS OPERATOR'S MANUAL
BEFORE USING THE FREQUENCY COUNTER**



GoldStar

1. INTRODUCTION

GoldStar frequency counters are advanced-class counter having wide measurement range of 1Hz-100 MHz. By use of the most up-to-date LSI, this series frequency counters have the following features;

- (1) High performance and reliability
- (2) Easy to use
 - Employment of the AUTO range and HOLD function makes users easier to measure the input signal frequency
- (3) High stability in reference oscillator
- (4) High performance in the noise rejection of AC power line
- (5) Compact size and light weight

The pre-scaler circuit extends measuring range to 60 MHz – 550 MHz in FC-7051, 7052, 7053, and 60 MHz – 1 GHz in the FC-7101, 7102, 7103.

2. SPECIFICATIONS

100MHZ FREQUENCY COUNTER SPECIFICATIONS

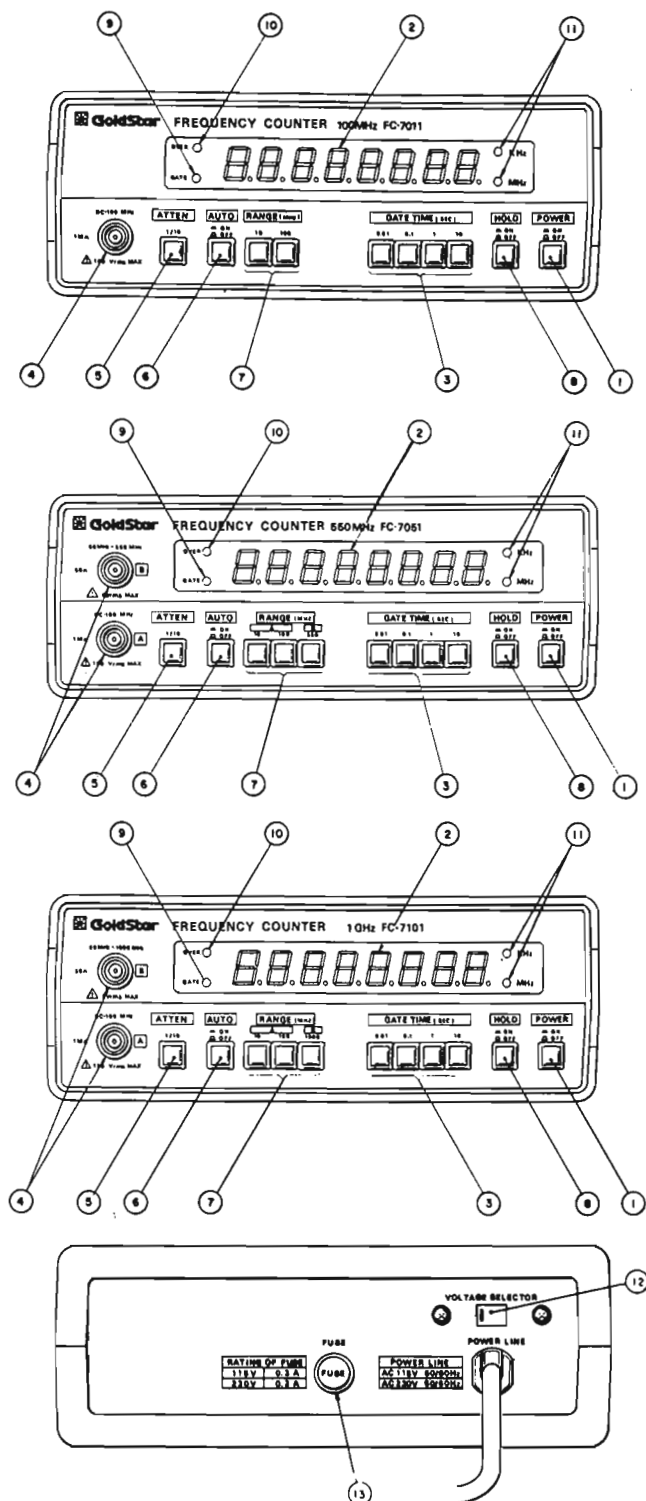
MODEL	FC-7011	FC-7012	FC-7013
DISPLAY	8 DIGIT, LED	8 DIGIT, LED	8 DIGIT, LED
RANGE	1 Hz - 100MHz	1 Hz - 100MHz	1 Hz - 100MHz
RESOLUTION	0.1, 1, 10, 100Hz	0.1, 1, 10, 100Hz	0.1, 1, 10, 100Hz
GATE TIME	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS
ACCURACY	$\pm(1\text{Hz} + 1\text{DIGIT} + \text{Time Base Error})$	$\pm(1\text{Hz} + 1\text{DIGIT} + \text{Time Base Error})$	$\pm(1\text{Hz} + 1\text{DIGIT} + \text{Time Base Error})$
INPUT CHARAC- TERISTIC	SENSITIVITY(RMS)	10Hz - 60MHz : 10mV 60MHz - 100MHz : 20mV	10Hz - 60MHz : 10mV 60MHz - 100MHz : 20mV
	INPUT IMPEDANCE	1M Ω / 100pF	1M Ω / 100pF
MAX.INPUT VOLTAGE	150V RMS	150V RMS	150V RMS
FREQUENCY	10MHz, CRYSTAL	10MHz, TCXO	10MHz, TCXO
STABILITY	5PPM (0°C - 50°C)	1 PPM (0°C - 50°C)	1 PPM (0°C - 50°C)
AGING	1 PPM / 1 Week	0.1 PPM / Week	0.1 PPM / Week
INPUT POWER	AC 110V / 220V, $\pm 10\%$	AC 110V / 220V, $\pm 10\%$	AC 110V / 220V, $\pm 10\%$
SIZE (mm)	210(W) $\times$ 260(L) $\times$ 76(H)	210(W) $\times$ 260(L) $\times$ 76(H)	222(W) $\times$ 345(L) $\times$ 94(H)
WEIGHT	1.8kg	1.8kg	2.6kg
BODY MATERIAL	PLASTIC	PLASTIC	ALUMINIUM

550MHz FREQUENCY COUNTER SPECIFICATIONS

MODEL		FC-7051	FC-7052	FC-7053
FREQUENCY	DISPLAY	8 DIGIT, LED	8 DIGIT, LED	8 DIGIT, LED
	RANGE	CH A 1 Hz - 100 MHz CH B 60 MHz - 550 MHz	1 Hz - 100 MHz 60 MHz - 550 MHz	1 Hz - 100 MHz 60 MHz - 550 MHz
INPUT CHARACTERISTIC	RESOLUTION	0.1, 1, 10, 100 Hz	0.1, 1, 10, 100 Hz	0.1, 1, 10, 100 Hz
	GATE TIME	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10ms
REFERENCE OSCILLATOR	ACCURACY	±(1Hz+1DIGIT+Time Base error)	±(1Hz+1DIGIT+Time Base error)	±(1Hz+1DIGIT+Time Base error)
	SENSITIVITY (RMS)	CH A 10Hz - 60MHz : 10mV 60MHz - 100MHz : 20mV CH B 60MHz - 150MHz : 20mV 150MHz - 250MHz : 30mV 250MHz - 500MHz : 100mV 500MHz - 550MHz : 150mV	10Hz - 60MHz : 10mV 60MHz - 100MHz : 20mV 60MHz - 150MHz : 20mV 150MHz - 250MHz : 30mV 250MHz - 500MHz : 100mV 500MHz - 550MHz : 150mV	10MHz - 60MHz : 10mV 60MHz - 100MHz : 20mV 60MHz - 150MHz : 20mV 150MHz - 250MHz : 30mV 250MHz - 500MHz : 100mV 500MHz - 550MHz : 150mV
OPERATING TEMP.	INPUT IMPEDANCE	CH A 1MΩ / 100 pF CH B 50Ω	1MΩ / 100 pF 50Ω	1MΩ / 100 pF 50Ω
	MAX. INPUT VOLTAGE	CH A 150V RMS CH B 5V RMS	150V RMS 5V RMS	150V RMS 5V RMS
BODY MATERIAL	FREQUENCY	10MHz, CRYSTAL	10MHz, TCXO	10MHz, TCXO
	STABILITY	5PPM (0°C-50°C)	1PPM (0°C-50°C)	1PPM (0°C-50°C)
INPUT POWER	AGING	1 PPM / Week	0.1PPM / Week	0.1PPM / Week
	OPERATING TEMP.	0°C-50°C	0°C-50°C	0°C-50°C
SIZE (mm)	INPUT POWER	AC 110V / 220V±10 %	AC 110V / 220V±10 %	AC 110V / 220V±10 %
	WEIGHT	210(W)×260(L)×76(H) 1.8kg	210(W)×260(L)×76(H) 1.8kg	222(W)×345(L)×94(H) 2.6kg
BODY MATERIAL		PLASTIC	PLASTIC	ALUMINIUM

1GHZ FREQUENCY COUNTER SPECIFICATIONS

MODEL			FC-7101	FC-7102	FC-7103
FREQUENCY	DISPLAY		8 DIGIT, LED	8 DIGIT, LED	8 DIGIT, LED
	RANGE	CH A	1Hz - 100MHz	1Hz - 100MHz	1Hz - 100MHz
		CH B	60MHz - 1GHz	60MHz - 1GHz	60MHz - 1GHz
	RESOLUTION		0.1, 1, 10, 100Hz	0.1, 1, 10, 100Hz	0.1, 1, 10, 100Hz
	GATE TIME		10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS
INPUT CHARACTERISTIC	ACCURACY		±(1Hz+1 DIGIT+Time Base error)	±(Hz+1 DIGIT+Time Base error)	±(1Hz+1 DIGIT+Time Base error)
	SENSITIVITY (RMS)	CH A	10Hz - 60MHz : 10mV 60MHz - 100MHz : 20mV	10Hz - 60MHz : 10mV 60MHz - 100MHz : 20mV	10Hz - 60MHz : 10mV 60MHz - 100MHz : 20mV
		CH B	60MHz - 300MHz : 20mV 300MHz - 600MHz : 30mV 600MHz - 1GHz : 50mV	60MHz - 300MHz : 20mV 300MHz - 600MHz : 30mV 600MHz - 1GHz : 50mV	60MHz - 300MHz : 20mV 300MHz - 600MHz : 30mV 600MHz - 1GHz : 50mV
	INPUT IMPEDANCE	CH A	1MΩ / 100pF	1MΩ / 100pF	1MΩ / 100pF
		CH B	50Ω	50Ω	50Ω
REFERENCE OSCILLATOR	MAX. INPUT VOLTAGE	CH A	150V RMS	150V RMS	150V RMS
		CH B	5V RMS	5V RMS	5V RMS
	FREQUENCY		10MHz, CRYSTAL	10MHz, TCXO	10MHz, TCXO
	STABILITY		5PPM (0°C - 50°C)	1PPM (0°C - 50°C)	1PPM (0°C - 50°C)
	AGING		1 PPM / Week	0.1 PPM / Week	0.1 PPM / Week
OPERATING TEMP			0°C - 50°C	0°C - 50°C	0°C - 50°C
INPUT POWER			AC 110V / 220V ± 10 %	AC 110V / 220V ± 10 %	AC 110V / 220V ± 10 %
SIZE (mm)			210(W)X 260(L)X 76(H)	210(W)X 260(L)X 76(H)	222(W)X 345(L)X 94(H)
WEIGHT			1.8kg	1.8kg	2.6kg
BODY MATERIAL			PLASTIC	PLASTIC	ALUMINIUM



(Fig 1) FRONT PANEL & REAR PANEL

3. FUNCTIONAL DESCRIPTIONS

1) Power

When red knob is pushed, the instrument is turned on.

2) Display

Measured frequency is displayed on the 8 digit LEDs of seven segments.

3) Gate time selection switch

This switch selects a gate time among 0.01, 0.1, 1 or 10 seconds. It determines the sampling time for the input signal.

4) Input "A" and "B" terminals

Input signal is connected to either "A" or "B" terminal except model FC-7011, 7012, 7013.

Input "A" terminal frequency range is for 1 Hz -100 MHz, in all models and "B" is for 60 MHz -550 MHz in FC-7051, 7052, 7053, and for 60 MHz -1 GHz in FC-7101, 7102, 7103.

5) Attenuation switch

This switch is used when either input signal is too high ($>400\text{mV rms}$) or noise level is high. When this switch is pushed, the attenuation ratio is 20dB (1/10 attenuation) in volts.

6) Auto ranging switch

Input frequency is measured automatically when AUTO switch is pushed. It is very useful when input frequency is unknown.

7) Range switch

This switch is used when higher frequency resolution is required.

- 10 MHz switch : When the input frequency is below 10 MHz, this switch is used.
- 100 MHz switch : When the input frequency is between 10 MHz and 100-MHz, this switch is used.
- 550 MHz switch : This switch exists in model FC-7051, 7052, 7053 only.
- 1 GHz switch : This switch exists in model FC-7101, 7102, 7103 only.

- 8) **Hold switch**
This switch is used when measured frequency is required to be held. When hold switch is pushed, the display is not up-dated.
- 9) **Gate time indication LED**
During counting gate is opened in the circuit and input frequency is being counted, gate LED is lit.
- 10) **Overrange indication LED**
When the frequency of input signal is larger than the selected frequency range, the overrange LED is lit. At this time the frequency range and gate time must be changed.
- 11) **KHz, MHz indication LEDS**
This LED denotes the frequency unit in KHz or MHz.
- 12) **AC power selection switch**
Operator must select the AC input line voltage either 110V AC or 220V AC by this switch.
- 13) **Fuse**
When the input line voltage is 110V AC ,0.3A fuse must be used. When 220V AC ,0.2A fuse must be used.

4. PRECAUTIONS

- 1) Check the line voltage and fuse rating before applying power.

This instrument is set to 110V AC/50-60Hz in factory.

- 2) Do not apply an excessive input signal voltage to avoid instrument damage.

When the input is connected to "A" terminal ($1\text{M}\Omega$ impedance), the maximum voltage which can be applied to the input depends on frequency as shown Fig-2. When the input is connected to "B" terminal (50Ω impedance), the maximum voltage which can be applied to the input is 5V RMS, without regard to the frequency.

- 3) Avoid a heavy shock to this instrument

- 4) Do not use in an extremely hot or cold temperature.

The operating temperature is 0°C – $+50^{\circ}\text{C}$, and the storage temperature is -55°C – $+70^{\circ}\text{C}$.

5. MEASUREMENT PROCEDURE

1) Preparations before use

Connect a cable with BNC connector to the BNC connector terminal on the front panel, and set the attenuation switch to 1/10 position. (push the attenuation switch)

2) Push the power switch to turn on.

3) Select range switch in accordance with measuring frequency.

If overrange indication LED is lit, change range switch.

4) Select the gate time in accordance with resolution requirement of input signal frequency. The resolution versus gate time and range is shown in table 1 and table 2.

Table 1. Resolution versus gate time and range

RANGE GATE TIME	10MHz	100MHz	550M, 1GHz
0.01S	XXXXXXXX.X	XXXXXX.XXX	XXXXXXX.XX
0.1S	XXXXXXX.XX	XXXXX.XXXX	XXXXXX.XXX
1S	XXXXXX.XXX	XXX.XXXXXX	XXXXX.XXXX
10S	XXXXX.XXXX	XXXXXX.XXX	XXX.XXXXXX

Table 2. Frequency unit LED to be displayed

RANGE GATE TIME	10MHz	100MHz	550M, 1GHz
0.01S	KHz	MHz	MHz
0.1S	"	"	"
1S	"	"	"
10S	"	KHz	"

- 5) If the input is displayed and LED remains Zero, set attenuation switch to 1:1 position. (Release attenuation switch)
- 6) To freeze the LED display for stable reading, push the “HOLD” switch.

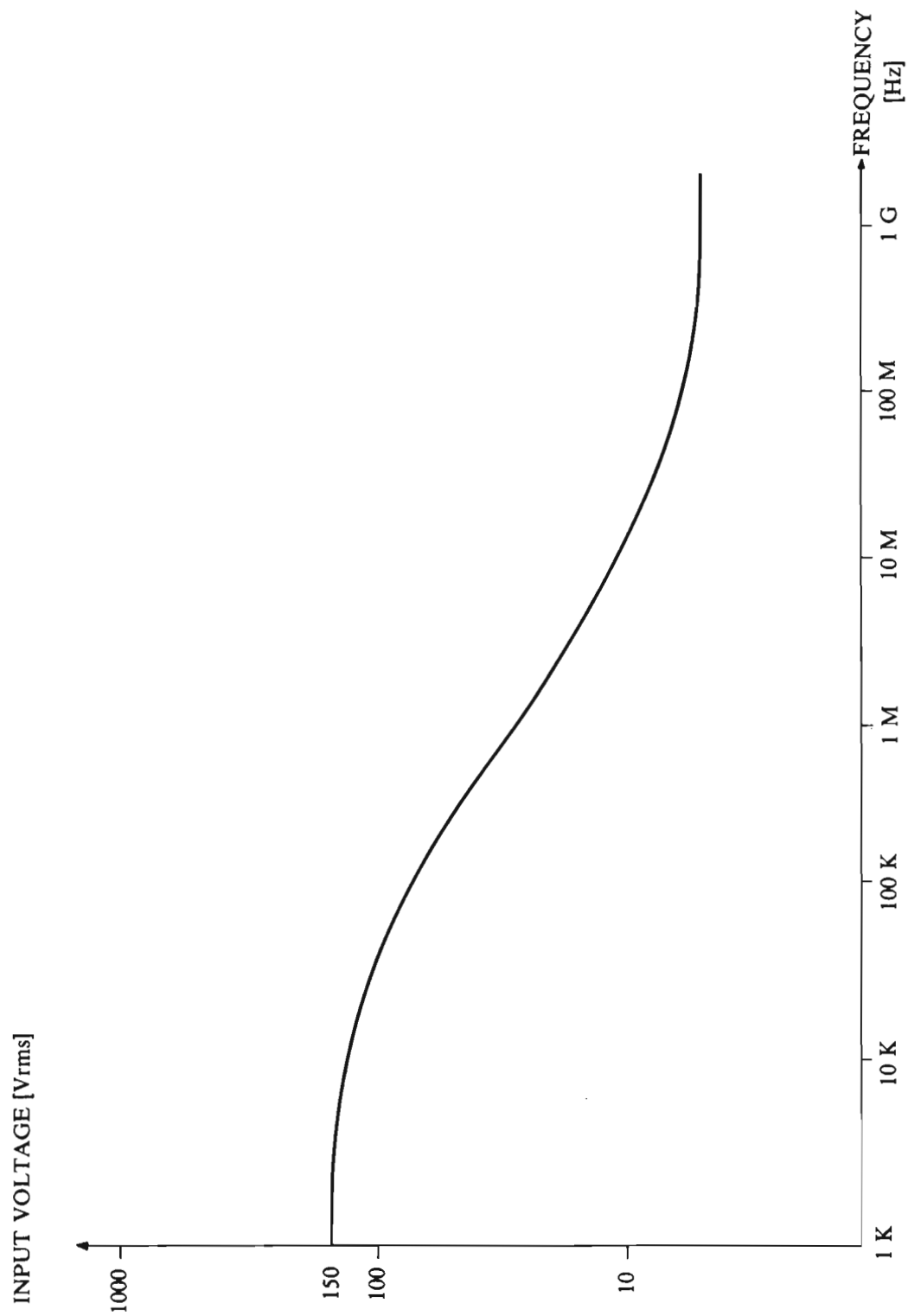
6. CALIBRATION

The frequency of the internal reference oscillator must be calibrated in every 6 months.

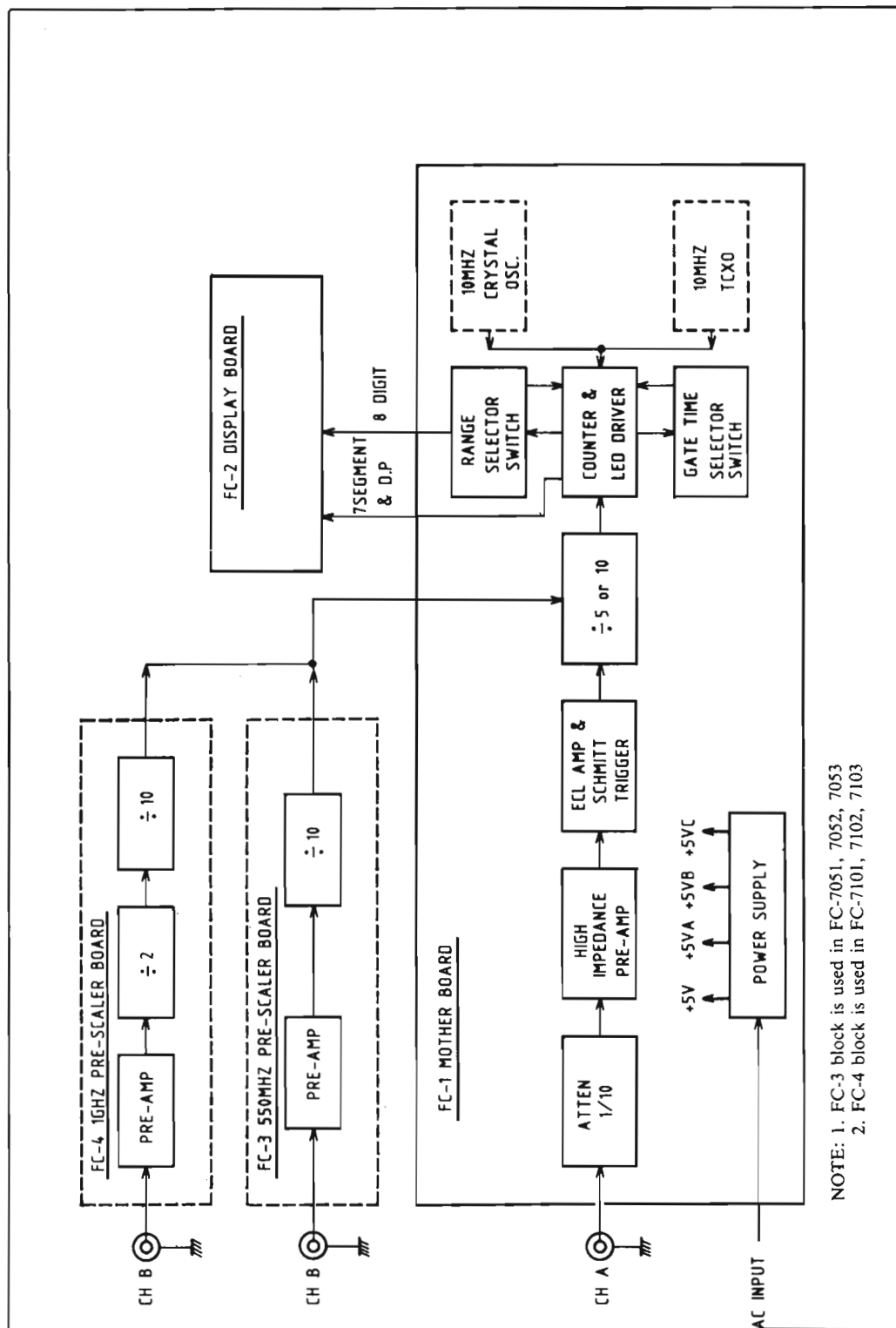
It must be calibrated after more than 30 minutes warm-up.

Use high accuracy counter having an accuracy of over 1×10^{-7} as the calibration instrument.

Apply the calibrating frequency signal of 10 MHz to the input “A” terminal of the frequency counter, and adjust internal trimmer capacitor C113 or TCXO through 10 MHz adjusting hole so that the display becomes 10,000 KHz.

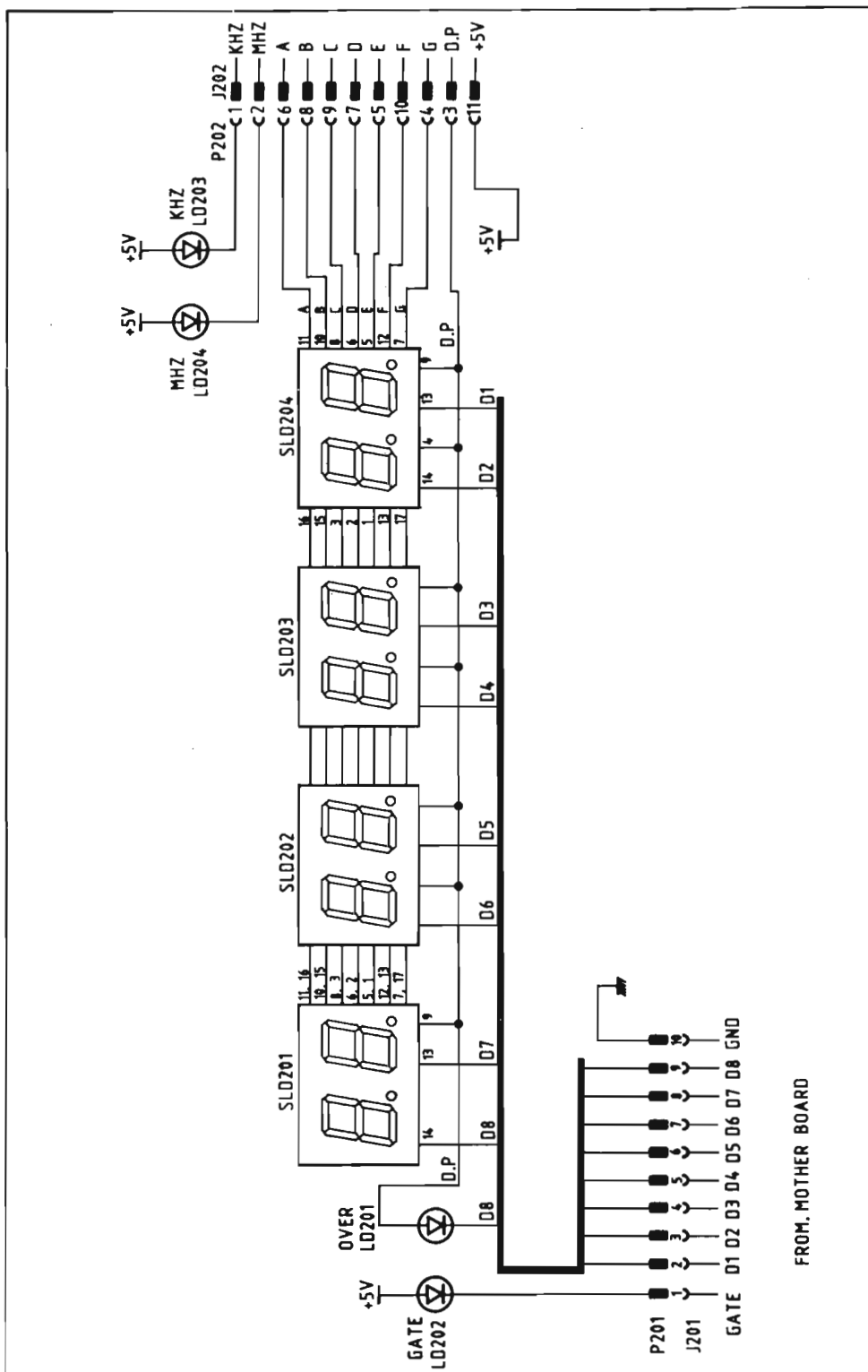


(Fig. 2) MAXIMUM INPUT VOLTAGE VS FREQUENCY

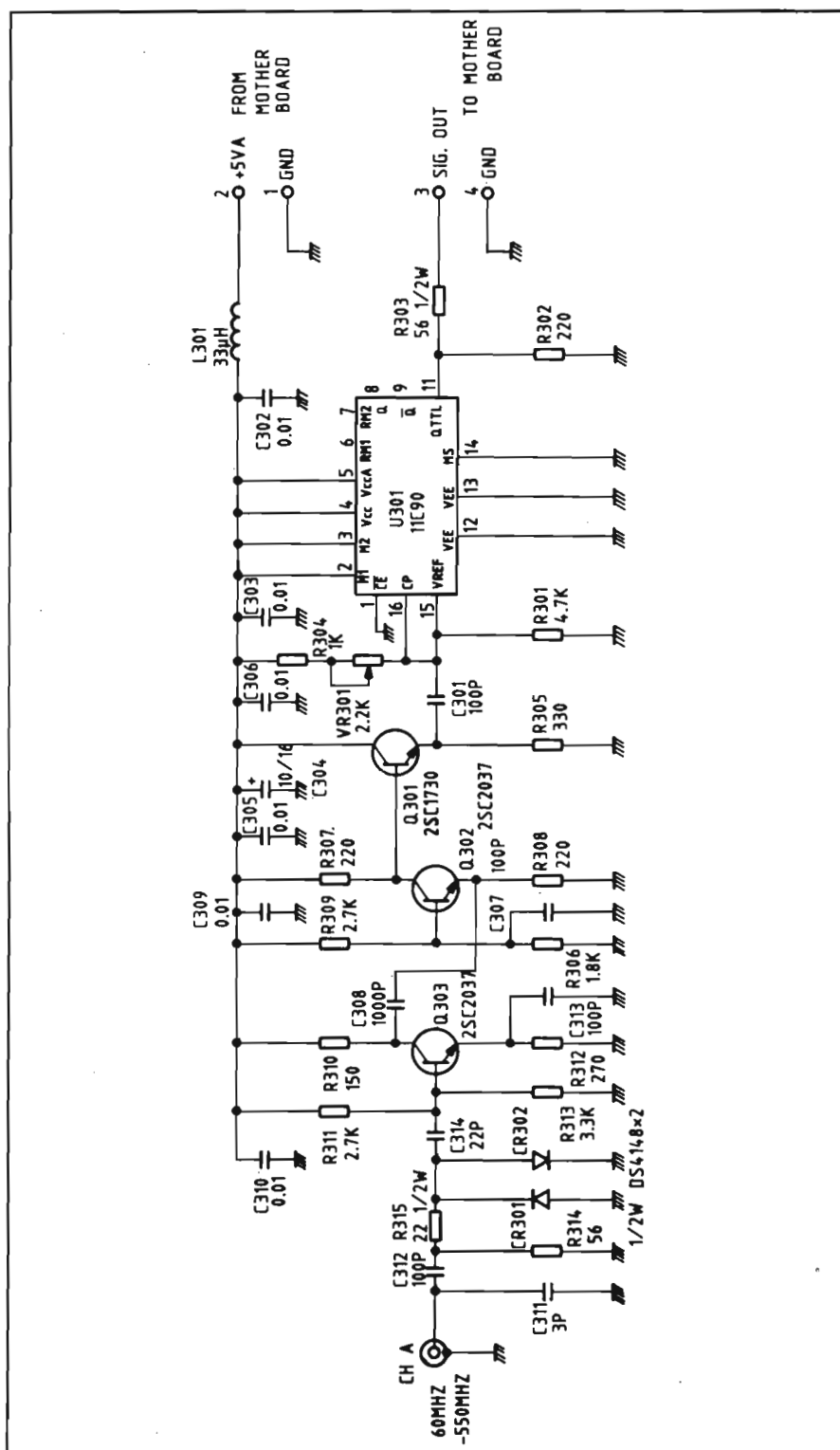


NOTE: 1. FC-3 block is used in FC-7051, 7052, 7053
 2. FC-4 block is used in FC-7101, 7102, 7103

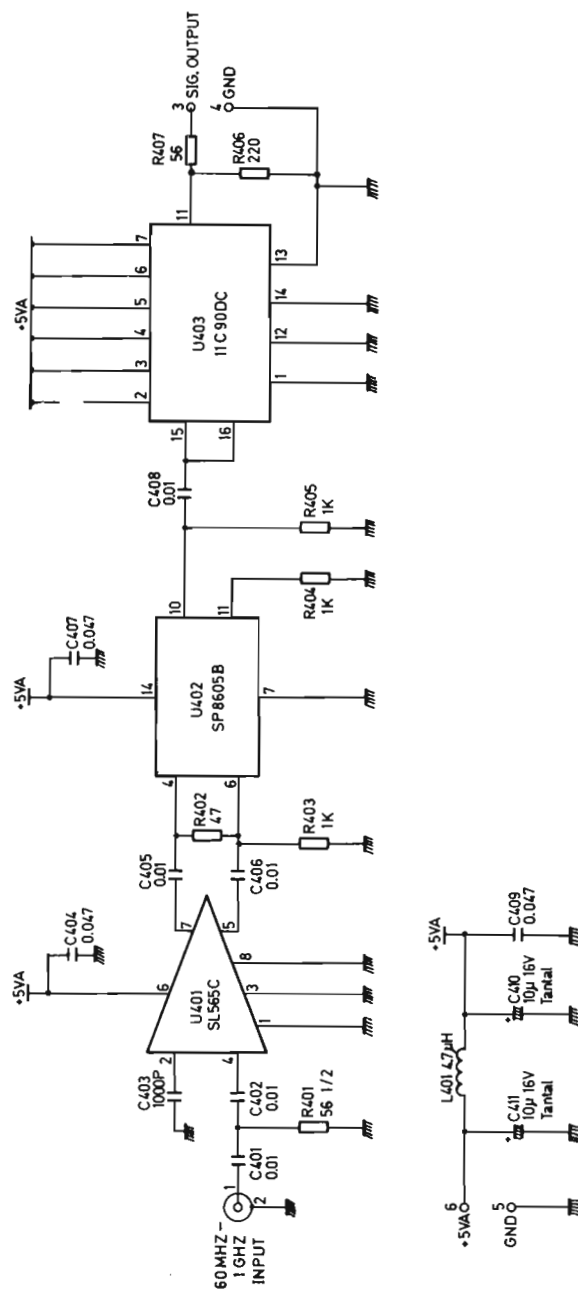
(Fig 3) FUNCTIONAL BLOCK DIAGRAM



(Fig 5) FC-2 DISPLAY BOARD CIRCUIT DIAGRAM



(Fig 6) FC-3 550 MHz PRE-SCALER BOARD CIRCUIT DIAGRAM



(Fig 7) FC-4 1GHz PRE-SCALER

**GoldStar Precision Co., Ltd.**

20, Yeouido-dong, Yeongdongpo-gu, Seoul 150, Korea
19th Fl., East Tower, Lucky-Goldstar Twin Tower
Tel.: 787-6848-57 Tlx.: GSRADAR K22838 Fax.: (02) 784-1646
Cable: GOLDRADAR

GoldStar Precision

13013 East 166th Street, Cerritos, Ca. 90701-2295 U.S.A.
Tel.: (213) 404-0101 Tlx.: (910)583-5719 LGI LA
Fax.: (213) 926-0849