

MODEL: DF1641A

**FUNCTION
GENERATOR**

INSTRUCTION MANUAL

D. C. Electronics Inc.

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1. INTRODUCTION

The DF1641A is portable, bench type function generator, featured in plastic case, fine appearance and light weight, capable of producing 7 different waveforms. They are sine, square, triangle, positive & negative pulse, positive & negative ramp.

The frequency generated by DF1641A is adjustable from 0.2Hz to 2MHz in 7 ranges, indicated by 6-digital-LED counter, and the amplitude is adjustable in range of 0-20Vp-p. The DC offset can be adjusted from $0 \pm 10V$ by a front panel adjustment. The slope of ramp output and duty cycle of pulse output can be continuously adjusted between 20% and 80%.

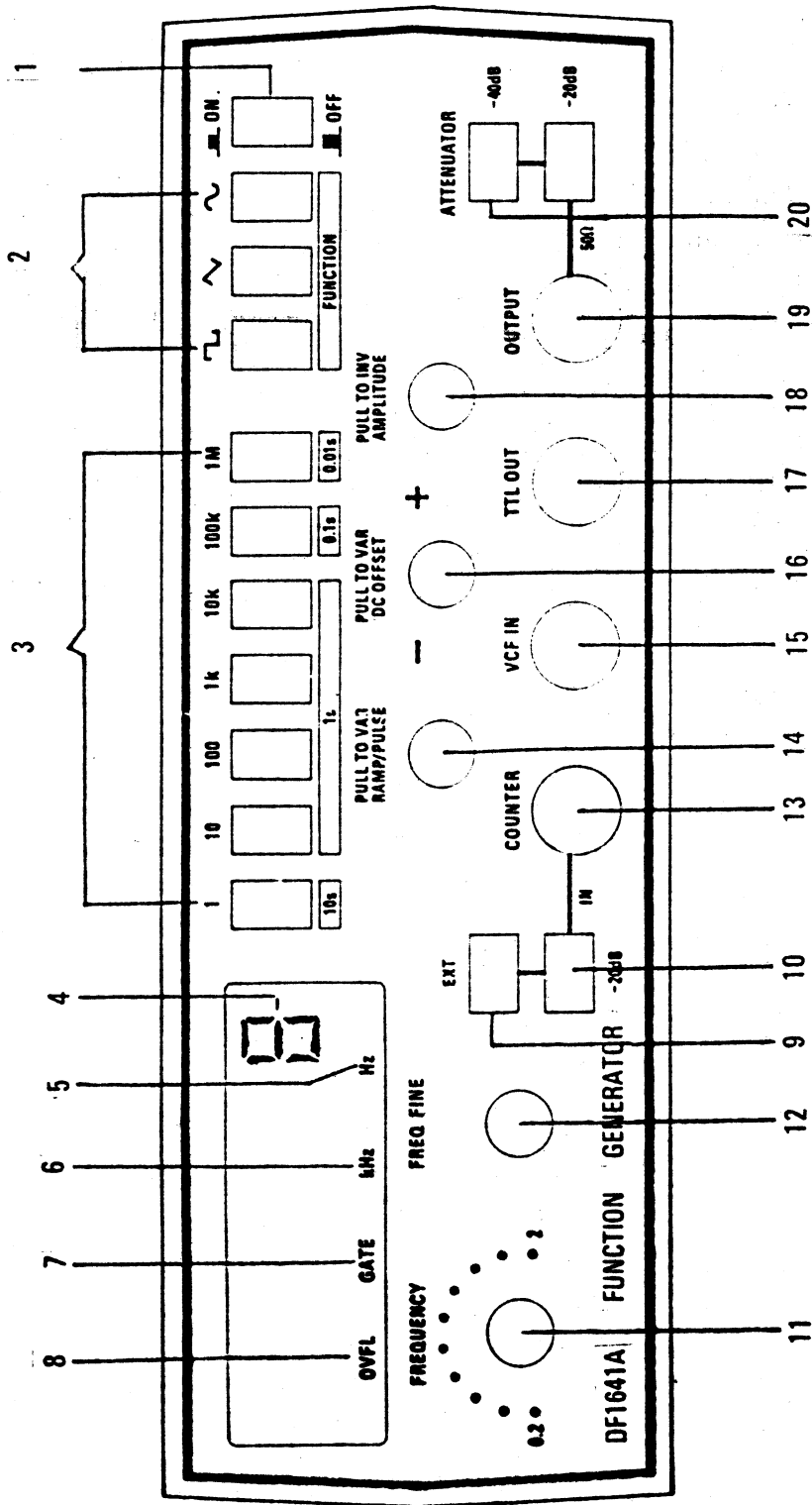
The unit has a voltage controlled frequency input (VCF in) of 1000:1 that allows the frequency to be adjusted or swept by an external source. It has also TTL square wave sync. output.

The 6-digital-LED counter can be connected externally for measuring frequency from 10 Hz to 30MHz.

2. PANEL DESCRIPTION

The following is an explanation of the function of the front panel controls and connectors. You should refer to Figure 1 for the location of each control connector.

1. PWR-This is the main power switch. It is push on push off type.
2. FUNCTION-This bank of switches is used to select the output waveform. Only one of the switches can be depressed at a time.
3. 1-1MHz 10S-0.01S-This bank of interlocked buttons is used to select the frequency range produced. The actual output is indicated by 6-digital-LED. For measuring external frequency, these buttons are used to select time gate for frequency counter.
4. Digital LED-Display the frequency either generated internally or added externally.
5. Hz-Indicate the unit of frequency. When the frequency range of "1", "10", or "100" is selected, the indicator is on.



MAX

SV

Fig.1

6. kHz-Indicate the unit of frequency. When the frequency range of "1k", "10k", "100k", or "1M" is selected, the indicator is on.
7. GATE-This indicator flashes when the counter is working.
8. OVFL-The light is on when the 6 LEDs is not enough to indicate the frequency.
9. EXT-When the knob is depressed, an external frequency will be measured; If it is out, the generator measures internal frequency.
10. —20dB-When the input signal is more than 10V, press this knob to assure the stability of the counter.
11. FREQ-This knob is used to select the output frequency. The frequency is dependent on the dial of this knob and the RANGE-Hz switch(3).
12. FINE-This is used to adjust frequency more exactly.
13. COUNTER-The input terminal of external signal. Input impedance is 1MOhm.
14. PULL TO VAR RAMP PULSE-When the knob is pushed in, the waveform is symmetric. When pull out, the symmetric is changeable, the slope of ramp and the duty cycle of pulse is adjustable.
15. VCF IN-This input is used to control the frequency with an external source.
16. PULL TO VAR DC OFFSET-This adjustment knob allows a DC voltage to be added to the output signal. Note that the knob has to be pulled out for the offset to affect the signal. When the control is pushed in, no offset voltage is added.
17. TTL OUT-Output a fixed TTL level synchronous with the main signal frequency.
18. PULL TO INV AMPLITUDE-This adjustment sets the signal level of the output. Turning the control clockwise to full will increase the amplitude, otherwise there is 20dB attenuation; At out position, it will invert the polarity of the output signal.
19. OUTPUT-This connector provides the output signal for all wave-forms, the output impedance is 50Ω.
20. -20dB -40dB-When either of the two buttons is depressed, there is 20dB or 40dB attenuation. When both buttons are depressed, the output signal is attenuated 60 dB.

3. OPERATING INSTRUCTIONS

WARNING: Before applying power to your generator, make sure that the AC power source is correct.

1. Connect the generator to AC power source and press the POWER ON switch (1).
2. Select the desired waveform by using the FUNCTION select switch (2). For generating ramp or pulse output, pull out the slope and duty cycle adjust knob (14), and set the desired slope or duty cycle. Pull out the AMPLITUDE (18), the ramp or pulse will be inverted.

3. Set the desired frequency with the **FREQ** dial (11) and the "1-1M" button (3). The actual output frequency will be:

$$F(\text{out}) = \text{Dial Indication} \times \text{Range setting}$$

4. If the output needs to be less than 20 volts peak to peak, it may be adjusted with the **AMPLITUDE** control (18) to the desired level. If a very small signal is required, the -20dB/ -40dB switch (20) can be depressed.
5. Any required DC offset voltage can be set with the **DC OFFSET** (16) control.
6. If a TTL compatible signal is required, use the **TTL** output terminal (17).
7. For measuring external frequency, the measured signal is connected to **COUNTER** (13) terminal. Select gate time, and the digital-LED will indicate the value. When the 6 LEDs are not enough to indicate frequency, **OVFL** lamp (8) is on.
8. **VCF** is an important feature of the generator. You may supply a trim voltage (0~5V) to the **VCF IN** terminal (15), and the output frequency will varies from high to low, with **VCF** ratio of 1000:1.

4. OPERATING CAUTIONS

Please observe the following when operating your model DF1641A Function Generator:

1. To assure operation within the listed specifications, allow the unit to warm and stabilize for at least 15 minutes.
2. Do not supply more than 5V AC or DC into **VCF IN** terminal.

5. MAINTENANCE & CALIBRATION

To assure the most stable operation possible, your Model DF1641A should be periodically adjusted. To perform the following adjustment procedures, you will need a screwdriver, an oscilloscope, a distortion meter, a crystal oscillator and a signal generator. As you perform this procedure, please refer to the adjustment position layout drawing (Fig.2).

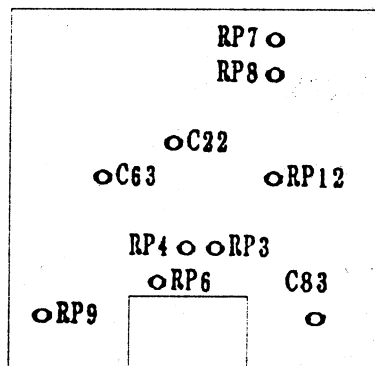


Fig.2

1. Open the unit by turning it upside down and removing the 4 screws that hold the two halves of the case together.
2. Upper-frequency-limit adjustment:
Set frequency range (3) to "1k", turn coarse-tune to maximum, fine-tune to minimum, then adjust RP6 until displayed value is between 2100Hz~2200Hz.
3. 2MHz adjustment:
Set the COUNTER (13) to INT, frequency range to "1k", FREQ (11) to "×2.0", observe the digital-LED indicating 2000Hz; then set the range to "1M", adjust C22 until LED indicates 2000kHz.
4. Power amplifier:
 - Set the operating frequency on 50Hz, FUNCTION to square wave, observe the output signal with LF oscilloscope, adjust RP9 to get best top-flatted waveform ("Square response" of the oscilloscope's should be calibrated previously).
 - Set operating frequency on 500kHz. Adjust C63 to get best square wave transient response.
5. Sine wave distortion calibration:
Set "FREQ" (11) to "2", frequency range to "1k", repeatedly adjust RP7, RP8, RP3 until the distortion is minimum.
6. Gate adjustment:
Depress the "EXT" button (9), connect a signal of 10MHz produced by standard crystal oscillator to COUNTER terminal, select gate time being 0.01S. Adjust C83 until LED indicates 10000.0kHz.
7. Counter-input-sensitivity adjustment:
Depress "EXT" (9), and select "0.01" for gate time. Connect a signal of 10MHZ 40mVrms produced by IIF signal generator. Adjust RP12 for LED displaying 10000kHz.

6. SPECIFICATIONS

1. Waveforms: Sine, Square, Triangle, positive & negative Ramp, positive & negative Pulse.
2. Frequency Range: 0.2Hz~2MHz in 7 steps.
3. Square Wave Rise Time: less than 100nS
4. Sine Distortion: 10Hz~100kHz less than 1%
100kHz~200kHz less than 2%
5. Sine Wave Frequency Response: 0.2Hz~200kHz ±5%
200kHz~2MHz ±10%
6. TTL Output: High Level>2.4V, Low Level<0.4V; Tr no more than 40nS.
7. Output
 - Impedance: 50Ω±10%

- Amplitude: no less than 20Vp-p (open circuit);
no less than 10Vp-p (50Ω load).
- Attenuation: 20dB, 40dB, or 60dB, with error of $\pm 0.5\text{dB}$ ($f < 200\text{kHz}$)
- 8. DC Offset: 0 ~ $\pm 10\text{V}$ continuously adjustable (no load).
- 9. Symmetry: 80:20 ~ 20:80 (use FREQ button)
- 10. Frequency Counter:
 - 1 Measuring range: 1Hz ~ 10MHz
 - 2 Input impedance: no less than 1MΩ 20pF
 - 3 Sensitivity: 50mV
 - 4 Resolution: 100Hz, 10Hz, 1Hz, 0.1Hz four steps
 - 5 Max. input: 150V(AC+DC) (with attenuator)
 - 6 Input attenuation: 20dB
 - 7 Measuring error: no more than $3 \times 10^{-5} \pm 1$ word
- 11. VCF feature:
 - Input voltage: 0 ~ 5V $\pm 10\%$ DC, reverse
 - Max. VCF ratio: 1000:1
- 12. Source: 220V $\pm 10\%$ 50Hz, 10VA
- 13. Ambient condition:
 - Temperature: 0 ~ 40 °C
 - Humidity: no more than RH90%
 - Atm. pressure: 100 \pm 4kPa
- 14. Size: 310(L)X230(W)X80(H) mm
- 15. Weight: about 2kgs

7. ACCESSORIES

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|-----------------------|---|
| 1. Instruction Manual | 1 |
| 2. Power Cord | 1 |
| 3. Input Cable | 2 |
| 4. Fuse | 2 |

