DIGITAL DISPLAY UNIT
WITH
FREQUENCY COUNTER
YC-601B

For direct frequency readout on
FT-101/277 and FTdx401/501 Series

GENERAL

The model YC-601B Digital Display Unit/Frequency Counter provides digital readout of the operating frequency for the FT-101/277 and the FTdx401/501 series of transceivers.

The full operating frequency is displayed on the YC-601B, with resolution to 100 Hz. As well, the YC-601B may be used as a frequency counter in the range 100 Hz – 35 MHz, with accuracy to 20 ppm.

Construction is fully solid state, making extensive use of integrated circuits, for high reliability and compactness of design.
SPECIFICATIONS

GENERAL
Display digits : 6
Clock frequency : 1.31072 MHz
Ambient temperature : 0°–40°C
Power requirements : 100/110/117/200/220/234 VAC, 50/60 Hz
Power consumption : 7 VA nominal
Size : 220(W) x 80(H) x 235(D) mm
Weight : 2.5 kg

DIGITAL DISPLAY
Frequency coverage : Amateur bands within the range
                      1.5000 MHz – 29.9999 MHz
Input frequency : 8700 kHz – 9200 kHz
                 @ 100 mV RMS
Gate time : 0.1 sec.
Display time : 0.2 sec.

COUNTER
Frequency range : 100 Hz – 35 MHz
Input requirements : 100 Hz: 180 mV
                   : 1 kHz – 10 MHz: 30 mV
                   : 35 MHz: 90 mV
Maximum input voltage : DC: 100 Volts
                        AC: 2 Volts RMS
Input resistance : 1 M ohm
Input capacitance : Less than 30 pf.
Gate time : 0.1 sec. for 100 Hz resolution
            1 sec. for 10 Hz resolution
Clock accuracy : ±20 PPM at 25°C
(1) POWER
This is the main power switch for the YC-601B.

(2) CALIB
This is the calibration control. Use with the transceiver 25/100 kHz crystal calibrator to align the display for the exact frequency being received.

(3) DISPLAY
The digital display reads out the frequency in this window.

(4) HOLD
This switch will hold the display on the frequency being read out.

(5) INPUT
This is the input terminal for the frequency counter.

(6) MODE (BAND/COUNTER)
In the BAND position, the YC-601B is used as a digital display for your transceiver. In the COUNTER position, the YC-601B functions as a frequency counter.

(7) GATE TIME
This switch selects a gate time of 0.1 seconds for 100 Hz resolution, or 1 second for 10 Hz resolution, on the counter.

(8) BAND
The BAND switch should be set to the same position as the transceiver bandswitch.

HTTP://WWW.FOXTANGO.ORG
VFO (J1, J2, J3)
As shown in the drawings, these jacks are parallel-connected for VFO input. Connect your transceiver to the jack most convenient for this interface.

GND
It is essential that the YC-601B be bonded to the transceiver via the supplied ground strap. Make the connection to the post marked GND on the rear panel.
INTERCONNECTIONS

The YC-601B may be connected to the transceiver or external VFO in your station by the following means:

(1) **FT-101** and **YC-601B**

Connect the FT-101 EXT VFO socket to J3 of the YC-601B, using cable A, supplied with the YC-601B. Refer to Figure 2.

![Figure 2](image)

(2) **FT-101, FV-101, and YC-601B**

Remove the connection cable between the FT-101 and the FV-101 from the FT-101 EXT VFO jack; reconnect this end of the cable to J2 of the YC-601B. Then connect Cable A between J3 of the YC-601B and the FT-101 EXT VFO jack. Refer to Figure 3.

![Figure 3](image)
(3) FT-401 and YC-601B

Connect the FT-401 VFO jack to J3 of the YC-601B, using the RCA plug/8-pin socket Cable B, supplied with the YC-601B. Refer to Figure 4.

Figure 4

(4) FT-401, FV-401, and YC-601B

Remove the connection cable between the FT-401 and the FV-401 from the FT-401 VFO jack, and reconnect it to J1 of the YC-601B. Connect the VFO jack of the FT-401 to J3 of the YC-601B, using Cable B. Refer to Figure 5.

Figure 5
(5) FR-101 and YC-601B

When the FR-101 is to be used with the FT-101 or the FL-101, the YC-601B may be used, if the modification shown in Figure 7 is performed to the FR-101. Connect a co-axial cable as shown: center conductor between pin 8 of MJ-4 and center pin of AUX jack, and shield between pin 6 of MJ-4 and shield of the AUX jack. Pin 6 should be connected to ground, as shown.

Then connect Cable B between J3 on the YC-601B and the AUX connector of the FR-101.

Figure 6

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16WV 2200μF

Ground

MJ-4

1.5Ω 8V

(A TRIP) (SP) (TONE) (MUTE) (AUX)

Figure 7
INSTALLATION AND OPERATION

The YC-601B may be used in practically any location. However, it is recommended that extremely hot locations within the operating room (e.g. on top of a transceiver in an enclosure, or on top of an amplifier) be avoided. Moreover, it is recommended that no partition be placed over the transceiver in hopes of avoiding heat transfer to the YC-601B; this may restrict the air flow around the transceiver.

The YC-601B is designed for use in many areas of the world, and hence is capable of operation with a variety of AC supply voltages. Therefore, be sure that the voltage specifications marked on the rear panel of the YC-601B matches the supply voltage you are using. If you move to an area with different supply voltage, rewire the transformer connections as shown below.

When replacing fuses, be absolutely certain that you replace the blown fuse with one of the proper rating. For 100/110/117 VAC, use a 1 amp fuse, and for 200/220/234 VAC, use a 1/2 amp fuse. WARRANTY DOES NOT COVER DAMAGE CAUSED BY IMPROPER FUSE REPLACEMENT.

CAUTION

PERMANENT DAMAGE WILL RESULT IF IMPROPER AC SUPPLY VOLTAGE IS APPLIED TO THE YC-601B. WARRANTY DOES NOT COVER DAMAGE CAUSED BY APPLICATION OF INCORRECT SUPPLY VOLTAGE. IF YOU HAVE ANY DOUBT ABOUT THE WIRING OF THE TRANSFORMER, INSPECT THE CONNECTIONS BEFORE APPLYING AC POWER.
A. DIGITAL DISPLAY OPERATION

Set the switches as follows:

**POWER OFF**

**BAND** Set to the same band as the transceiver, receiver, or transmitter.

Check to see that the interconnections have been correctly made, and then set the **POWER switch to ON**. The frequency is indicated directly on the digital display. The first and second digits from the left represent MHz, the third, fourth, and fifth represent kHz, and the sixth digit represents the 100 Hz increment.

The accuracy of the frequency readout depends on the tolerance of the transceiver crystals, and upon the mode of operation. It is recommended that the YC-601B be calibrated using the transceiver calibrator signal, as described below:

1. Set the **BAND switch to the same band as that of the transceiver**.

2. Set the transceiver mode switch to the desired mode, and activate the internal calibrator in the transceiver, calibrate the transceiver against the marker zero beat signal, in the usual manner.

3. Adjust the **CALIB control of the YC-601B until the digital display indicates precisely the calibration frequency of step (2)**.

4. For the CW mode, calibrate the transceiver and YC-601B in the USB mode. Because the CW transmit frequency is shifted 800 Hz higher than the USB carrier frequency, adjust the **CALIB control on the YC-601B** for a reading of 800 Hz higher than the zero beat frequency. For example, if the zero beat frequency is 14.0560 MHz, align the YC-601B to indicate 14.050.8 MHz. This method results in the transmit frequency being displayed, thus minimizing the chance of out-of-band operation near the band edges.

B. FREQUENCY COUNTER OPERATION

The YC-601B may be used as a frequency counter as follows. There is no need to remove the interconnection cables for use of the YC-601B as a digital display unit, as the MODE switch makes the necessary changes internally. Set the MODE switch to the **COUNTER position** and use the cable supplied with alligator clips (**Cable D**) for sampling the signal.

**EXTREME CARE MUST BE TAKEN TO ENSURE THAT THE INPUT TO THE COUNTER DOES NOT EXCEED 2 VAC RMS OR 100 VOLTS DC.**

Selection of the desired gate time will affect the resolution of the counter. With one second gate time, resolution is to 10 Hz, and with 0.1 second it is 100 Hz. For example, the measurement of 14.235.12 MHz will be displayed as follows:

<table>
<thead>
<tr>
<th>GATE TIME</th>
<th>FREQUENCY DISPLAYED</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 second</td>
<td>14.235.1</td>
</tr>
<tr>
<td>1.0 second</td>
<td>4.235.12</td>
</tr>
</tbody>
</table>
THEORY OF OPERATION

The MHz range is programmed by a diode matrix circuit consisting of Q127 (MSL980YS) and Q128 (MSL980Y6), which indicates the MHz frequency when the BAND switch is set properly.

The VFO frequency (8700 to 9200 kHz), applied through one of the input receptacles on the rear panel (J2, J3, or J4), is amplified by Q906 (3SK40M). The amplified signal is applied to an 8700–9200 kHz bandpass filter to Q105 (2SK19GR), and then fed to the mixer, Q110 (SN-76514N). The heterodyne oscillators Q906 and Q907 (both 2SC945) oscillate at either 22.2 MHz or 21.7 MHz, and selection of the appropriate oscillator is made by Q904 and Q905 (2SC945). The heterodyne signal is passed to Q110 for mixing with the VFO signal.

The frequency of the heterodyne oscillator is shifted slightly by varying the capacitance of the crystal via the front panel C113B control, thus allowing precise calibration of the YC-601B.

The output signal from the mixer is fed through wave shaper Q111 and Q112 (both 2SC785) to counter gate Q118 (SN74LS51N).

The crystal controlled clock oscillator Q117 (MSM5564) divides a 1.31072 MHz signal, divides it by 2 and thus produces a 5 Hz pulse. This pulse is delivered to Q115 to be used as a gate pulse. This pulse is also divided by ten to generate an 0.5 Hz pulse to be used for a 1 second gate time.

The output from Q118 is applied to Q120 (SN-74LS90N), which counts 10 Hz and delivers a pulse every 100 Hz to Q20 (MSM5501). Q210 counts 1 kHz, 10 kHz, and 100 kHz, and its output is applied to LED drivers Q221 (MSM561) and Q222 (MC1416P) for illumination of the LED's.

When the YC-601B is used as a frequency counter, Q118 selects the input signal. Q115 (SN74LS04N), Q116 (SN7404N), and Q117 (SN7400N) generate the reset and set signals.

POWER SUPPLY

The power transformer has a dual primary winding for operation from 100/110/117/200/220/234 VAC.

The AC 9 Volt winding supplies 9 VAC to bridge-connected rectifier diodes D1–D4 (all V06P). The 9.5 VDC is regulated at 5 Volts by Q215 (LMC14035) and supplied to the semiconductors, with the exception of Q110 (SN76514N), which receives 9 VDC.

MAINTENANCE

The YC-601B has been carefully aligned and tested at the factory prior to shipment. With normal usage, it should not require other than the normal attention given to electronic equipment.

CAUTION

APPLICATION OF ANY SIGNAL OTHER THAN THAT FROM THE TRANSCEIVER VFO WILL RESULT IN SEVERE DAMAGE TO THE DIGITAL DISPLAY. EXCEEDING THE VOLTAGE SPECIFICATIONS FOR THE FREQUENCY COUNTER WILL, LIKewise RESULT IN SEVERE DAMAGE.

Most difficulties encountered with the YC-601B will be traced to a misconnection of the cables between it and the transceiver. The frequency counter requires highly specialized test equipment for troubleshooting, and, should repairs be necessary, the equipment should be returned to the dealer for service.
### PARTS LIST

<table>
<thead>
<tr>
<th>Item</th>
<th>Main Chassis</th>
<th>Symbol Number</th>
<th>Description</th>
<th>Unit</th>
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<tr>
<td>220</td>
<td>C1.2</td>
<td>G2993072</td>
<td>TRANSFORMER</td>
<td>UNI-3-1200X 120V-2</td>
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<tr>
<td>230</td>
<td>C1.7</td>
<td>230D0064</td>
<td>TRANSISTOR</td>
<td>230D0064</td>
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<tr>
<td>240</td>
<td>C1.3</td>
<td>G2993072</td>
<td>TRANSFORMER</td>
<td>230D0064</td>
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#### VARIABLE CAPACITOR
- **Type**: C1.2
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### CRYSTAL
- **Type**: C1.7
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### CONNECTOR
- **Type**: C1.3
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### RESISTOR
- **Type**: C1.4
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### DIODE
- **Type**: C1.5
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### SWITCH
- **Type**: C1.6
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### COUNTERT UNIT
- **Type**: C1.7
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### C, FET & TRANSISITOR
- **Type**: C1.8
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### COUNTER UNIT
- **Type**: C1.9
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### BLOCK RESISTOR
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### POTENTIOMETER
- **Value**: 230D0064
- **Description**: TRANSFORMER
- **Unit**: 230D0064

### CAPACITOR
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- **Description**: TRANSFORMER
- **Unit**: 230D0064
### PARTS LIST

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### ACCESSORIES

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<td>PLUG</td>
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### DISPLAY UNIT

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<td>Printed Circuit Board</td>
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<td>IC SOCKET</td>
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