

## YC-221 DIGITAL DISPLAY UNIT

FOR FT-221/221R 2-METER ALL MODE TRANSCEIVER

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### GENERAL

The model YC-221 Frequency Counter unit is designed to display the operating frequency on digital readout for the FT-221/221R 2-meter all mode transceiver.

The frequency is indicated in MHz, kHz, and 100 Hz ranges in seven digits displayed on LED (Light Emitting Diode).

The unit is connected to the transceiver by an attached cable and all necessary connections, such as the power supply, are included.

With the use of YC-221, the FT-221/221R transceiver will have both, digital and analogue, features.

## SPECIFICATIONS

Frequency Display	-	144.0 MHz - 148 MHz
Digits	-	7 segment LED with MHz, kHz decimals
Gate Time	-	0.1 sec
Display Time	-	0.2 sec
Temperature	-	0°C - 40°C
Power Requirements	-	DC 13.5 Volt 0.5A supplied from the transceiver

## SEMICONDUCTORS

<u>ICs</u>		<u>LED</u>	
MSM561	(2)	TLR-312	(7)
MSM5501	(1)	<u>Transistors</u>	
MSM5564	(1)	2SC372Y	(5)
SN7400N	(1)	2SC509	(4)
SN7404N	(1)	2SC735Y	(1)
SN7490AN	(2)	2SK19GR	(2)
SN76514N	(1)	<u>Diodes</u>	
SP8640B	(1)	WZ-090	(1)
μPC14305GP	(1)	1S1555	(1)

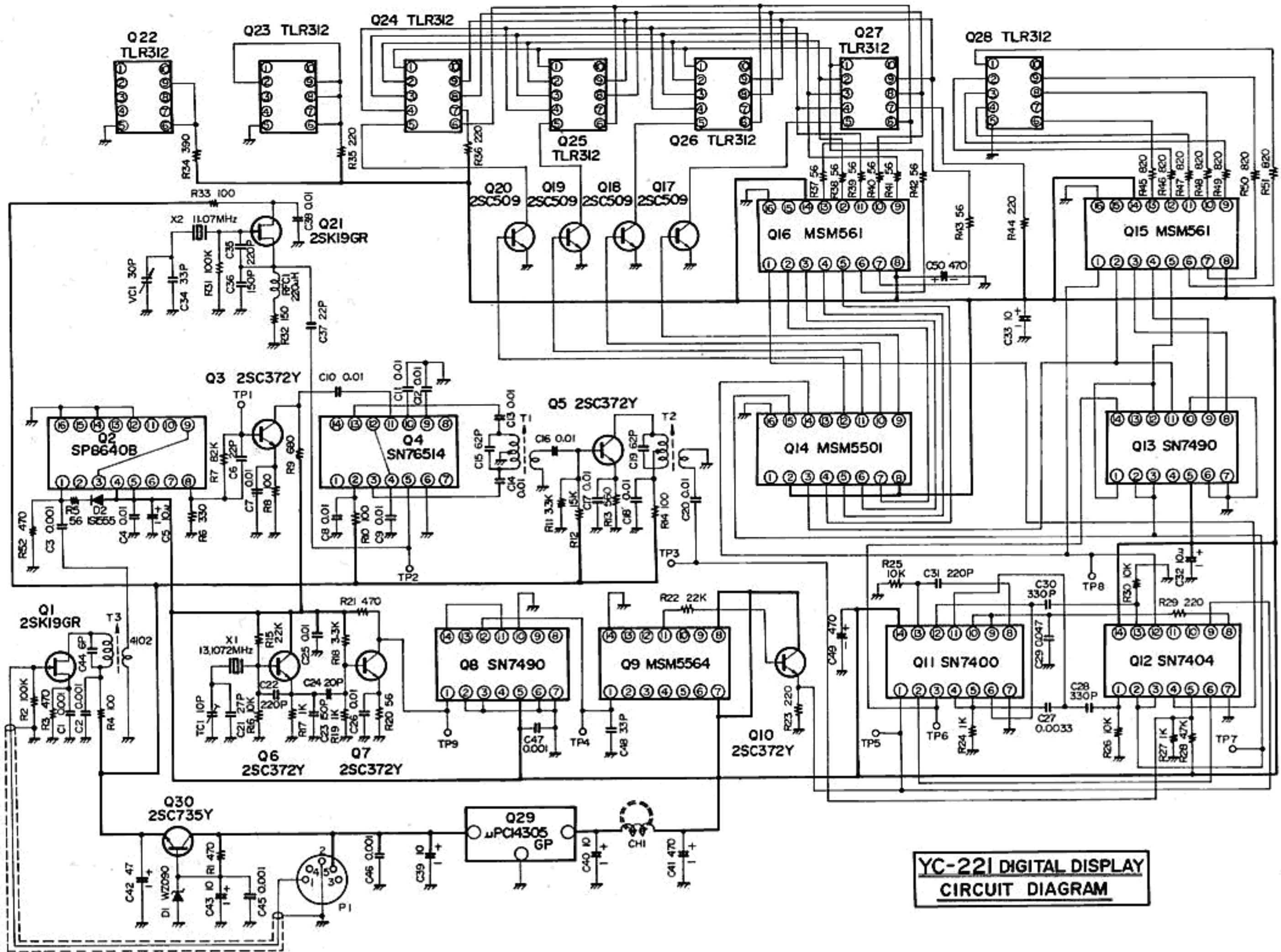
## INSTALLATION AND OPERATION

Prior to installation of the YC-221, check the serial number of the transceiver.

The YC-221 can be installed without any modification to the transceivers which show a "D" mark followed by the serial number.

Connect the plug from the YC-221 to a DISPLAY jack on the rear panel of the transceiver. Calibrate the transceiver against an internal marker signal in accordance with the DIAL CALIBRATION paragraph of the transceiver instruction manual. Then, calibrate the frequency on the YC-221 to the correct frequency using a "CALIBRATE" potentiometer on the front panel of the YC-221.

For transceivers which do not show a "D" mark before the serial number, the following modification is necessary prior to connecting the YC-221 to the transceiver.



YC-221 DIGITAL DISPLAY  
CIRCUIT DIAGRAM

## CIRCUIT DESCRIPTION

The heterodyne signal of the transceiver mixer, 133.3 MHz - 137.3 MHz, is delivered through Pin 1 of the plug, P1, to the YC-221.

The signal is amplified by a buffer amplifier Q1, 2SK19GR and fed to the pre-scaler Q2, SP8640B where the signal is divided by ten.

The divided output signal is fed through a buffer amplifier Q3, 2SC372Y to the double balanced mixer, Q4, SN-76514N. The mixer produces 22.4 MHz - 24.8 MHz signal with a local signal of 11.07 MHz generated by crystal oscillator Q21, 2SK19GR. The heterodyned output is then amplified by Q5, 2SC372Y and fed to the frequency counter circuit.

The signal is then fed through an inverter Q12, SN7404N to gate circuit Q11, 7400N which passes the pulses while the gate opens. The pulses are sent to a decade counter Q13, SN7490AN.

The crystal oscillator Q6, 2SC372Y generates a 13.1072 MHz clock signal which is fed through a buffer amplifier Q7, 2SC372Y to a divider, Q8, SN7490AN, where the signal frequency is divided by ten.

The divided signal is then further divided by a binary counter Q9, MSM5564 to obtain 0.1 sec gate signal. The gate signal is fed through buffer amplifier Q10, 2SC372Y to the gate circuit Q11, 7400N.

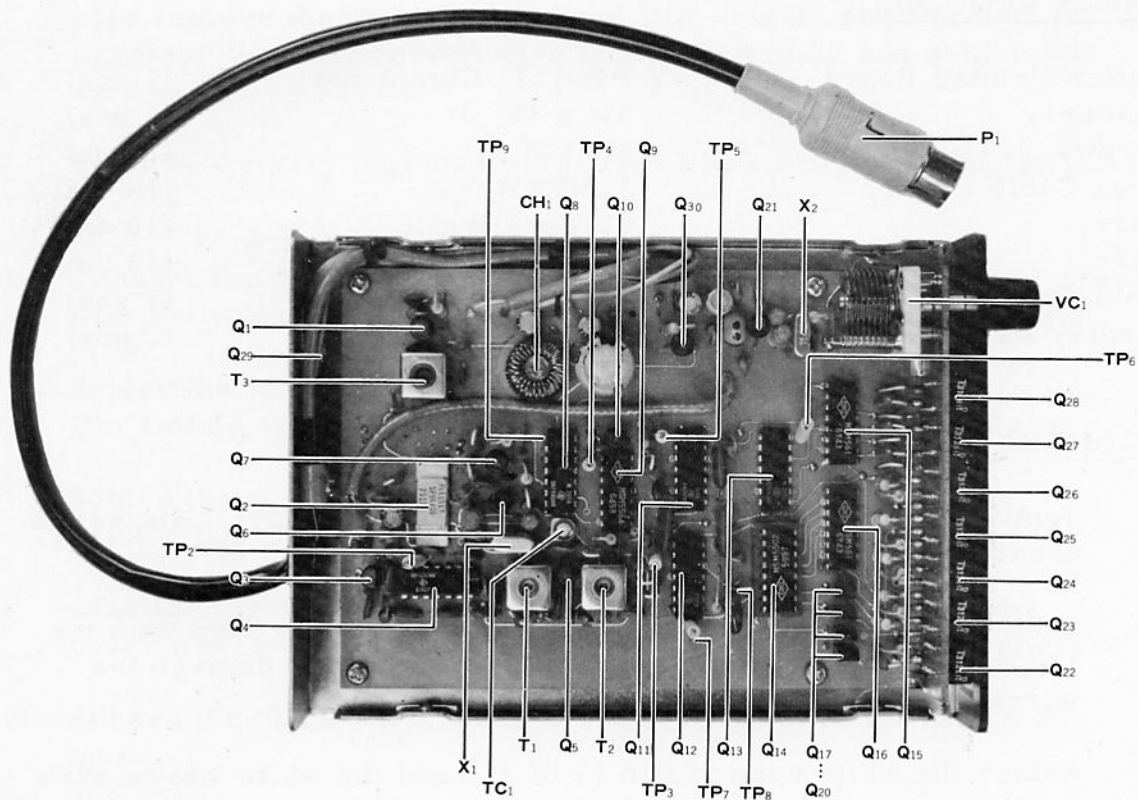
The pulses which passed through the gate circuit are fed to the decade counter Q13, SN7490AN which counts 10 Hz digits. The binary coded output signal from Q13 is fed to a decoder/driver/latch circuit Q15, MSM561 which drives display LED, Q28, TLR312.

The tenth pulse at Pin 11 of Q13, SN7490AN is fed to Q14, MSM5501 which counts 100 Hz, 1 kHz, 10 kHz and 100 kHz.

The BCD output signal from Q14 is fed through driver Q16, MSM561 to the display LED, Q24-27, TLR312.

Transistors Q17 - Q20, 2SC509 work as switches operated by a timing signal delivered from Q14 to select the output of Q16, MSM561. The output of Q16 drives display LED, Q24 - Q27 in a sequence of 1 kHz, 10 kHz, 100 kHz and 1 MHz. The LED Q23 and Q24 is set to display 1 and 4.

The DC voltage, 13.5V, supplied from the transceiver is stabilized at 5 volts by a voltage regulator Q29,  $\mu$ PB-249D GP for a digital integrated circuit. The 8 volts output from regulator Q30, 2SC735Y is used for other circuits.



## MODIFICATION

### PARTS REQUIRED:

Buffer Printed Board	PB-1671 Completed	(1 pce)
Spacers	M3 x 18	(2 pcs)
Screws	M3 x 8	(2 pcs)
Coax Cable	1.5D 2V	(18 cm)
Wire	0.18 x 7 White	(10 cm)
Wire	0.18 x 7 White/Brown	(12 cm)
Insulator		(1 pce)
Display Label		(1 pce)

### MODIFICATION:

- (1) Remove the bottom cover from the cabinet. Figure 1 shows the location of the modification work within the dotted circles.
- (2) Remove the nuts holding J14 and J15 and replace them with the tapped spacers as illustrated. Be careful not to damage the wires when the spacers are tightened.
- (3) Solder the white wire to Pin 17 of J15 and the white /brown wire to Pin 4 of J14. Solder the other ends to the printed board PB-1671 and install the printed board as illustrated in Figure 2.



- (4) Locate the TONE IN jack, J2, on the rear panel. Remove the white wire from Pin 3 of J2 and Pin 4 of J17. Refer to Figure 3. Also remove the yellow wire from Pin 1 of J2 and Pin 8 of J17. Unsolder the white/green wire from Pin 4 of J2 and solder this wire to Pin 8 of J17.
- (5) Remove the grey shielded wire from Pin 2 of J2 and Pin 33 (17A) of J22.
- (6) Connect Pin E of J2 to the ground terminal between J17 and J18 with the yellow wire removed after step (4). Solder both ends.
- (7) Solder the inner conductor of the coax cable supplied to Pin 1 of J2 and its outer conductor (shield) to Pin E of J2.
- (8) Solder the coax cable, white and white/brown wires to the printed board PB-1671 as illustrated in Figure 3.
- (9) Glue the insulator board to the inside surface of the bottom cover where the installed printed board PB-1671 will touch.
- (10) Adhere the "DISPLAY" seal to the rear panel at the TONE IN mark.

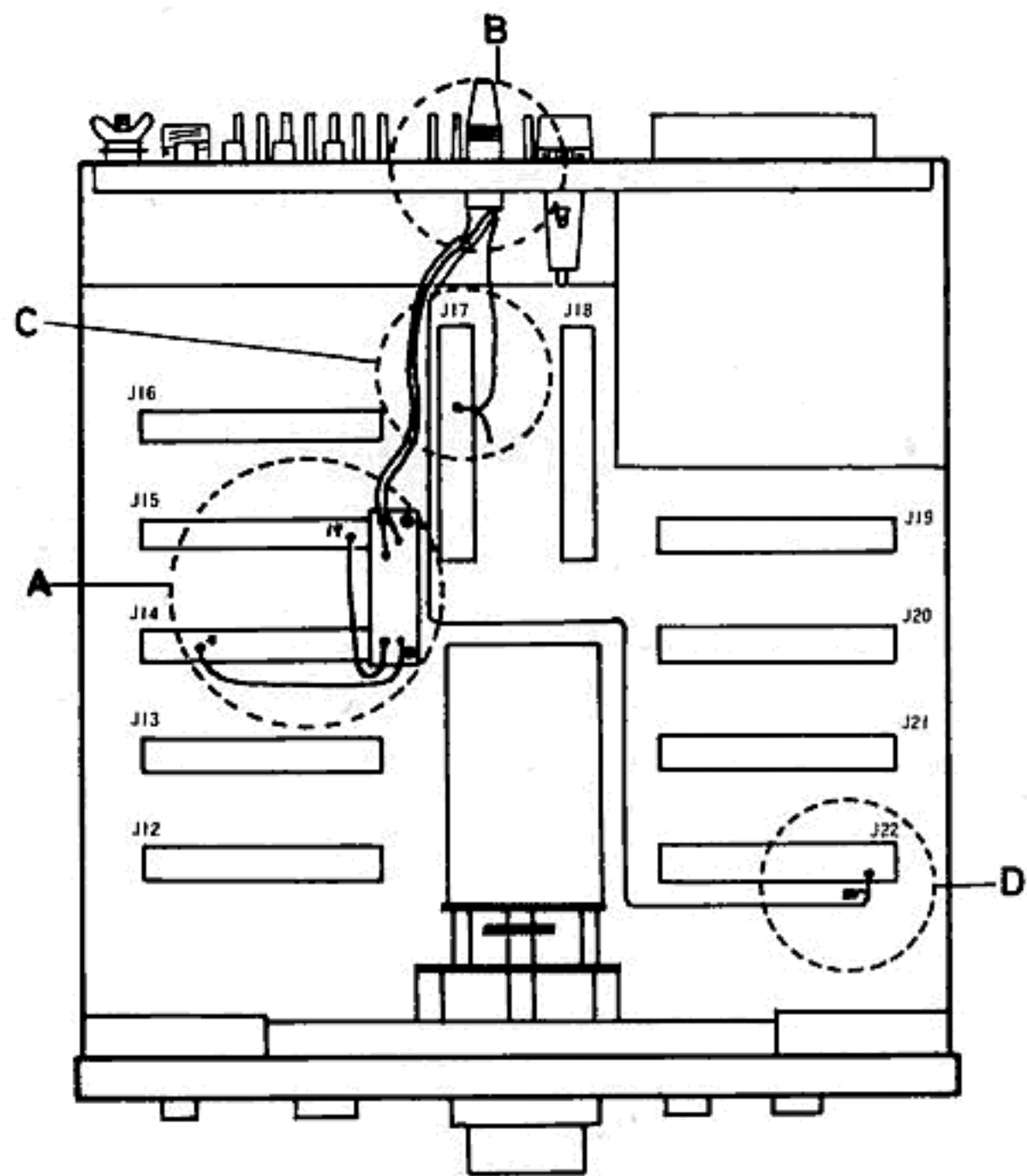


Fig. 1

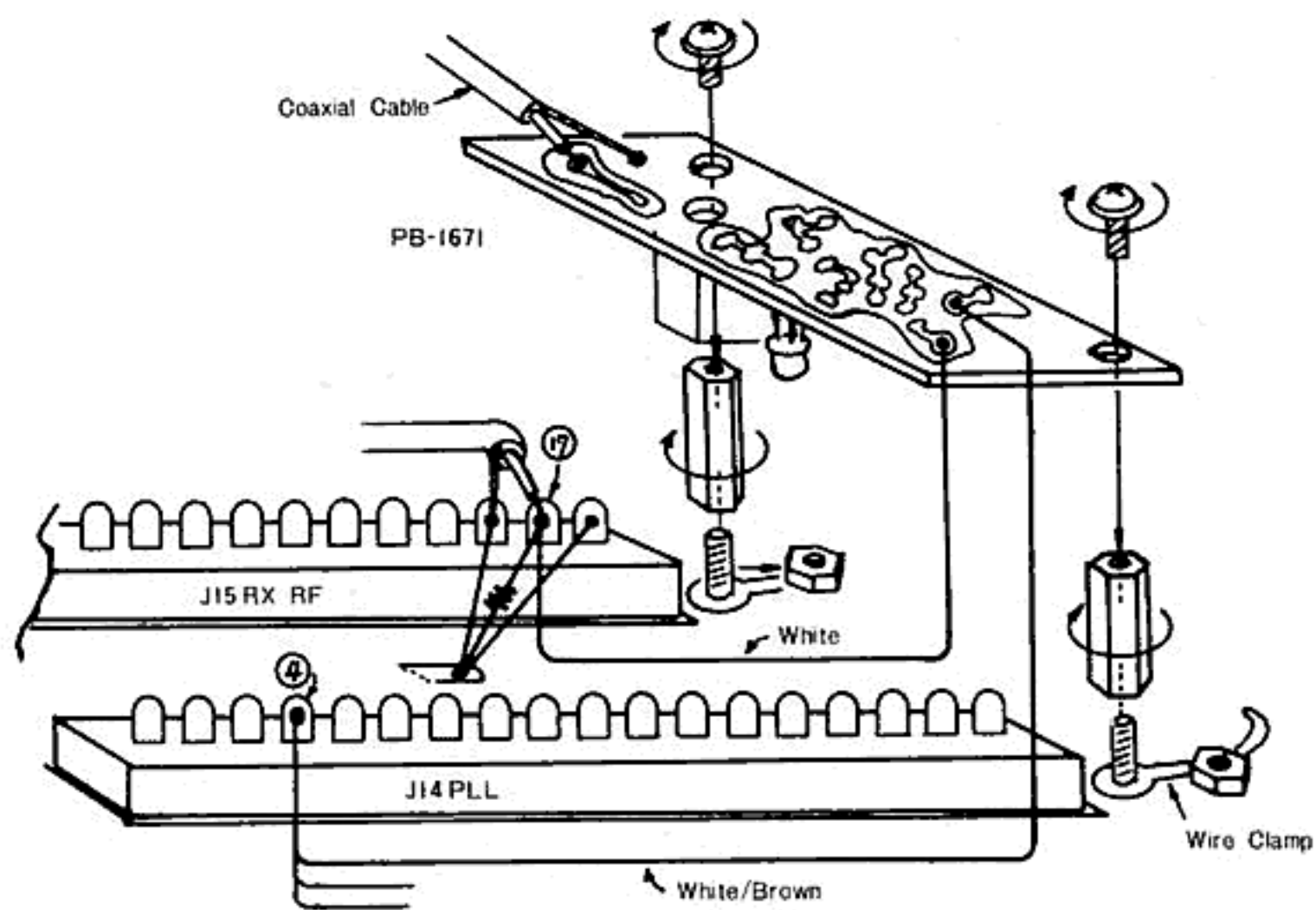


Fig. 2

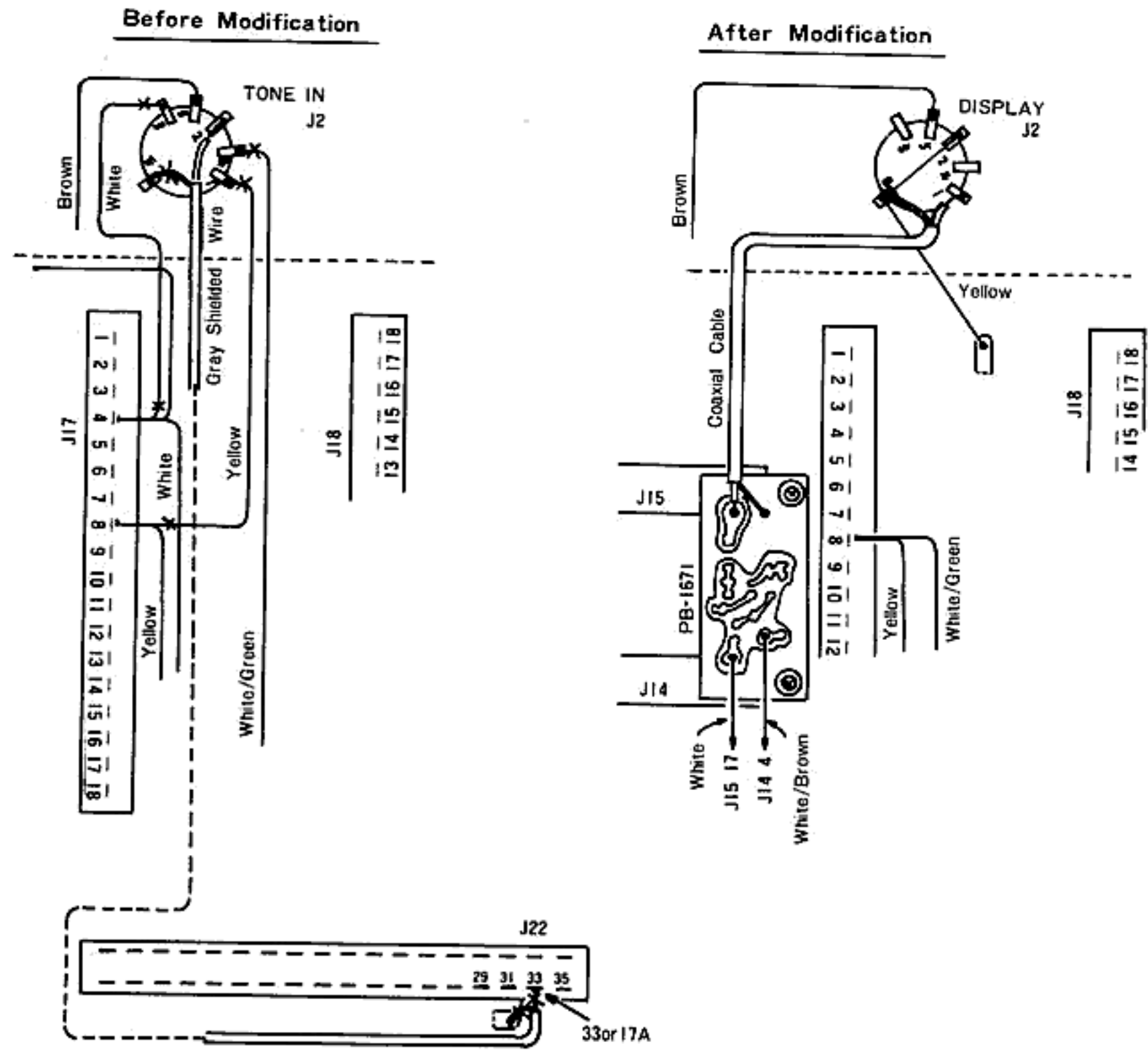


Fig. 3

