

NOTE 1: CR18 NOT NEEDED WITH MOST MODELS BY-PASS WITH JUMPER.

DS1-DS8 F1.0-159

Ramsey Electronics CT-50 Frequency Counter

Introduction: The CT-50 is a versatile and precision frequency counter which will measure frequencies to 60 mhz and up to 600 mhz with the optional pre-scaler. Large Scale Integration, CMOS circuitry and solid state display technology have enabled this counter to match performance found in units selling for over three times as much. Low power consumption (typically 300-400 ma) makes the CT-50 ideal for portable battery operation.

Specifications:

Sensitivity: less than 25mv, typically 10mv
Frequency range: 5Hz to 60mHz, typically 65mHz
Gate time: 1.0 seconds 1Hz resolution, 0.1 seconds 10Hz resolution
Decimal points: automatic in all modes, including prescale
Display: 8 digit red LED 0.4 inch height
Stability: 2.ppm over 10° to 40°C Temp comp.
Accuracy: Adjustable to .5ppm.
Input: BNC, 1 megohm direct, 50 ohms on prescale (optional)
Overload: 50 VAC, all modes
Power: 110VAC, 5W or 12VDC, 400ma.
Size: Approx. 6"x4"x2", high quality aluminum case

Optional CB-1 Burst adapter:

Accuracy: less than 0.001ppm
Input Impedance: greater than 1 meg, 10 pf
Power: 12VDC, 30Ma from CT-50 power supply

Optional CT-600 Prescaler option:

Sensitivity: less than 100mv to 500mHz, 150mv to 600mHz, typically 10 - 25mv at 150Hz
Overload: 2 watts, diode limited, resistor fuse protected
Input impedance: 50 ohms nominal
Frequency: 25mHz to over 600mHz, typically 650mHz

Construction notes: Use a small tipped iron for assembly. A power rating of 30-50 watts is ideal. Do not use a soldering gun! Do not use any sort of additional solder flux, use only a good grade of rosin core solder. Proper soldering techniques are important! Each joint should be shiny and completely surround the lead wire. There should not be just a slight dab of solder barely held on to the lead. Don't be afraid of damaging a component due to too much heat, modern day semiconductor can withstand more heat than your iron can put out! Use enough heat to form a good solid joint, a quick touch of the iron is usually not enough. The main PC board has plated thru holes, thereby eliminating the need to solder top side of the board. This, however, makes removing a part more difficult, so follow the directions closely.

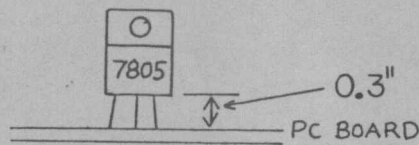
Note that all parts stand upright on end. Do not mount the parts flat, to do so may cause unnecessary shorts between component leads. Keep component lead lengths as short as possible.

Assembly: Unpack all parts and check against parts list for errors, notify Ramsey Electronics immediately of any discrepancy. Review all details in the instruction manual. Save scrap resistor leads as they will be used later for jumper leads. Check off each step as you go along.

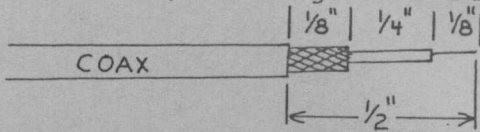
- 1) Install 16 pin IC socket at U11 location and insert U11, 10116. When installing ICs, pay close attention to position of notch or pin 1 locator.
- 2) Install 14 pin socket at U10 location and install U10, 74S00
- 3) Install 16 pin socket at U8 location and insert U8, 4049
- 4) Install 14 pin socket at U5 location and insert U5, 74196
- 5) Install 14 pin socket at U12 location and insert U12, 4013
- 6) Install 14 pin socket at U9 location and insert U9, 4011
- 7) Install 16 pin socket at U14 location and insert U14, 4518
- 8) Install 8 pin socket at U13 location and insert U13, 5369
- 9) Install 14 pin socket at U6 location and insert U6, 7490

- 10) Install 16 pin socket at U4 location and insert U4, 4511
 - 11) Install 16 pin socket at U3 location and insert U3, 4511
 - 12) Install 14 pin socket at U7 location and insert U7, ITT-500, or 492
 - 13) Install 28 pin socket at U2 location and insert U2, MK-50398
 - 14) Install R50, 15 ohm; R29, 470 ohm and R1, 270 ohm. All located near U1
 - 15) Install CR10, 1N4148 type diode, observe cathode band
 - 16) Install R28, 100 - 120 ohm
 - 17) Install Q4, 2N5771, observe position of flat side
 - 18) Install C2, 10uf and C21, .01uf. Observe C2 polarity.
 - 19) Install R32, R31, R34, R33, all 470 ohm
 - 20) Install R36, 1K and R39, 150 ohm
 - 21) Install R38, 270 ohm
 - 22) Install Q6, 2N5485 and Q5, 2N5771. Observe flat side position.
 - 23) Install C12, 10uf and C11, .10 to 2.0uf tantalum, observe polarity
 - 24) Install R37, 1K and R30, 270 ohm
 - 25) Install C10, .01uf
 - 26) Install C15, 10uf, observe polarity
 - 27) Install R40, 1Meg and CR11, CR12, 1N4148 type diodes, observe cathode band
 - 28) Install R42, 100K and C16, 100pf
 - 29) Install C14, 4.7 to 10uf, observe polarity
 - 30) Install C13, .01uf, R35, 51 ohm and R41, 1K ohm
 - 31) Install R18, 100K, CR6 and CR7, 1N4148 type diodes, observe cathode band
 - 32) Install wire jumper in place of CR-19
- NOTE: R47, R46, CR17, 18, C17, R44, R45, C18, U15, C20, R43, C19, Q7 and Q8 are part of the CT-600 option and are not included in the basic CT-50 kit.
- 33) Install trimmer capacitor, C9 and R25, 22Meg
 - 34) Install C7 and C8, selected capacitors, 10 to 47pf range
 - 35) Install Y1 crystal. Mount it slightly above the PC board (1/16")
 - 36) Install R48, 100K and CR8, 1N4148 type diode, observe cathode band
 - 37) Install R23, 10K and Q3, NPN, observe flat side placement
 - 38) Install CR9, 1N4148 type diode and R24, 10K. Observe cathode band
 - 39) Install R22, 100K; C4, .001; and Q2, NPN, observe flat side
 - 40) Install R16, 10K; C3, .001; R17, 10K; R15, 1K and Q1, NPN; R14, 10K
 - 41) Install C5, .001uf and R21, 100K
 - 42) Install C6, 100pf and R20, 1Meg
 - 43) Install R49, 1K and R19, 10K
 - 44) Install R27, 270 ohm and R26, 470 ohm
 - 45) Install R4, 51 ohm; CR3, CR4, 1N4148 type diodes, observe cathode band
 - 46) Install R2, 51 ohm; CR2, CR5, 1N4148 type diodes, observe cathode band
 - 47) Install R3, 51 ohm
 - 48) Install C1, 1000 uf; CR13-CR16 1N4001 type diodes. Observe cathode band.
 - 49) Install CR1, 1N4001 type diode, observe cathode band
 - 50) Locate piece of thin green enameled fuse wire. Cut a 1/2" piece and form into a small loop. Slip a 1/4" long piece of spaghetti tubing over the loop and solder to the holes marked 'F1' above S3.
 - 51) Prepare a 3 1/2" piece of coax as follows: Strip each end back 3/4", separate braid from center conductor and tin, strip center back 1/8" and tin. Locate isolated input hole between S1 and S3 labeled 'IN'. Solder center conductor to this hole and braid to ground plane around hole. This piece solders on component side.
 - 52) Install S1, S2, S3 switches, make sure switches are seated properly
 - 53) Install jumper wires. There are a total of three; one above U5, 1 1/2" long; one below U3, 2" long, and one above R3, 3 1/2" long. The jumpers are cut from the insulated wire supplied.
 - 54) Insert a scrap component lead into the TP-1 hole near U13. Solder and trim the lead so that about 1/2" sticks up from the component side of the PC board.
 - 55) Install U1, 7805 regulator. It should mount about 0.3" above the PC board. Note that the metal tab faces to the back of the board (towards chassis).

55) Continued...

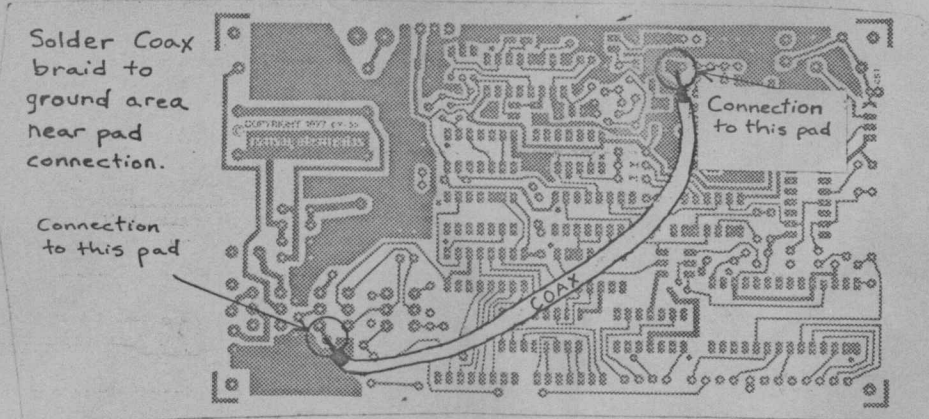


56) Prepare a 5 1/2" length of coax cable. Strip each end as follows:



Be careful when stripping the center conductor so that you don't pull the entire center out from the cable. Hold the cable tightly when stripping.

Tin the braid and the center conductor. When tinning the braid, use enough heat to tin it fully- do not use too much however, this will melt the center insulation and cause a short. When done, solder the piece of coax on the solder side of the board as shown below.



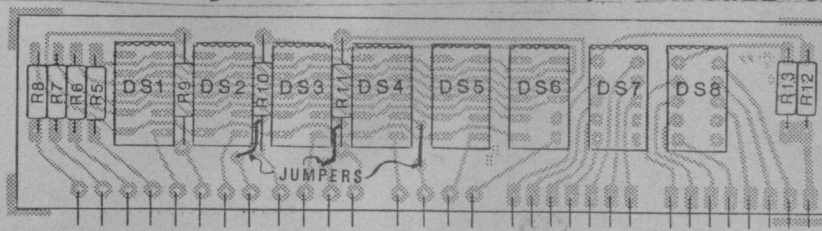
The coax pads are also indicated on the top side printed component layout.

57) Install transformer T1, note carefully the position of the dot on T1 and the PC board. The dots MUST be positioned correctly for proper operation. The dot on the transformer is located on the label.

58) Locate C22, .01 uf. Install it on the solder lugs on switch, S2, see page 11 for details. Keep leads fairly short.

Readout Board assembly: The readout board has many fine PC traces and requires much care in assembly, inspect each joint after soldering for any possible bridges. It is much easier to find mistakes now, as trouble shooting solder bridges is quite difficult. Do not rush this portion of assembly!

1) Install jumper wires under the R10, R11 locations using scrap component lead wire. Use a 1/4" long piece of spaghetti tubing on each jumper. Press the jumpers close against the PC board. Install third jumper near DS4.

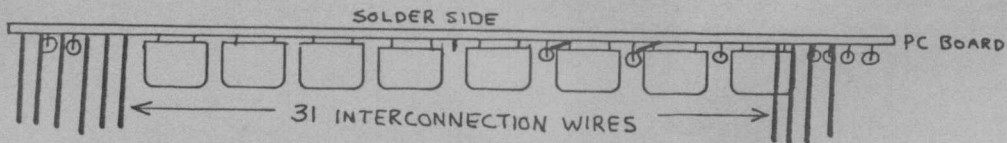


locations of the

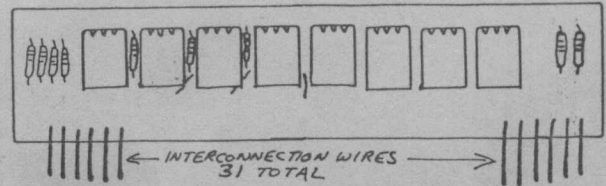
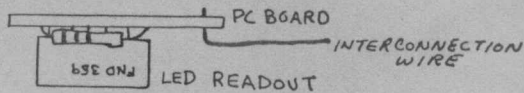
3 jumper wires:

- one under R10 location
 - one under R11 location
 - one between DS4, DS5
- Be sure jumper wires are not touching resistor leads.

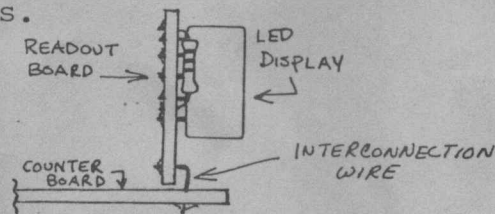
- 2) Install R5 thru R11, all 270 ohm
- 3) Install R12 and R13, 82 ohm
- 4) Place DS1 thru DS8, LED readouts in PC board. Note position of notches on tops of readouts. Turn the board over with the readouts sitting flat upon a flat surface. Push down on the PC board firmly to line up all readouts evenly, then solder.
- 5) Check alignment of readouts and if any are not positioned evenly, repair.
- 6) From scrap component lead wire, install the 31 inter-board jumpers as follows: Set the readout board down flat on the readouts with the solder side up. Insert a lead wire at least 3/4" long into the two end holes. Solder the two leads so that 1/2" extends from the component side of the board. With the board still standing solder side up, propped up by the two end leads, insert and solder the remaining 29 wires. See diagram.



- 7) Bend each lead sharply so all extend away from PC board.



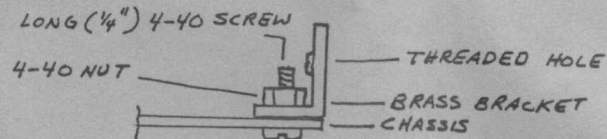
- 8) Line up the readout board wires with the counter board holes. Insert and solder all leads.



- 9) Once more, carefully inspect the boards for any solder bridges, unsoldered joints or cold-solder joints. A good visual check now will save hours of trouble shooting time later.

Case Assembly:

- 1) Carefully unwrap the chassis section and locate the press on rubber feet. Apply the feet to the chassis bottom. Do not place the feet within 1/4" of the corner holes (leave room for the screws).
- 2) Locate the two brass elbow brackets, two long 4-40 screws and two 4-40 nuts. Install the brackets in the center holes on each side of the case.



- 3) Locate the threaded standoffs. Install them in the four corner holes of the case using short 4-40 screws.
- 4) Locate the 3/8" press in grommet and insert it into the large hole in the back of the chassis.
- 5) Locate the BNC connector and solder lug. Insert the connector into the panel and secure with solder lug, washer and nut.
- 6) Locate the line cord and pull about 6" thru the rear panel grommet. Strip each end about 1/4" and solder to the '110 VAC IN' holes on the counter board. Use care making sure that any fray strands of the cord are cut and do not touch anything.
- 7) Press in all the pushbuttons on the counter assembly and slip the unit into the case. Feed the line cord out the grommet as the board is being slid in.
- 8) When the board is seated, install the 4 corner mounting screws.
- 9) Bolt the 7805 regulator to the case using long 4-40 screw and nut.
- 10) Bend the BNC connector's solder lug out and solder the input coax shield to it. Solder the center conductor to the BNC center pin.
- 11) Locate the plastic pushbutton covers. Press the red one over the power switch and the remaining ones over the other switches. Press firmly until the cap snaps on, but don't force it after it is seated.
- 12) Locate the piece of red filter. Carefully remove the backing paper and slide the filter behind the window in the case. Tension between the case

Step 12 continued...

and readouts will hold it in place.

13) This completes the case assembly.

Checkout:

- 1) Connect a voltmeter between the case and pin 14 of U10, 74S00 Pin 14 is on the corner above R49.
- 2) Turn the power on, verify a voltage of 4.5 to 5.5 VDC. If not correct, turn off power and consult Trouble Shooting Hints.
- 3) Remove the voltmeter and leave the power on. Within a few seconds all displays should light up.
- 4) Cut an 8" piece of wire and strip each end back 1/8" and tin. Temporarily solder one end to the center pin of the BNC connector. Touch the other end to TP1, located near U13. With the 'GATE' and 'SCALER' buttons both out, the counter should display the approximate frequency of 3.579540MHz. Depressing the 'GATE' button should move the entire display to the right one digit.
- 5) If all checks out, remove the wire and discard.

Calibration:

- 1) Set the top cover on the CT-50 and allow it to warm up for at least 30 minutes.

Method A:

- 1) Connect a signal of known accuracy (a 100kHz calibrator which has just been zero beated to WWV works well) to the counter input. Set the gate time to 1.0 seconds and adjust C9 until the display shows the proper frequency.

Method B:

- 1) Using a counter of known accuracy, measure the frequency at TP-1 using a high impedance probe. Adjust C9 for a frequency of 3.579540MHz.
- 2) When calibration is completed, fasten the case cover on to the chassis using 4-40 screws. The assembly of the CT-50 is now complete.

Options

12VDC option: The CT-50 will accept 12 to 15VDC as a power source. To run the CT-50 on DC, route a cable thru the 1/4" option hole in the rear of the chassis to the 12VDC input holes located near S3. Note the labels on the holes, 'GND' and '+12 IN'. Solder the cable to the indicated holes in the PC board. If desired, a jack could be installed in the option hole.

CB-1 option: The CT-50 time base may be locked to an external frequency standard. The television networks maintain extremely accurate atomic based frequency standards to maintain color tint on TV programs. These standards are typically accurate to one part in 10 to the 12. By locking the CT-50 to one of these network standards, we are able to get super accuracy. The CB-1 adapter interfaces a standard color TV receiver to the CT-50 so that one can take advantage of the TV network frequency standards. Complete data for this option is contained in the CB-1 kit.

CT-600 option: The CT-600 prescaler option enables the CT-50 counter to measure frequencies as high as 650MHz with sensitivity in the 30 to 150mv range, depending upon frequency. Typical sensitivity at 150MHz is 30mv. The CT-600 option mounts on the same board as the CT-50, no extra boxes or PC boards are required. The scaler utilizes a state-of-the-art Motorola ECL IC chip and individually selected components to insure high sensitivity. The scaler input is protected against overload and burnout by diodes and a resistor fuse. Complete data is contained in the CT-600 option kit.

Theory of operation:

Input signals arriving at J1 are routed thru S1 to either the input amp or prescaler. The input amp consists of a high input impedance buffer amp which drives an ECL amplifier/schmitt trigger. The ECL signal is converted to TTL by Q4 and passed on to selector gate U10. U10, which is also switched by S1 selects which output (from input amp or scaler) is gated into the counter section. The first part of the counter section is U5, a high speed decade counter. The carry output of U5 is counted by U6, another decade counter. The counter outputs are decoded and displayed by U4, U3 and DS8, DS7. The TTL level carry output from U6 is converted to 12 volt level by Q1 and fed to U2's count input. The six digit counter, U2, counts, latches, decodes and drives the remaining six digits. Pins 3 thru 9 drive the segment lines while pins 18 thru 23 enable the individual digits. U7 amplifies the digit enables so that the LEDs may be driven. These six digits are multiplexed, meaning that only one digit is lit at any one time. The eye, due to persistence of vision, sees a display that looks as though it is continuously lit.

Time base and gating circuitry is as follows: The crystal, Y1, is divided by 59,659 in U13 to get 60Hz. The first section of U14 divides by 6 producing 10Hz. The second section divides by 10, producing a 1.0Hz waveform. These signals are the standard gate times, 0.1 second and 1.0 second. Selection of either one of these gate times is controlled by part of U9, which is switched by S2. The outputs of these two gates are 'ORed' and fed to the gate flip flop, U12 which enables the count gate, U10. When U10 is enabled, a precise time controlled amount of pulses are counted by the counting section. After the time 'window' is up, a pulse is sent to parts of U8. U8 tells the counter section to display the count and then feeds another pulse to the second section of U9. This section of U9 inserts a slight time delay to make sure the count is displayed, then resets all of the counters to zero. The counter then waits until U12 enables the counting gate and the whole process repeats. Transistors Q2 and Q3 perform the same function as Q1 - changing TTL levels to 12 volt levels. Portions of U8 are simply buffers which produce the 'stiffer' drive required by the TTL counters.

The power supply is a standard full wave bridge which rectifies the AC from the transformer and produces approximately 12VDC. U1, a 5 volt regulator, derives a 5 volt source from the 12 volt supply.

The prescaler option accepts VHF and UHF signals, amplifies them by way of an IC on chip amplifier, divides by 10 and produces a TTL output signal. The TTL output is then routed to the selector gate U10.

Trouble Shooting Hints: The first step involved in trouble shooting is to carefully examine all your work. Check parts placement against parts list and PC layout. Make sure all diodes, transistors, ICs and capacitors are orientated correctly. Examine all IC pins to make sure they are seated properly. Above all, check solder connections! Examine all PC runs to verify that no solder bridges exist. Carefully check the readout board as it has quite a few close foil runs.

Problem: Entire display doesn't light. Check; power supply voltages, connections to readout board.

Problem; 5 volts not present. Check; placement of T1, orientation of CR13-CR16, c1, U1.

Problem; Only DS7, DS8 light or only one digit in DS1-DS6 comes on. Check; placement of U2 and U7, connections on C3

Problem; Only DS1-DS6 light. Check; placement of U3 and U4, leads on readout PC board.

Problem; Display lights, but shows odd characters. Check; all solder joints on readout board- look closely for bridges.

Problem; Digit not lit (DS1-DS6). Check solder connection around U7 and U2.

Trouble Shooting Hints continued...

Problem; Display appears to work, but won't count. Check to make sure signal is flowing thru counter. Follow signal thru input amp U11, gate U10 and up to counter input, pin 8 on U5.

Verify operation of time base. Check for 3.579540MHz signal at TP1, 60Hz at pin 1 on U13, 10Hz at pin 5 on U14 and 1.0Hz on pin 14 on U14. Make sure gate, strobe and reset pulses are being generated.

Problem; Display of frequency is jittery. Signal being measured is either: varying in amplitude, varying in frequency or not large enough in amplitude to count.

Warranty

All parts used in the CT-50 counter are warranted to be free from any defects for a period of 90 days. Parts found to be defective within this period will be replaced promptly without charge upon receipt for inspection at the factory. After the warranty period has passed, parts may be purchased per the price list. Ramsey Electronics cannot be held responsible for faulty workmanship during assembly or damage/harm caused by construction or installation errors. Units obviously misused or modified are not covered by this warranty.

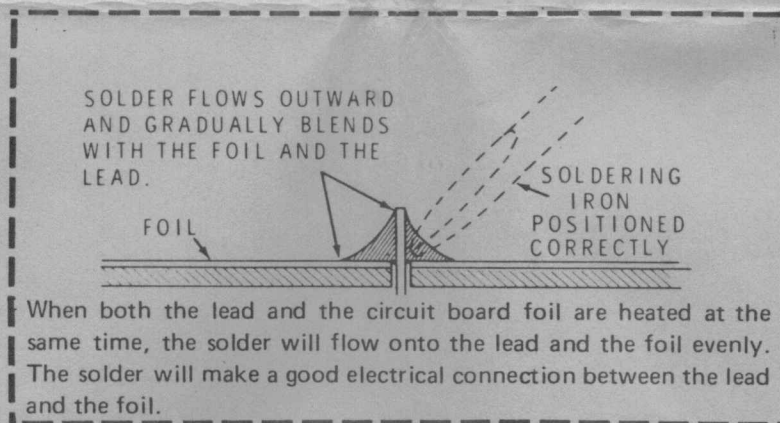
Repair Service

Assembled CT-50 kits may be returned for repair and calibration to factory standards for a fee of \$20.00. This fee covers repair, calibration, shipping, insurance, handling and a service report on difficulties found. CT-50 units containing the CT-600 option may be subject to an additional charge.

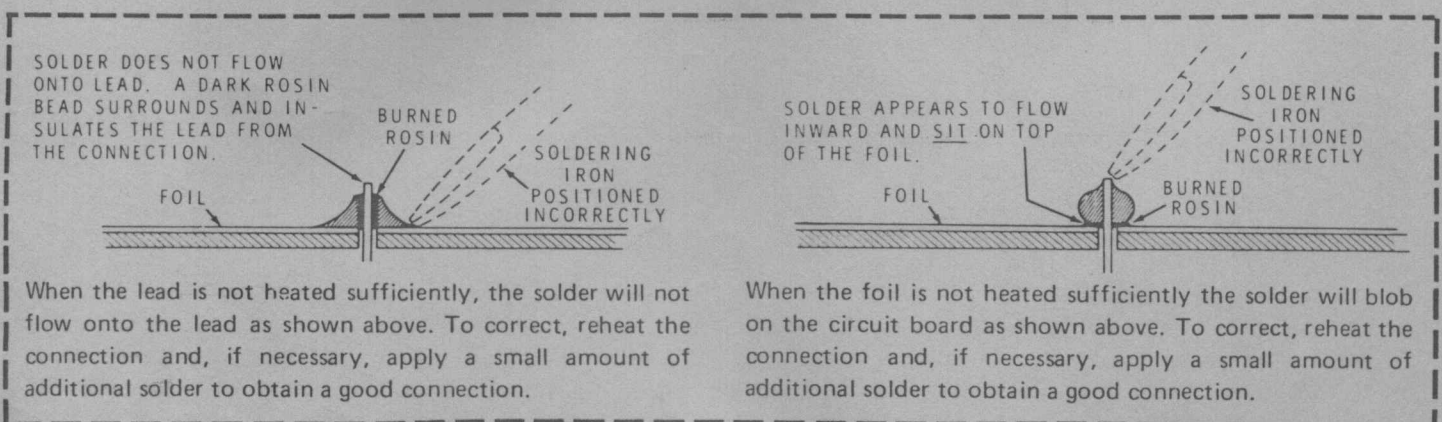
Units assembled with paste flux, acid core solder or soldering guns will not be accepted. Ramsey Electronics reserves the right to refuse repair on unreasonably constructed units.

Pack all returns adequately and insure for your protection.

A GOOD SOLDER CONNECTION



POOR SOLDER CONNECTIONS



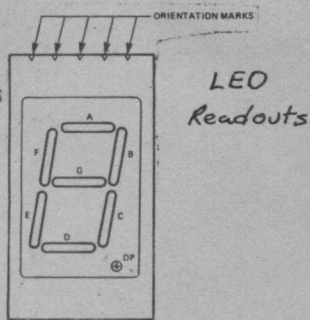
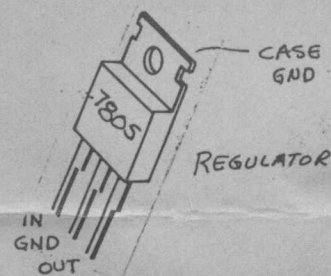
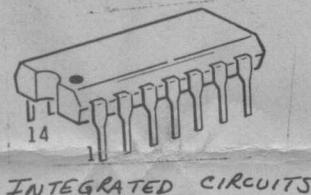
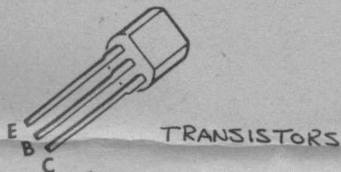
Parts List

<u>Designator</u>	<u>Description</u>	<u>Price (ea.)</u>
C1	1000uf electrolytic	.75
C2,C12,C15	10uf electrolytic	.25
C3,C4,C5	.001uf disc	.15
C6,C16	100pf disc	.15
C7,C8	10 to 47pf disc (selected)	.35
C9	3-40pf trimmer cap	.85
C10,C13,C21,C22	.01uf disc	.15
C11	.1 to 2.0uf tantalum	.45
C14	4.7uf dipped tantalum, or 10ufd elect.	.55
C17-C18	used in CT-600 option	---
CR1,CR13-16	1N4003 1 amp diode	.20
CR2-12	1N4148 type glass bead diode	.15
CR17,18	used in CT-600 option	---
SL1-8	FND-357,359 LED readout	1.00
Q1-3	NPN transistor, 237A (sim. to 2N3904),7545	.25
Q4,5	PNP transistor, 2N5771, or unmarked,2n3906	1.00
Q6	2N5485,2N5484,MPF-102 FET	1.00
Q7,Q8	used in CT-600 option	
R1,5-11,38,27,30	270 ohm 1/4 watt (11)✓	.10
R2-4,35	51 ohm 1/4 watt (4)✓	.10
R12,13	82 ohm 1/4 watt (2)✓	.10
R14,16,17,19,23,24	10K ohm 1/4 watt (6)✓	.10
R15,36,37,49,41	1K ohm 1/4 watt (5)✓	.10
R18,21,22,42,48	100K ohm 1/4 watt (5)✓	.10
R20,40	1Meg 1/4 watt (2)✓	.25
R25	22Meg 1/4 watt (1)✓	.25
R26,R29,R31-34	470 ohm 1/4 watt (6)✓	.10
R28	100- 120 ohm 1/4 watt (1)✓	.10
R39	150 ohm 1/4 watt (1)✓	.10
R43-47	used in CT-600 option	---
R50	15 ohm 1/4 watt (1)✓	.10
SL1-3	DPDT pushbutton switches	.95
TL1	✓ PC-24-180 transformer	6.95
U1	7805 5V regulator	.95
U2	MK50398 MOS-LSI counter IC	12.50
U3,4	4511 or 14511 decoder-driver	2.50
U5	74196 TTL decade counter	1.50
U6	7490 TTL decade counter	.50
U7	500 LED digit driver, or 492	.75
U8	4049 CMOS buffer	.50
U9	4011 CMOS gate	.35
U0	74S00 TTL gate	.75
U1	10116 ECL amplifier	1.75
U2	4013 CMOS flip flop	.75
U3	5369 CMOS divider	1.95
U4	4518 CMOS divider	1.95
U5	used in CT-600 option	---
	3.579545 crystal	3.00
Socket set	1-28pin, -14pin, -16pin	3.00

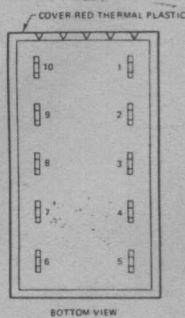
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CT-50 counter PC board		15.00
CT-50 display PC board		4.50
Fuse wire	2" approx. 1/4 amp	.35
Hook up wire	6" length	.25
Coax cable	12" RG-174	.35
Spaghetti tubing	2" length	.25
Snap in grommet	3/8" hole size	.20
BNC connector	✓ UG-625B/U	1.00
Solder lug	3/8" hole size	.10
Rubber feet	strip of four, pressure sensitive	.75
Red lens	1 1/2" x 4" x .062"	.95
4-40 screws	8- 3/16", 5- 1/4"	.50
4-40 nuts	3 pieces, 1/4" hex	.25
Standoffs (4)	4-40 threaded, 1/4" long	1.00
Brackets	Brass elbow, 2 pieces	.25
✓ Case assembly, CT-50	CT-50 case, top and bottom	10.00
✓ Line cord		1.00
Buttons	1-red, 2-black	.50

Parts Pinouts



LED Readouts



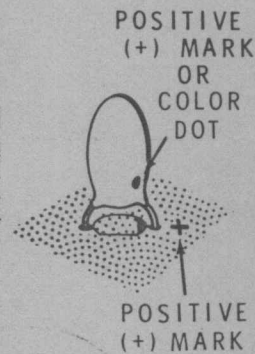
BOTTOM VIEW

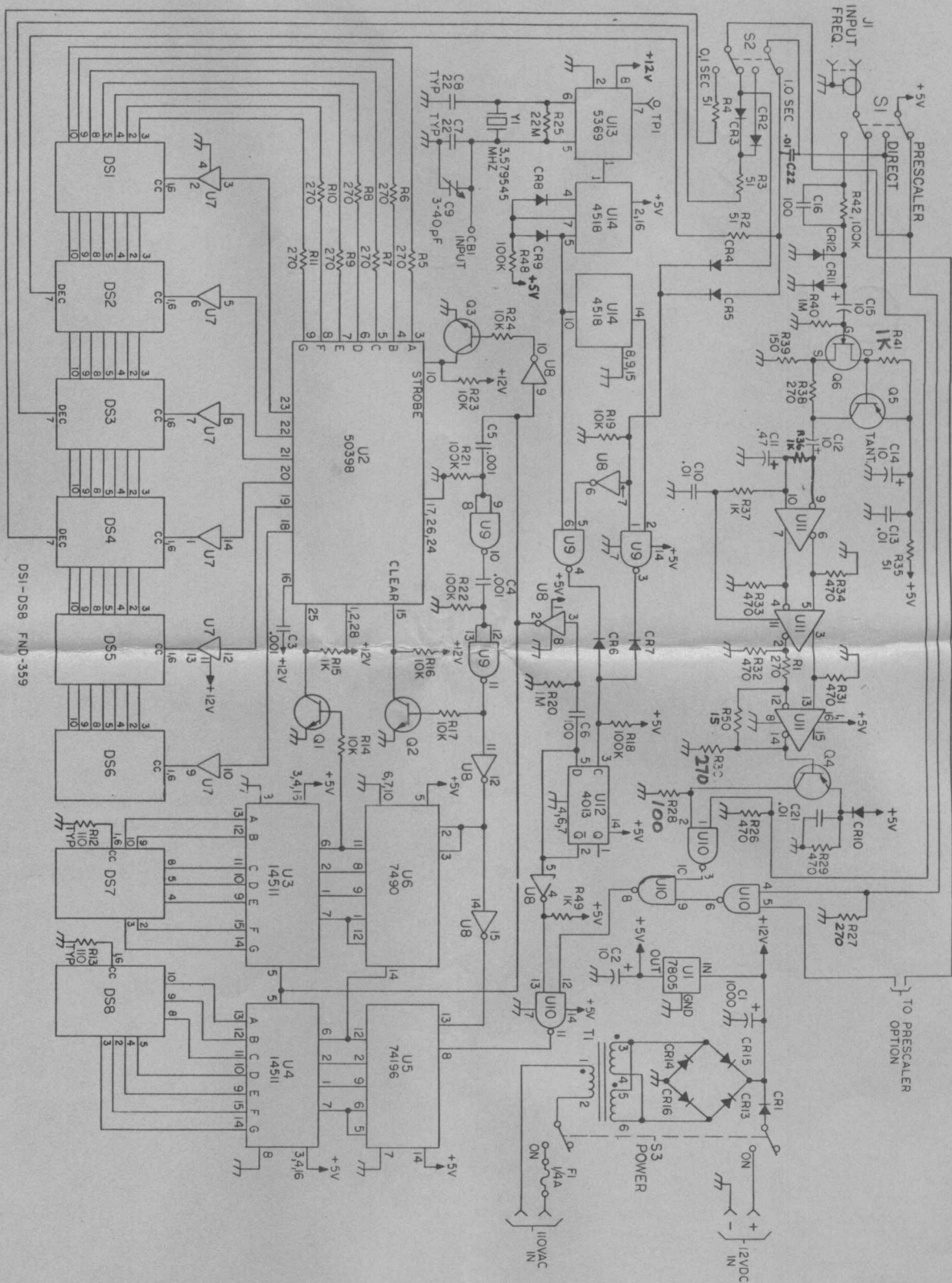
Pin Connections (See Bottom View)

Pin 1 Common Cathode	Pin 6 Common Cathode
Pin 2 Segment F	Pin 7 Decimal
Pin 3 Segment G	Pin 8 Segment C
Pin 4 Segment E	Pin 9 Segment B
Pin 5 Segment D	Pin 10 Segment A

When you install electrolytic and tantalum capacitors be sure to match the positive (+) mark or color dot on the capacitor with the positive (+) mark on the circuit board as shown.

Tantalum Capacitors

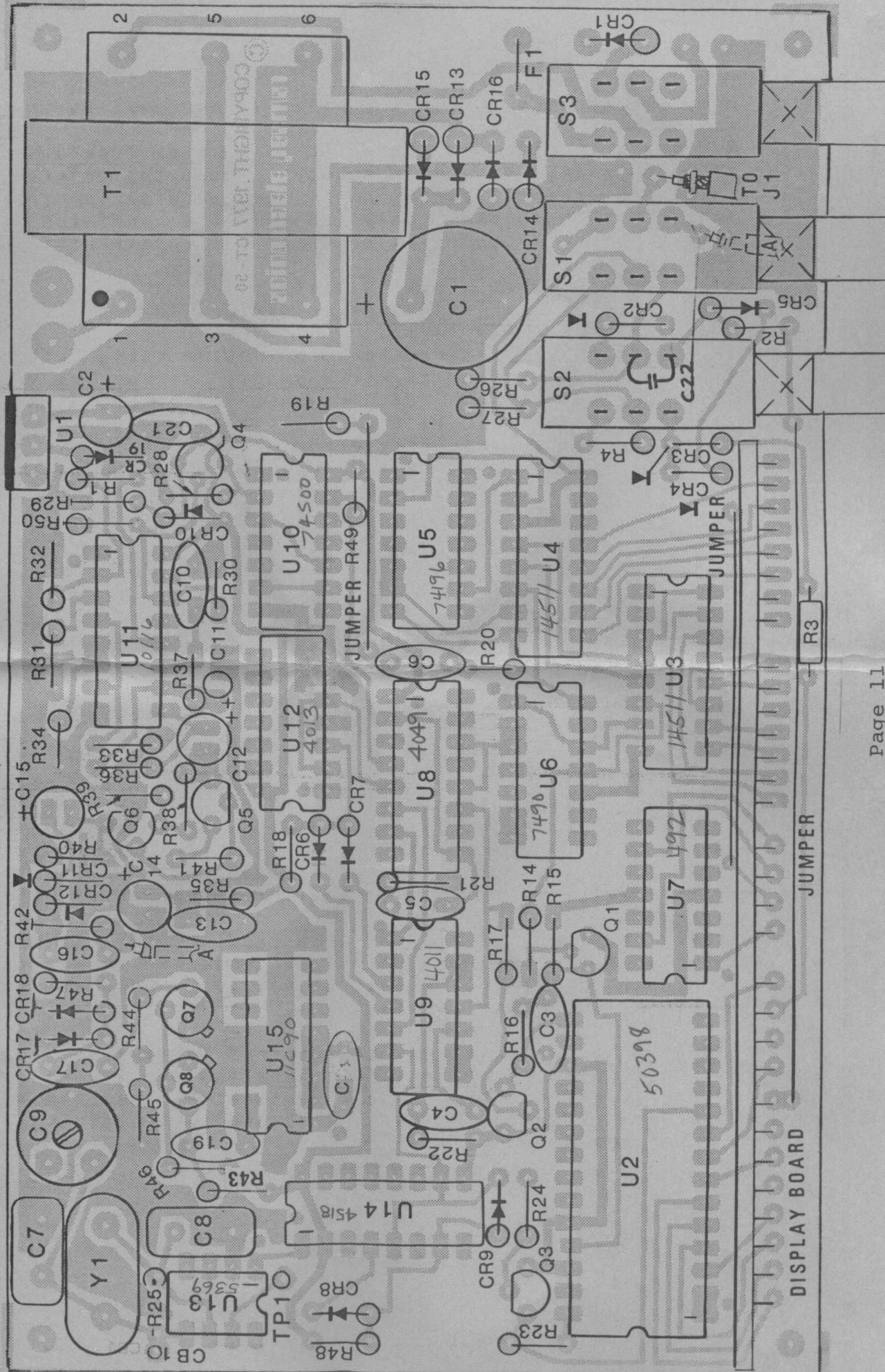
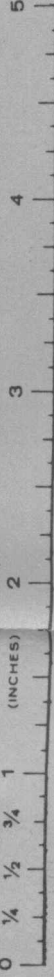




DS1-DS8 FND-359

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SCHEMATIC DIAGRAM -	
FREQUENCY COUNTER	
DATE: 5-78	REV: 2/4/77
RAMSEY ELECTRONICS - ROCH, N.Y.	
FORM 35-1	



CAUTION: 110VAC in this area

WARRANTY INFORMATION

Ramsey Electronics warranty applies to original purchasers only.

KITS: All parts in kits are warranted to be free from defects for a period of 90 days from date of purchase. Suspected defective parts will be replaced promptly at no charge upon receipt for inspection at the factory. Return parts only (in suitable condition for testing) do not return entire kits. Kits returned for repair will be billed at listed repair price.

To qualify for factory repair, kits must:

- 1) not be assembled with acid core solder or flux
- 2) not be modified in any form
- 3) be returned in fully assembled form (inside case, fully wired, etc)
- 4) be accompanied by proper repair payment. No repairs will be attempted until payment is received. Payment may be check, Money Order, or charge card. No C.O.D. repairs.
- 5) be packed properly (insurance recommended)
- 6) have description of problem and legible return address packed with returned kit. Do not send separate letters. Enclose all correspondence with unit.

REPAIR CHARGES

All clock products	\$7.50
Frequency counter products	\$20.00
Multimeter products	\$20.00
Video terminal products	\$35.00
Mini kits products	\$3.00

Ramsey Electronics reserves the right to refuse repair on any item.

FACTORY WIRED UNITS: All factory wired products are warranted to be free from any defects in parts or workmanship for a period of one year from date of purchase. This warranty applies only on units that have not been modified, misused, abused or repaired by unauthorized personnel. A \$3.00 return shipping and insurance remittance must accompany returned units. Pack all returns properly, insurance is recommended.

Warranty service time depends upon product, but typically runs 1-2 weeks after receipt. Most units are subjected to a burn in test to assure proper operation. Please do not cause needless delays, read all information above carefully.

RETURN FOR REFUND: Products may be returned for refund within 30 days. Refund made will be less the postage, handling and insurance charges. To qualify for a refund, the product must be returned; in original unassembled form (if kit), with all parts and instructions, and in suitable condition for resale.

Assembly Instructions - CT-600 Option

The CT-600 option provides a means of measuring upto 600 MHz using the CT-50 frequency counter. The installation should not be attempted until your CT-50 counter has been fully assembled and checked out.

Assembly:

- 1) Unbolt 7805 regulator.
- 2) Remove red filter lens.
- 3) Depress all three pushbuttons.
- 4) Unscrew four corner screws holding the PC board.
- 5) Unsolder the coax from the connector on the front panel.
- 6) Carefully remove the board from the case. Line cord can be fed out the grommet or the grommet can be unsnapped.

Now, install the parts,

- 7) Install socket at U15 location and insert U15, 11C90, observe position.
- 8) Install Q7 and Q8, MRF502, observe position of metal tab.
- 9) Install C18, .001 or .01 uf.
- 10) Install C19, .001 or .01 uf.
- 11) Install R43, 110 ohm and R46, 470 ohm.
- 12) Install R45, 51 ohm and R44, 470 ohm.
- 13) Install C17, .001 or .01 uf.
- 14) Install CR17, 18, glass bead diodes, observe polarity.
- 15) Install R47, 51 ohm.
- 16) Check all work and parts placement, then reinstall board back into case by backtracking the first six steps.

Checkout: Verify correct operation of the CT-50 counter without the scaler button depressed. When CT-50 checks out OK, depress scaler button, input is now routed to scaler. Decimal point will shift to right and counter will now measure upto 600 MHz.

For general purpose use, the CT50/600 can be used with a small whip antenna connected to the input jack. This will pick up nearby RF sources. For example, a 2 watt 146 MHz transmitter can be read from 5-10 feet away. Never connect a transmitter directly to the input, to do so will damage internal circuitry and void the warranty.

