

SECRET CB[®]

Special
Index
Issue



CONFIDENTIAL
**FACTUAL
REPORT**
SCHEMATICS ETC.
UPDATED QUARTERLY

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ACKNOWLEDGEMENTS

SECRET CB WISHES TO GRATEFULLY ACKNOWLEDGE THE FOLLOWING PEOPLE FOR THEIR HELP AND CONTRIBUTIONS TOWARD GETTING VOLUME 12 IN PRINT. THEIR ENCOURAGEMENT AND CONTRIBUTION OF MATERIAL HAS BEEN INVALUABLE.

JERRY CROOKSHANK

JAMES KERN

SAM KERSH

ROBERT ROSSLEY

TONY TROIDL

JAMES VAUGHAN

BILL WENTZ



**VIC says "THANKS" and
a free book to the above
people**

INTRODUCTION

We are celebrating our 4th year with this 12th edition of "Secret CB" and in it you will find information concerning the radios you have been asking about. We want to take this opportunity to thank all of our loyal customers and new friends for making this possible.

I get alot of calls from people wanting to know the specifications of our "Super Clarifier Diode". This is a "trade secret". We have contracted to have these varactors specially made- they are not available from replacement semiconductor distributors anyway. (They are also a bargain!)

Our new ZAPPER kits feature dual trimmer capacitors. This will let you set the frequencies right on the money. If you have a B & K Model 2040 Signal Generator, we have a kit for you. Our kit #117 gives 26-30 MHz coverage for the 2040. Makes receiver testing and alignment a BREEZE. By the time you read this , we will also have a KIT finally available for the TC9106 Chip, giving high or low channels. Neat!

Have you ever broken the cores trying to adjust a radio? Our item #120 CB Alignment Tool Kit features five of the most needed-most wanted alignment tools for practically any type of transceiver. This is a "must" for your tool box.

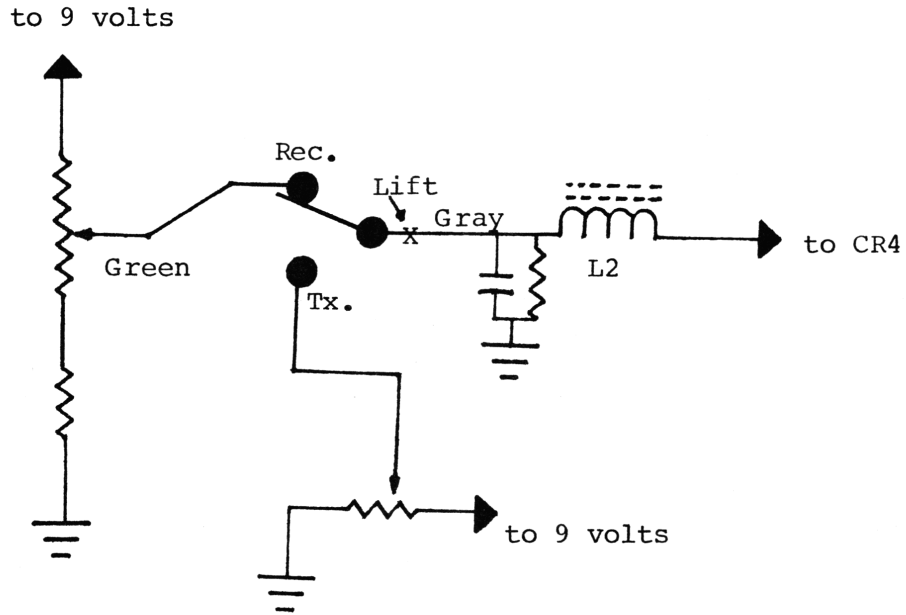
TIL THE NEXT TIME-

Jic Richter

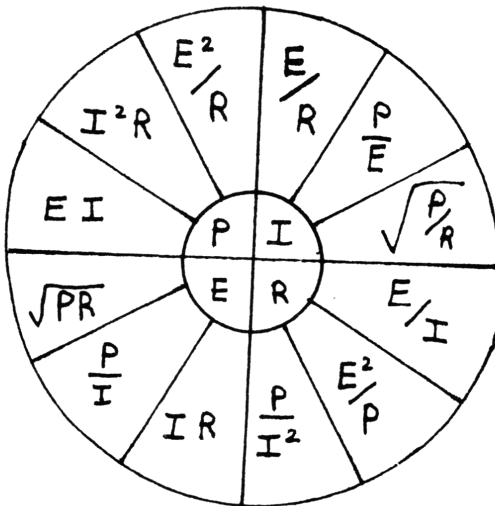
STX-105

CRAIG L231 CLARIFIER

1. Unsolder GRAY wire at relay.
2. Resolder at Green wire @ clarifier wiper.
3. Change CR4 to a Super Diode-L5 AM; L6 USB.



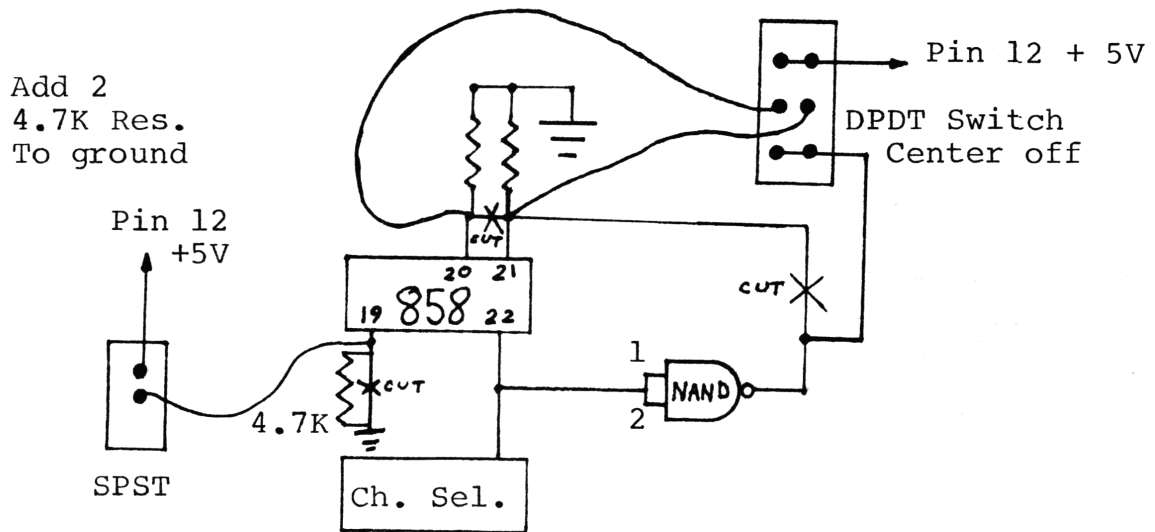
OHMS LAW FOR DC CIRCUITS



MIDLAND 13-883 B (UPD 858)

FREQUENCY EXPANSION:

1. Cut Pin 19 away from ground and reconnect to ground through a 4.7K resistor.
2. Wire a SPST Switch from Pin 12 to Pin 19.
3. Cut Pins 20 and 21 apart and install individual 4.7K resistors from Pin 20 and 21 ground.
4. Cut trace from NAND Gate to Pins 20 and 21 (1C2, pin 3).
5. Wire a DPDT-Center off Switch as shown.



L2; is VCO Coil

TR1 is disable control. It can be defeated by shorting across emitter and collector.

RX:

L201, L202.

1st if @ 9.785 Peak L203

2nd if @ 455KC Peak L206, L205, L204.

N.B. @23.5MHz Peak L220, L221.

VR201; A.G.C.

VR205; Squelch Range.

VR207; S Meter.

TX:

Peak L208, L209, L210, L211, L212, L215.

VR213; A.M.C.

VR209; RF Power Meter.

MIDLAND 78-999 PLL 02A (REF. Vol. 3)

RX: RV10; RF Gain Range.
RV6; SSB AGC.
RV7; AM SQ. Range.
RV8; SSB SQ. Range.
RV5; AM S Meter.
RV4; SSB S Meter.

TX: Peak T204, T205, T3, T209, L209, L212, L214, on USB.
RV1,RV2; Carrier Balance.
RV206; Final Bias adj. for .7v @ base of Q208.
RV3; SSB Mod. Gain.
RV201; SSB ALC.
RV9; AM AMC-or remove C71.
RV11; Mod. Meter.
RV202; RF Power Meter.

SLIDER:

1. Run a wire from the unused terminal on VR4 Clarifier Control to 8 Volt source located at the emitter of Q216.
2. Clip R221.
3. Clip D205.
4. Unit now slides. For more slide, replace D203 with Super Diode.

MIDLAND 79-891 02A

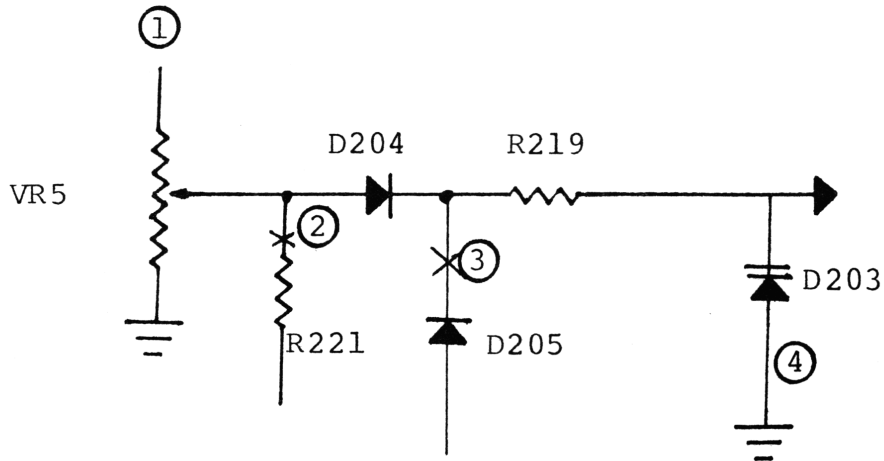
RX: RV6; SSB AGC.
RV7; AM Squelch Range
RV8; SSB Squelch Range
RV5; AM S Meter
RV4; SSB S Meter

TX: Peak T204 on Ch. 40 USB.
Peak T205 on Ch. 1, USB.
Peak T3, T209, L212, L214, on Ch. 19 USB.
RV1, RV2 Carrier Balance

Adjust R204 with VOM at base of Q208 on USB no signal input for .7 Volts.
RV3,RV201;ALC.
RV9; AM Power.
RV202; RF Power Meter.

Clarifier:

1. Run a wire from unused terminal on VR5 clarifier control to emitter of Q216.
2. Clip R221.
3. Clip D205.
4. D203 may be changed to a Super Diode.

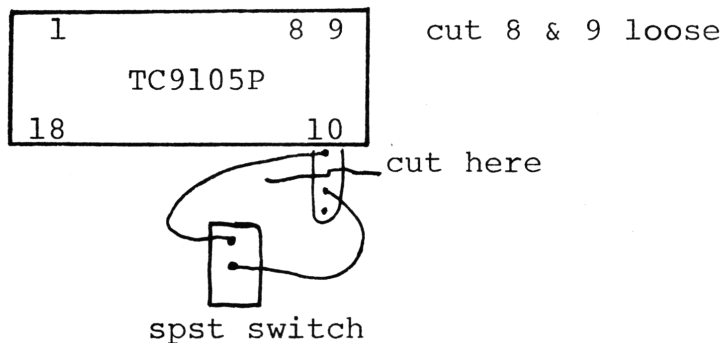


See Volume 3 for Channel Modification on 02A Chip.

MOTOROLA CM 555 TC9105P

FREQUENCY EXPANSION:

Channels 42 to 59 can be obtained directly from the Chip as follows. (For more channels, use our Zapper kit at C607.)



T601 is the VCO coil

pin 8 is loop detector output

pin 9 is T/R Switch

CLARIFIER:

- 1.) Cut off the wire on the end of the clarifier pot which reads 8V on RX, OV TX. Tape it. Run a new wire from the pot where the original wire was to pin 1 of IC702 (+side of C734).
- 2.) Clip D607.
- 3.) Remove C632.

D603 may be replaced with a "Super Diode" for more slide.

TUNEUP:

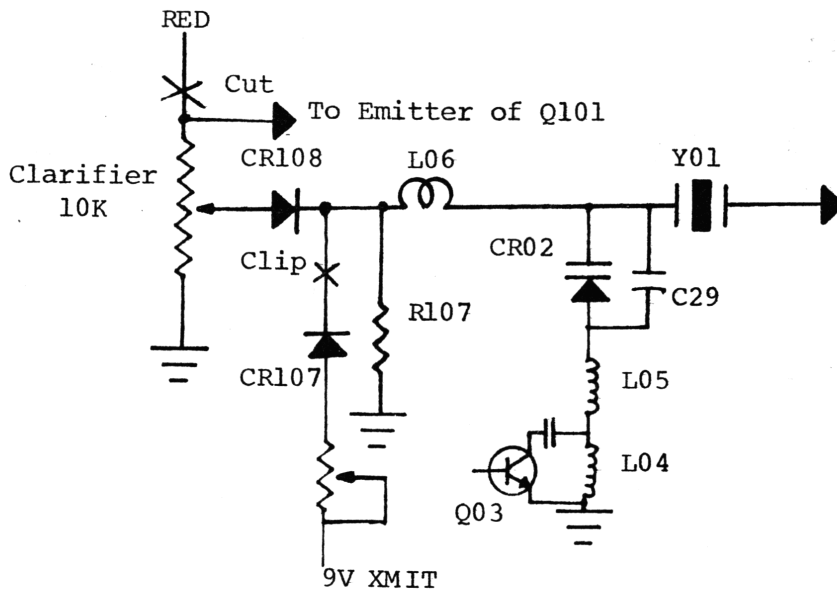
VR701 is AMC control (or remove TR704)

Peak L310, L313, L316, T201, T202, T203, T401.

VR303 is SSB ALC control.

N.D.I. PC-201 (NDC40013 PLL)

- RX: R517 AGC
 R518 Squelch Range
 R507 S Meter
 R103 Auto. Dimmer
 R912 Scan Sensitivity Range
- TX: Peak T701, T702, L702, L704, L706, L709 for Max.
 R207 AM Power
 R217 AMC
 R616 Balance Bias-adjust for 2.68V @ IC601, Pin 7.
 R611 Carrier Balance
 R721 SSB ALC
 R726 RF Power Meter
 R723 SWR Zero
 R53 SWR Call-adjust for .25V @ IC51, Pin 9.
 R61 SWR Meter-adjust for 3 Volts @ 150 OHM Dummy Load.
 R62 A.W.I.-adjust so light comes on with 150 OHM Load.



1. Cut Red wire off of end of clarifier.
 2. Run a new wire from clarifier to emitter of Q101.(9V).
 3. Clip CR107.
- Unit Now Slides.

PACE 8193 CCI3001

SLIDER MOD:

1. Remove D8.
2. Remove D9.
3. Solder a piece of hook-up wire in the hole where the cathode (banded end) of D9 was.
4. Solder the other end of the wire to the emitter of Q18.

The Pin Out of the CCI3001 is below:

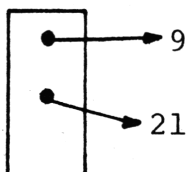
1. F. in.
2. + DC.
3. 1 Ref. OSC. input.
4. Ref OSC. output.
5. Ground.
6. Loop Filter.
7. Loop Filter.
8. D.O.
9. Phase detector output
10. T/R Switch.
11. P5 MSB.
12. P4.
13. P3.
14. P2.
15. P1.
16. P0 LSB
17. Loop Filter
18. Loop Filter

REALISTIC TRC-451

FREQUENCY EXPANSION:

For Low and High Frequencies (26.515-26.955; 26.965-27.405; 27.415-27.855) Use our Kit #106 and install @C72. Full instructions included with kit.

For high frequency coverage, (27.415-27.855) remove the uPD 2824C Chip (1C2) and install a uPD 2816C in its place. Connect pin 20 to 21 (ground). Connect a SPST Switch to pin 9 as follows:



L14 is the VCO Coil. Adjust as necessary to get all channels. The HI frequency channels come out on "even" frequencies, such as 27.410. But 15KC of slide can easily be installed by following instructions below:

CLARIFIER:

1. Clip D32 Switching Diode.
2. On Clarifier control, locate the White, Yellow and Brown wires.
3. Ground the Brown Wire.
4. Cut off the White Wire.
5. Run a new wire from where White wire was on Clarifier to cathode of D50. This supplies a constant 8 Volts to the Clarifier circuit.
6. Remove D30 Varactor and replace with a "Super Diode" for maximum slide.

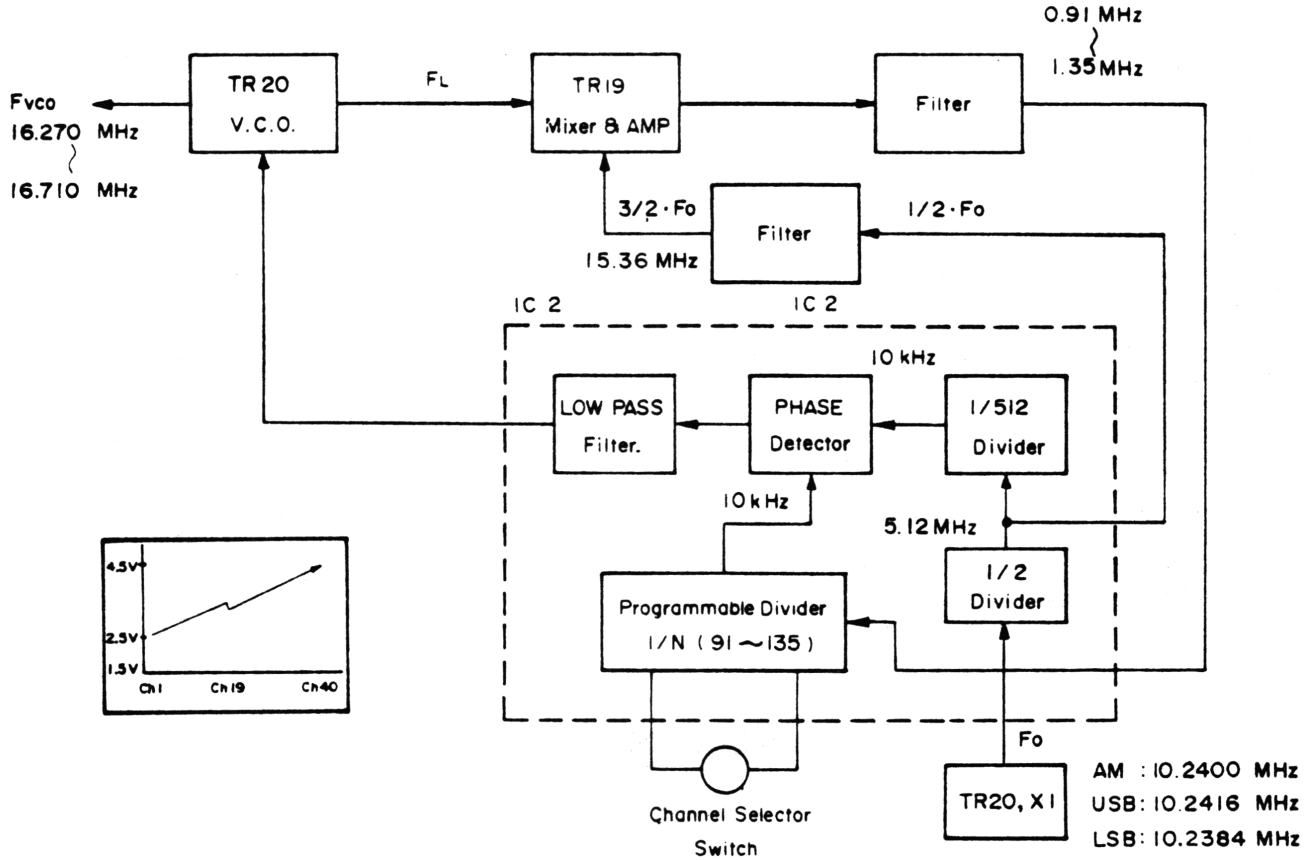
XMTR TUNE-UP:

VR9 Driver Bias 10MA, USB, No Modulation.
VR8 Final Bias 100MA, USB, No Modulation.
VR6 SSB ALC-adjust for max. power.
VR10 AM Power.
VR7 RF Power Meter.
VR5 A.M.C.
VR4 Balance.
Peak L40, L39, L38, L37, L27.

Since this chassis is very popular, we are including a Block Diagram and a description of how the circuit operates on the following pages.

CIRCUIT OPERATION

The Phase Locked Loop consists of 6 Major Components; Voltage Controlled Oscillator, 1/N Divider, Reference Oscillator, 1/1024 Divider, Phase Detector and Low Pass Filter.



The VCO is an Oscillator whose oscillation frequency varies in accordance with input voltage changes. 1/N Divider is a programmable Divider; the "N" is varied by the Channel Selector Switch. A portion of the VCO output is mixed with a signal from TR22 by TR19, "In-Loop mixer". It is used to shift the VCO frequency. TR22, "In-Loop Local Oscillator", generates 10.24 MHz frequency (AM: 10.2400 MHz, USB: 10.2416 MHz and LSB: 10.2384 MHz). This 10.24 MHz signal is fed to TR19, Mixer, passing through the 1/2 Divider and Filter. VCO frequency is down mixed with a signal from Tripler providing 0.91 MHz through 1.35 MHz (see frequency table). The signal is fed to the 1/N Divider through the Filter. The Filter eliminates harmonics. 1/N Divider produces the 10 kHz frequency and it is fed to the Phase Detector.

Meanwhile, the 10.24 MHz frequency generated by X1, is changed to 10 kHz by 1/1024 Divider and is fed to another input of the Phase Detector. Thus the Phase Detector receives two signals (both 10kHz).

CIRCUIT OPERATION cont'd. (REALISTIC TRC-451)

It compares the phase difference of the two and generates an error voltage which acts on the VCO to bring the two frequencies exactly in phase. When this condition occurs, the PLL circuit is "Locked". A Low Pass Filter is used to change the AC signal to DC.

Then the VCO output is up-mixed with Local Oscillator frequency (X2 and TR23) and the resulting 27 MHz frequencies are transmitted.

By Varying the constant N, the output frequency from the VCO can be varied in 10 kHz steps. The Constant N is controlled by the Channel Selector Switch. A frequency shift of 2.5 kHz (required for AM, USB and LSB) is obtained by switching Diodes D29 (LSB), D28 (USB) and D27 (AM).

TR23 is a carrier oscillator which generates 10.6925 MHz, 10.6975 MHz or 10.6950 MHz.

In USB mode, X2 functions by D35 switching; so TR23 oscillates on 10.6925 MHz.

In LSB mode, X2 functions by D36 switching and TR 23 oscillates on 10.6975 MHz.

In AM mode, when the unit is in transmitting, X2 functions by D34 switching and also TR21 oscillates on 10.6950 MHz.

Therefore TR23 oscillates on 10.6950 MHz when receiving on AM modes.

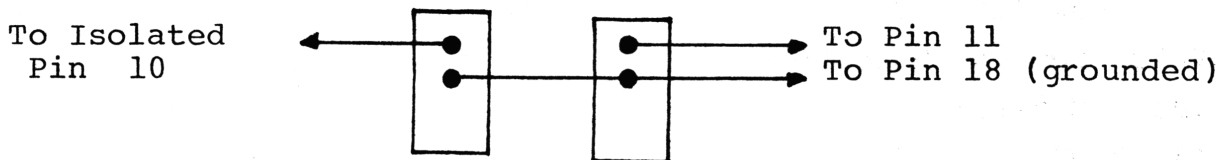
The carrier output goes to the receiver circuit for demodulation of SSB signal or goes to transmitter circuit for modulation.

NOTES

REALISTIC TRC490 (MB8734)

FREQUENCY EXPANSION:

1. Locate IC2, MB8734 and remove by unsoldering all 18 pins and lifting out.
2. Install an 18 pin socket or solder an MB8719 Chip directly in place of IC2.
3. Isolate pin 10 from ground by cutting the foil pattern with an xacto knife.
4. Wire up two SPST Switches as shown below:



5. Adjust L13 VCO as necessary for full coverage from 26.815 to 28.045.

CLARIFIER:

1. Clip D36.
 2. Locate Brown wire which goes from one end of clarifier control over to R415. Cut this wire and resolder to ground so one end of pot will be grounded.
 3. Locate Red wire on the other end of clarifier pot. ~~Cut off of pot and tape.~~ *Solder from switch board and resolder to open hole NEXT TO C77 or SAME POINT*
 4. ~~Run a new wire from that end of pot to pin 1 of IC5 (MB3756 Voltage Regulator)~~
 5. Install a 2-8UH choke in series with the anode of D37 for desired amount slide.
- * D37 may be replaced with a Super Diode to increase slide. Replace the Clarifier pot with a 10 Turn Pot for best results.

REALISTIC TRC490 (MB8734) (Cont'd):

Clarifier Cont'd:

- CT3 is USB adjustment.
- L19 is LSB Adjustment.
- L20 is AM Centering Adjustment.
- VR5 is Carrier Balance.
- VR7 ALC.
- VR6 AM Power
- VR10 RF Power Meter Adjustment.
- L39 TVI filter.

Peak L26, L27, L28, L29, L36 and adjust for best all around power.

RX: Peak L10, L9, L8, L7, L6, L5, L4, L3.

- VR12 Squelch Threshold
- VR1 S Meter
- L1,L2 NB/anl Adjust.

FREQUENCY-CHANNEL NUMBER CHARTS

Frequency	Channel	Frequency	Channel	Frequency	Channel
26.965 MHz	1	27.135 MHz	15	27.295 MHz	29
26.975 MHz	2	27.155 MHz	16	27.305 MHz	30
26.985 MHz	3	27.165 MHz	17	27.315 MHz	31
27.005 MHz	4	27.175 MHz	18	27.325 MHz	32
27.015 MHz	5	27.185 MHz	19	27.335 MHz	33
27.025 MHz	6	27.205 MHz	20	27.345 MHz	34
27.035 MHz	7	27.215 MHz	21	27.355 MHz	35
27.055 MHz	8	27.225 MHz	22	27.365 MHz	36
27.065 MHz	9	27.255 MHz	23	27.375 MHz	37
27.075 MHz	10	27.235 MHz	24	27.385 MHz	38
27.085 MHz	11	27.245 MHz	25	27.395 MHz	39
27.105 MHz	12	27.265 MHz	26	27.405 MHz	40
27.115 MHz	13	27.275 MHz	27		
27.125 MHz	14	27.285 MHz	28		

SEARS
934.3677150 & 934.36772600
23 CHANNEL CRYSTAL SET

RX: Peak T5,T4,T3,MF1,T2,T1,L1 on Ch. 13.0(AM)

Peak T9,T8,T7,T6 for max. on CH. 13 LSB

R17; AM Sensitivity
R62; SSB Sensitivity
R231; SSB AGC
R37; AM Squelch Range
R260; SSB Squelch Range
R262; AM S Meter
R263; SSB S Meter

TX: Peak T10,T11,L13B,L14,L10,L11 for Max.

L13A is T.V.I. filter adjustment

On SSB, No Mod. input, adjust R67, C55 for Minimum output.

R405; Voltage Reg.
R86; SSB Mic Gain
R281; A.L.C.
R264; RF Power Meter
For Maximum AM Mod., Clip D25.

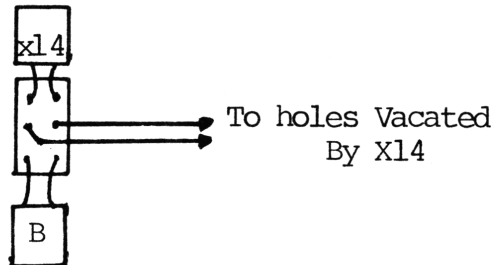
Crystal Frequency Chart:

X1 can be pulled and replaced with one crystal from chart below for 4 new channels. Or, build a Crystal Switcher to handle more crystals. X1, X2, X3, X4, X5, or X6 may be replaced. They are Tripler type. Type HC-18/W.

7.8766	26-27-28-30
7.8933	31-32-33-35
7.9100	36-37-38-40
7.9266	41-42-43-45
7.9433	46-47-48-50
7.9600	51-52-53-55
7.9766	56-57-58-60
7.9933	61-62-63-65

SEARS (CONT)

If you want to get channels between 3 & 4 (26.995); 7 & 8 (27.045) etc., pull X14 (14.947) and install a DPDT Switch using 14.947 on one side and 14.937 on the other side.

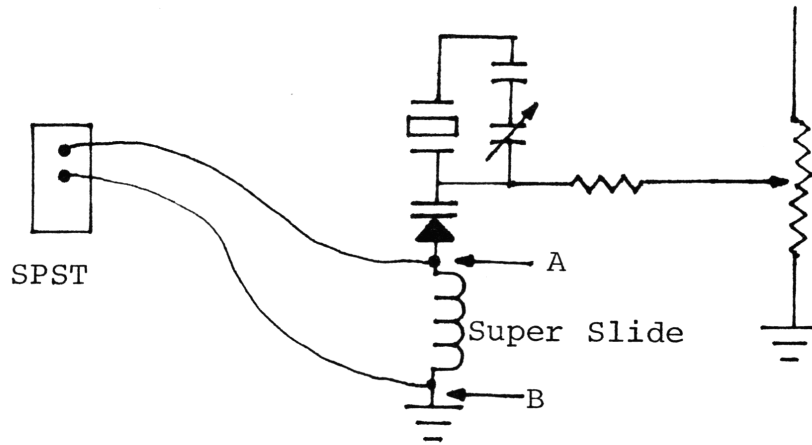


Clarifier Modification:

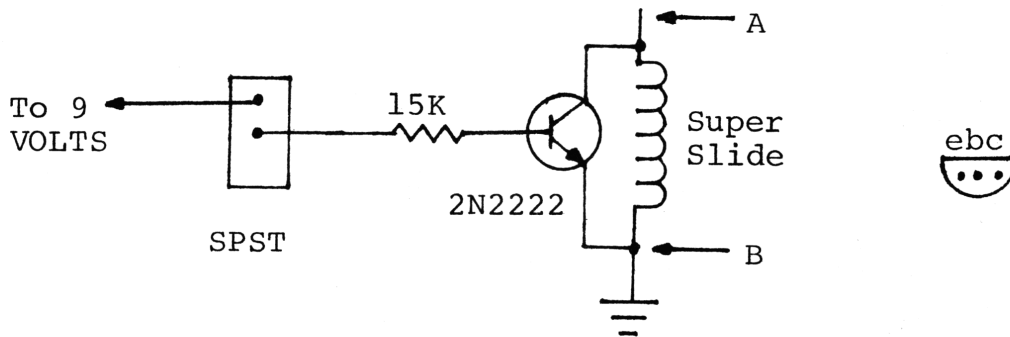
1. Clip D72
2. Disconnect Brown Wire from R501 (15K)
3. Run a new wire from R501 to cathode of D66

Unit now slides on transmit. For more slide, install a variable 2-10 UH choke in series with fine tuning capacitor (black wire).

DUAL RANGE CLARIFIER FOR SEARS ROADTALKER SM5104 CHASSIS

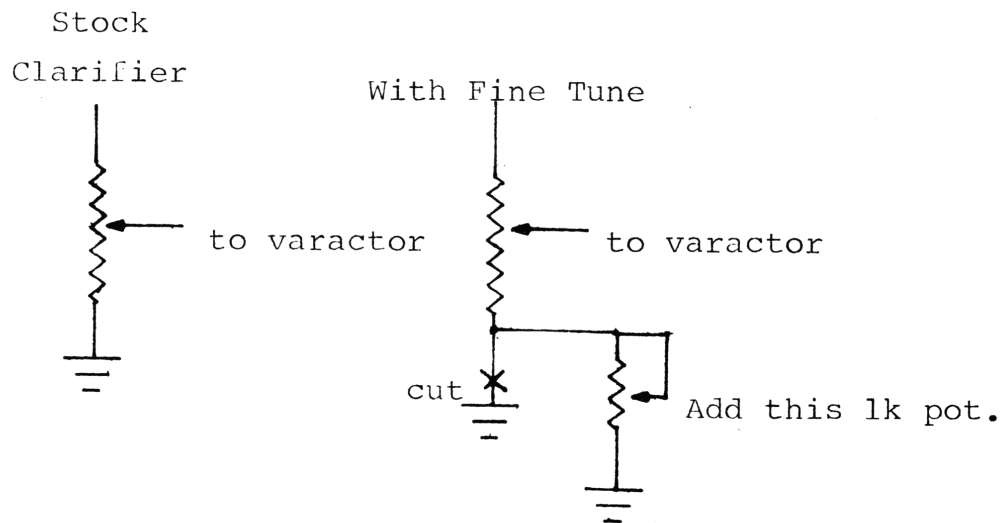


This method didn't work due to lead length. We overcame this by using a transistor for switching, located next to the Super Slide as shown here:



If you ground Pin 5 along with Pins 9 and 10 of the PLL Chip, you will obtain low frequency in 5 KC steps. For high frequency replace crystals X301 and X302.

ADD A FINE TUNE TO YOUR CLARIFIER LIKE 2000 GTL



1. Unsolder Clarifier from ground. (sometimes there will be a resistor in series-if so, remove resistor)
2. Drill a hole in any convenient place and mount the additional 1K control.
3. Run a jumper wire from the stock pot over to the new one. One end and wiper should be connected together as shown above. Ground the remaining end of the 1K pot.

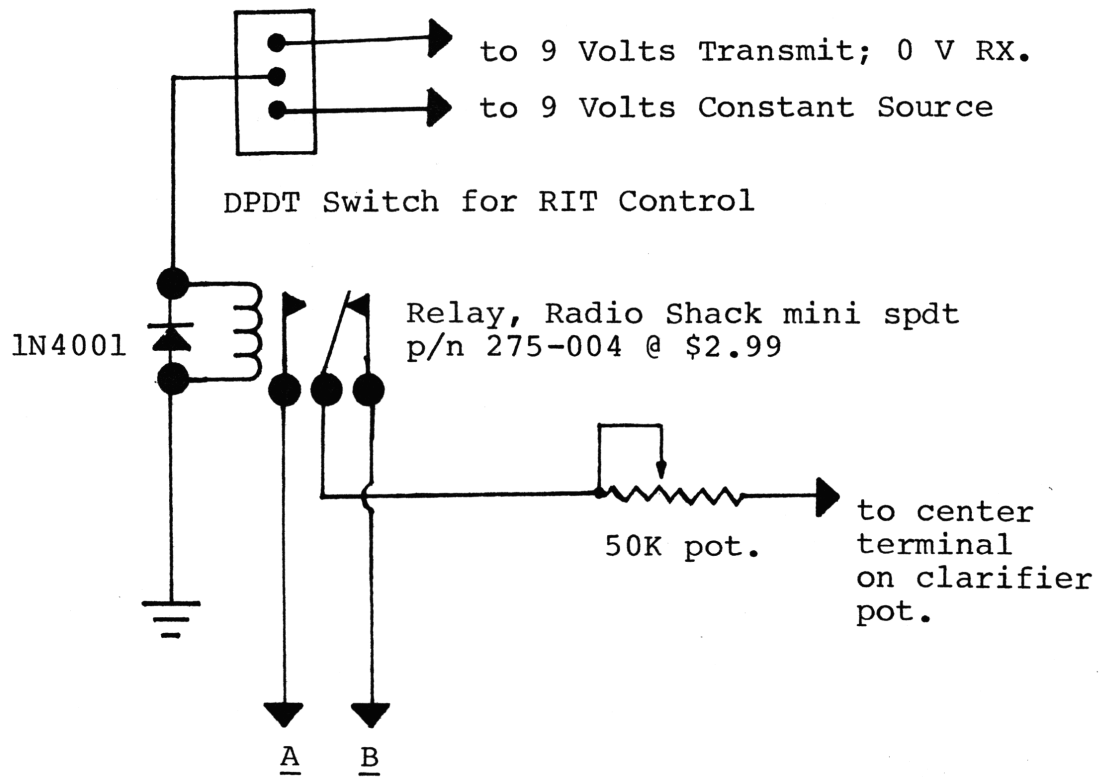
If you wish, the stock pot could be replaced with a dual pot as in the 2000 GTL.

The above circuit really works. NEAT! Now you can have 10-20KC Slide on your "Course" Control and about .5KC on your "Fine" control.

SIMPLE CURE FOR RX-TX TRACKING PROBLEMS

INSTRUCTIONS:

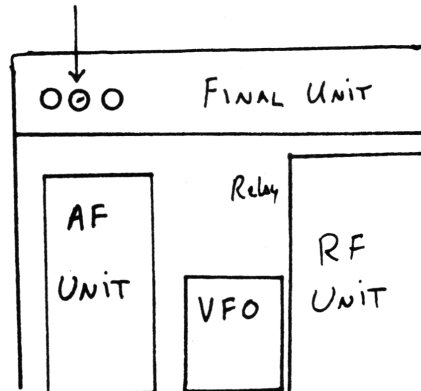
Ground A or B side of Relay Contacts to reduce clarifier voltage on either REC. or XMIT.
Ground Point (A) if you wish to Lower Voltage on Transmit.
Ground Point (B) if you wish to Lower Voltage on Receive.



KENWOOD TS-120S

Follow the steps outlined below for increased frequency coverage into the 11 meter band.

1. Locate J15 on the PLL board.
2. Cut white and red wire on the plug.
3. Adjust T3 (VCO coil) for coverage from 26.5 to 28.0 MHz. in the last three positions on the 10M band selector switch.
The display will either indicate 10M frequencies or if the PLL is out of lock, it will blank out.
4. Adjust L15, 16 & 17 for maximum output around 27.250.
5. Adjust T4 for cleanest waveform on O-Scope.
6. Shown below is the 10M ALC adjustment.



In order for the display to function, you must do the following:

1. The Counter Unit is underneath the AF Unit so it must first be lifted out of the way.
2. Obtain a 15K $\frac{1}{4}$ W resistor.
3. Solder one end to pin 6 of IC13. Solder the other end to pin 8 of IC 13.
4. Obtain two 1N914 diodes. Connect the anodes together and solder to pin 2 of RB-1.
5. Connect one of the above diodes cathode (banded end) to D8, cathode end.
6. Isolate pin 8 of RB-1 by cutting foil pc pattern.
7. Solder a 1N914 diode from pin 8 (cathode) back to pc pattern cut above (anode) to bridge cut.
8. Connect cathode of other diode in step 4 to RB-1 pin 8.
Your display will now function on all frequencies.****

KENWOOD TS-130

FREQUENCY EXPANSION:

1. Locate PLL Board.
2. Cut the white and yellow wires off of J15.
3. Adjust T5 VCO Coil to lock in on the last three 10 meter stops. If the readout goes blank, VCO is Out-Of-Lock!
4. Install a SPST Switch to reconnect the two wires in Step 2 in order to cover the phone band.

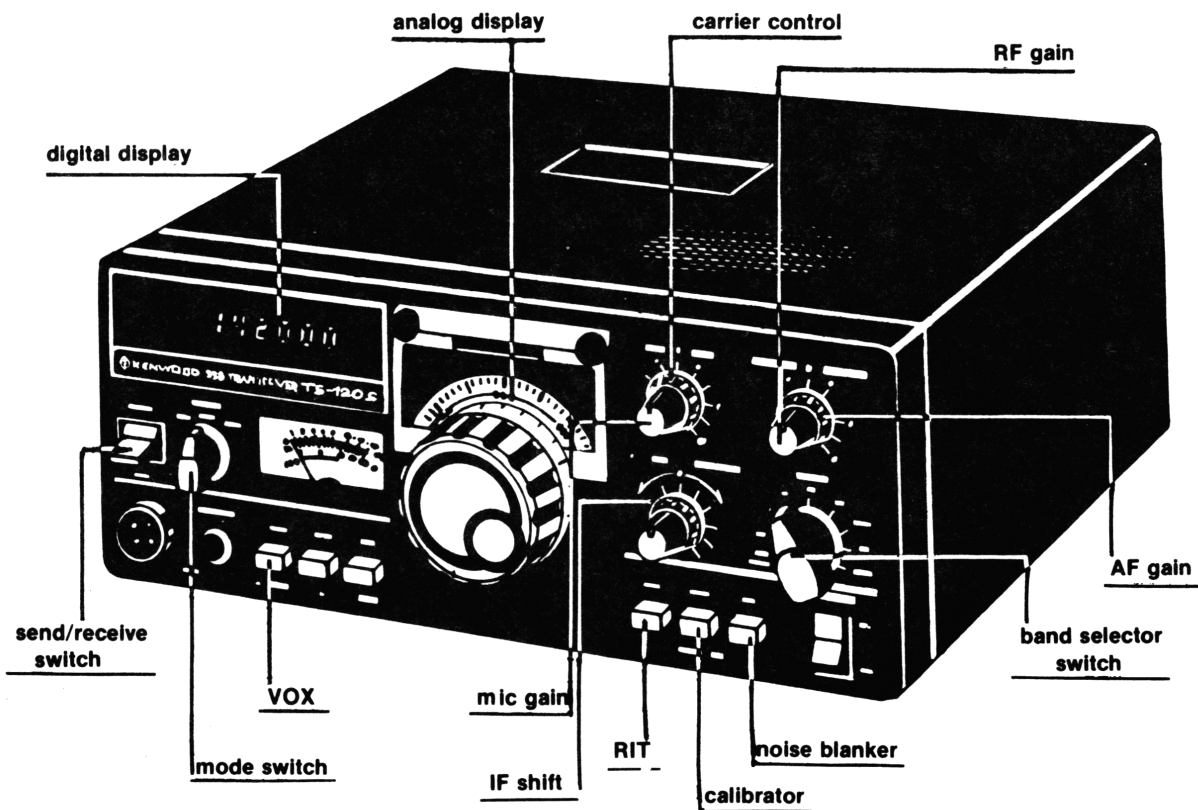
READOUT MODIFICATION:

1. Connect the anodes of two 1N914 diodes together. Solder this to one end of a 33K resistor.
2. Solder the free end of the resistor to D17 cathode.
3. Solder the cathode of one of the 1N914's to pin 1 of Q17 (TC4081 Chip).
4. Solder the cathode of the other 1N914 to pin 6 of Q17 Chip.
5. Install another 1N914 diode by soldering the anode of the diode to the cathode of D35. Solder the cathode to pin 10 of Q19, an MC14011B Chip. Readout now covers 26.5-28.



HAM RADIO CRYSTAL SELECTOR

FREQUENCY RANGE	DRAKE TR4, TEMPO 1, YAESU FT7B	TEMPO 2020	KENWOOD TS-520, HEATHKIT- HW101;SB104	KENWOOD 820S	YAESU FT101E, EE, EX	YAESU 901DM
26-26.5	40.5	48.025	34.895	31.5	32.020	40.4875
26.5-27	41.0	48.525	35.395	32.0	32.520	40.9875
27-27.5	41.5	49.025	35.895	32.5	33.020	41.4875
27.5-28	42.0	49.525	36.395	33.0	33.520	41.9875
28-28.5	42.5	50.025	36.895	33.5	34.020	42.4875
28.5-29	43.0	50.525	37.395	34.0	34.520	42.9875
29-29.5	43.5	51.025	37.895	34.5	35.020	43.4875
29.5-30	44.0	51.525	38.395	35.0	35.520	43.9875



TEABERRY STALKER XX

VSB-1 HOOK-UP

COMPRESSOR:

Remove C83. Solder Black wire in + hole; White wire in the other hole.

Remove TR32, ALC-AMC limiter.

EXPANDOR:

Remove C28. Install black wire in hole towards collector of TR13; White wire in hole towards R36.

Pre-Amp recommended.

REALISTIC TRC490

VSB-1 HOOK-UP

COMPRESSOR:

Remove C83. Solder Black Lead to + side of hole, White lead to the other hole. Remove TR32.

EXPANDOR:

Remove C28. Solder Black lead to hole towards TR13 and White lead in the other hole.

WARDS GEN-719A

VSB-1 HOOK-UP

COMPRESSOR:

Remove C93. Solder Black lead to + side of hole and White lead to other hole. Remove TR32.

EXPANDOR:

Remove C28. Solder Black lead to hole towards TR13 and White lead in other hole.

DELCO 90BFMC1,90BFPC1, 91YFMC1 DM83

For High or low channels, X2 and X1 Crystals in the down oscillator must be replaced with a new pair, X2 should equal X1 + 1.828.

TX: Peak L5 on Ch. 19.
Peak L4 on Ch. 40.
Peak L44, L75, L76 on Ch. 19.

Repeak L44

T6; VCO Coil.

MIDLAND 77-861

The crystal (X101) in the down oscillator can be switched to get hi or low frequencies. The Stock Crystal is 36.380. For hi channels, replace with 36.820 and for low channels 35.940.

RX: T103; is VCO Coil.
T101; is down oscillator coil adjustment.

TX: Peak T1, T2, T3, T4, T5, L4, L5.

L13 should be peaked with a Field-Strength meter near telescopic antenna.

RX: VR5; Squelch Range
VR3; S Meter

TX! T6; is T.V.I. Filter.
VR1; Lo Power Adjustment-Set to 1W.
VR2; RF Power Meter.

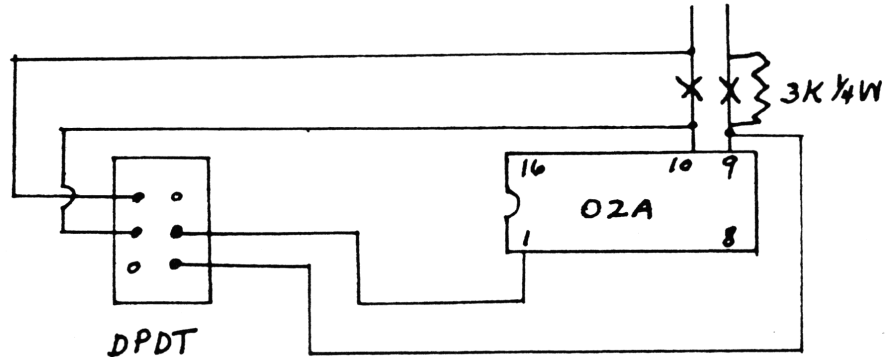
SEARS 23 CHANNEL PLL D63911 WITH uPD861C CHIP

Frequency Exp: Connect Pins 12 and 6 together with a SPST Switch. This will give new Channels 24-39 on positions 4-23.

RAY JEFFERSON CB845 (02A)

Frequency Expansion-

1. Locate IC1, PLL02A Chip.
2. Cut trace on Pins 9 & 10.
3. Bridge cut of no. 9 with 3K resistor.
4. Wire up a DPDT Center-Off Switch as shown:



Pin 16 is Ground.
This gives hi and lo Channels.
L1 is V.C.O. Coil.

RX: Peak T10, T9, T8 (if Coils).
Peak T7, L14, T6, T5 on Ch. 19.
RV1; Squelch Range
RV3; S Meter

TX: Peak L5, T3, T4 also L7, L11, L12.
RV2; AM Mod. Control (or remove Q15).
RV501; SWR Cal.
RV4; RF Power Meter

REALISTIC TRC-57

RX: L9, L8, L7, L6, L5, L4.

VR26; If Gain
 VR8; Squelch Range
 VR4; S Meter
 VR3; Gain Range
 L1,L2,L3 Noise Blanker, USB, Ch. 13 Rec., NB on. Adjust for Max. on 23.5MHz. 1000UV, VTUM to PT.

TX: Peak L32, L31, L30, L29, L27, L24 on USB, Ch.13

L21; TVI filter-adjust for Minimum on Ch. 13 AM, XMIT
 VR24; Voltate Regulator-adjust for 14.00V.
 VR11; SSB Mod.
 VR25; SSB ALC
 VR10; Carrier Balance
 VR13; Mic Gain
 VR23; XMIT Bias-adjust for no crossover on scope with 2 tone input.
 VR21; AM Power
 VR12; AM Mod.
 VR22; RF. Pwr. Meter

Clarifier-

1. Clip D38.
2. Clip white wire off of VR15 Clarifier Control.
3. Run a wire from Clarifier Control where white wire was to Cathode of D40.
4. Adjust VR16 for desired down slide.

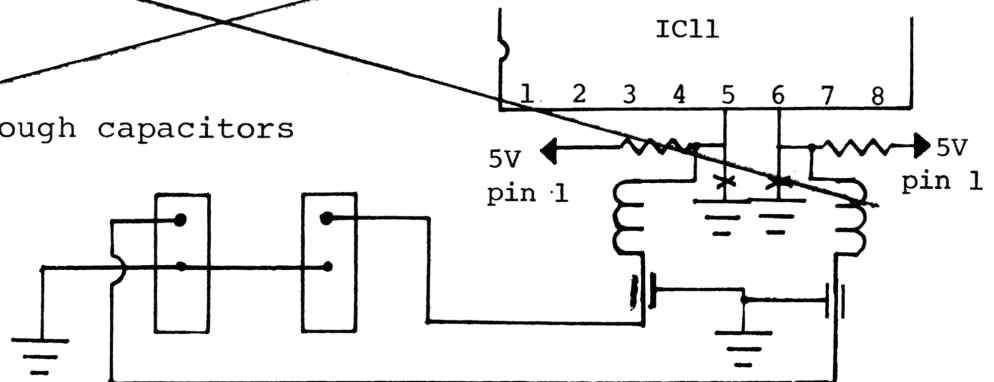
A SUPER SLIDE can be used in series with D36 varactor for additional slide.

Frequencies-

DO NOT USE - INCORRECT

~~IC10 and IC11 make up the programmable counter. Pin 3 is A data input, pin 4 is B data input, pin 5 is C data input and pin 6 is D data input. On IC11 pins 5 and 6 are grounded. These can be taken high for more channels. Wire as shown below:~~

- 2- 1K $\frac{1}{2}$ W Resistor
- 2- 4.7 UH Chokes
- 2- SPST Switches
- 2- 1000 pf feedthrough capacitors
- Misc. Ribbon Wire
- L11 is VCO Coil



REALISTIC TRC-410

This Chassis uses the LC7131 R.O.M. PLL Chip.

Pin Out is as Follows:

Pins	1-6	Ch. Sel. Inputs to R.O.M.
Pins	7	N/C
	8	Ch. 9 Selector or N/C
	9	Ch. 19 Selector or N/C
	10	In between Ch. Kill
	11	Ref. OSC 10.240
	12	Ref. OSC
	13	Ground
	14	Unlock Det.
	15	Phase Det. output
	16	Filter Input
	17	Filter Input
	18	8V Chip Supply
	19	Prog. Div. Input
	20	T/R Switch

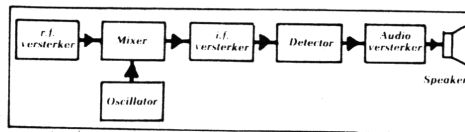
TX:

T10 Pre driver stage

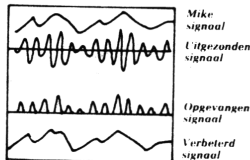
Peak T11, L5, L4, L3 for Max.

R95 Can be changed to a piece of wire for increased power.

AMC remove Q12 for maximum modulation.

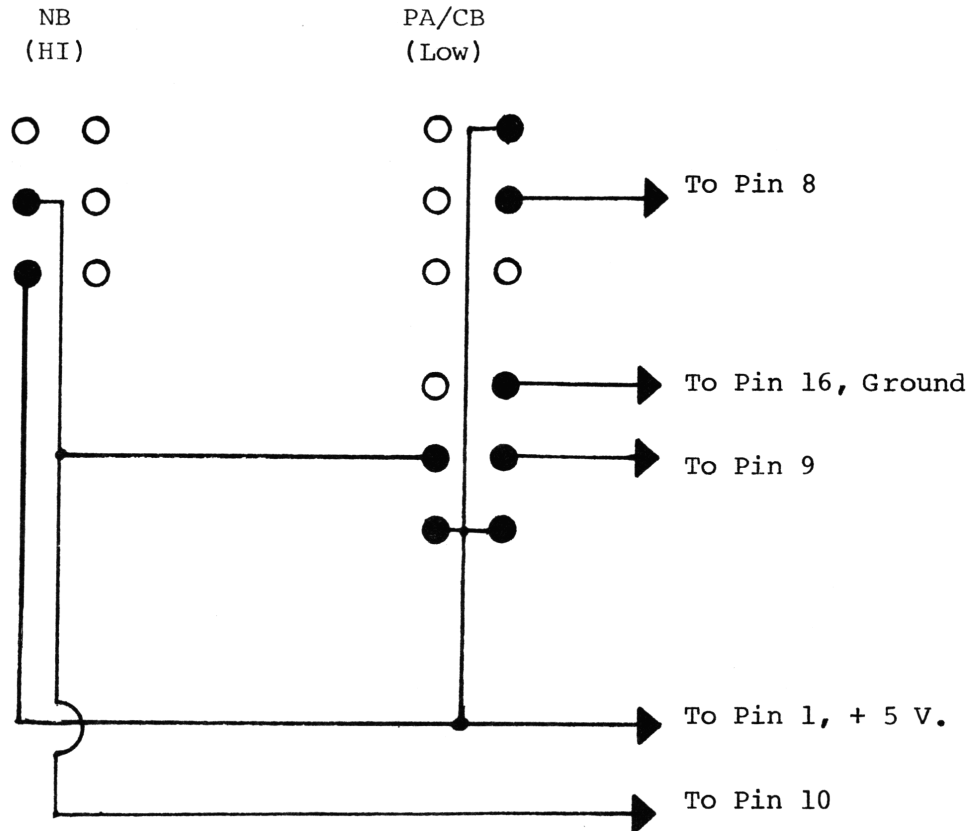


Superhet-ontvanger.



REALISTIC TRC 455 SM5104

Frequency conversion shown here will yield 26.645-27.595. However, unit is capable of lows to 25.755 and hi's to 28.015. We switched circuits by using the PA/CB Switch and NB Switch, wired as shown below:



1. Unground PIN 9, IC1.
2. Unsolder the jumper on PIN 8.
3. Solder wires directly to the PINS on IC1 as shown above.

R504 AM Mod. Control (or clip D503)

XMTR: Adj. T3, T4, T5, T6 for max.

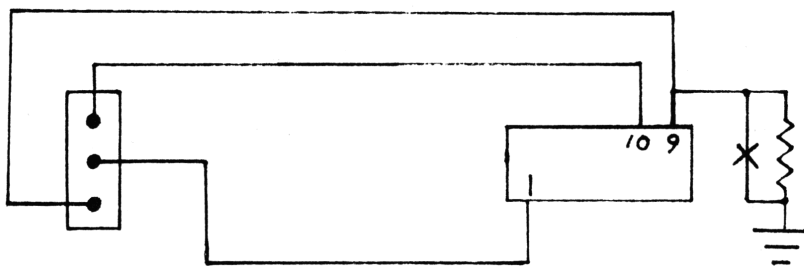
Peak T401, L407, L404, L403, C430

NOTE: Be sure to disconnect wires from NB and PA/CB Switches before adding the above wires for the modification. You will have to solder the wires which are normally connected through the PA/CB and NB Switches together.

ROBYN WV-110 (SM5104)

Frequency Mod. for Channels Above 40:

1. Locate pins 1, 9, and 10 on IC1, SM5104 PLL Chip.
2. Wire up a SPDT Switch as shown below:



3. Isolate pin 9.
4. Add a 5600 ohm Resistor from pin 9 to ground.
L2 is VCO Coil. X2 Down Mixer Oscillator Xtal may be replaced if low frequencies are desired.

RX:

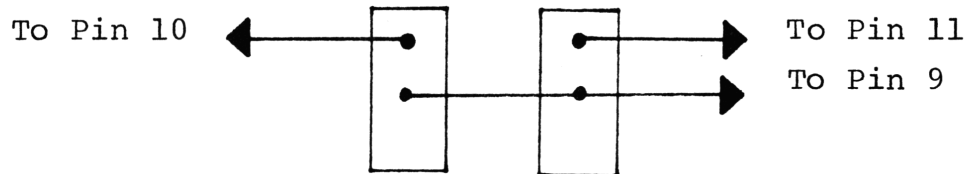
Peak L8,L7,L6,L1,L2,L3,L4,L5 on Ch. 19.
VR2 Squelch Range
VR5 S Meter

TX:

Peak L18,L17,L16,L15,L13,L12,L11,L10.
L9 T.V.I. Filter
VR6 AM Mod. Control (or remove TR18).
VR4 RF Power Meter.

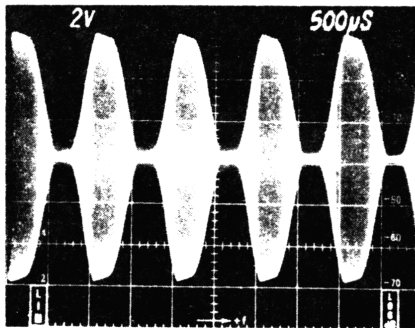
23 CHANNEL PLL02A AM CONVERSION FOR 26.645 TO 27.275 COVERAGE

- 1.) Isolate pin 10 by cutting away from pin 9.
- 2.) wire up two SPST Switches as follows:

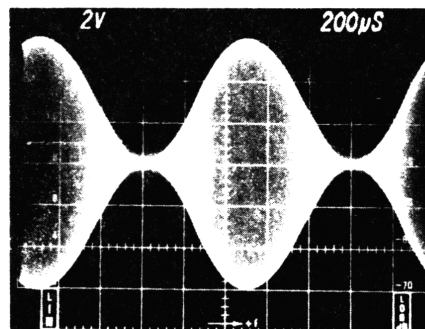


- 3.) Readjust VCO as necessary to get all channels.

If you wish, you may use the NB and ANL Switches instead of adding two additional ones.



OVERMODULATION



100% MODULATION

MODULATION ADJUSTMENTS FOR VARIOUS REALISTICS

MODEL	MODULATION ADJUSTMENT
TRC-420	Remove C-146
420A	Clip Collector of Q-14
421	Clip D-16
421A	Clip D-16 & D-17
422	Clip D-16
422A	Clip D-14, D-15, D-16
424	Remove C-518
425	Clip D-508
426	Clip D-507
427	Clip D-21
428	Clip Violet wire to left of audio XFMR in hole "2"
431	Remove C-511
432	Clip collector Q-10
440	Remove C-131
441	Clip D-110
452	Clip D-213
454	Clip D-704
461	Clip D-11
462	Remove C-60
466	Clip D-110, D-111
468	Clip D-7
470	Clip D-513
471	Remove VR-2 and C-37
TRC- 5	Change R-22 to 22K $\frac{1}{2}$ W
9A & 11	Pull C-55, but now modulation light will not work!
23B	Clip D-6
24C	Remove C-528
30A	Remove C-528
30	Remove C-528
50 & 50B	Clip D-6, D-7
56	Remove C-525
61	Remove C-63
68	Clip D-7
99A	Remove C-42
100	Remove C-44
101	Clip D-5
180	Remove C-42
200	Remove R-43
204	Clip D-11, D-12
208	Clip D-11, D-12
209	Remove R-41

SPECIFIC RADIO TUNE-UPS

AR 711: President:

RX: Adjust L1, L2, L3, L4, L5, L6, L7 for max. on Ch. 19.
VR4; Squelch
VR1; S-Meter-adjust for S-9 with 100 UV input.

TX: Peak L17, L18, L10, L14 on Ch. 19.
VR5; A.M.C.
VR3; RF Pwr. Meter.

American Motors 3231847/48/49/50:

RX: VR102; Squelch Range.
VR101; S Meter.

TX: Peak F1L, T301, L302, L304, L305, L306
VR301; RF Power.
VR303; AMC
VR320; RF Power Meter.

Cobra 19GTL TC9109P:

RX: VR7; RF Gain.
VR3; SQ Range.
VR4; S Meter.

TX: Peak L10, L11, L12, L15
VR6; AMC
VR5; RF Power Meter.

Cobra 45XLR (MPD858):

TX: Peak L111, L113, L110
RV105; AM Mod.

For Channels 41-66, raise pin 19 to 5V.

DAK Mark V MM55116N:

RX: RV101; Squelch Range
RV102; S Meter

TX: Adj. L402, L302, L303, L304, L305, L306, L307, and L308 for
Max. RF output.
RV301; RF Power Meter.
RV202; AMC or remove Q202.
L403 VCO coil.

SPECIFIC RADIO TUNE-UPS (Cont'd):

General Electric TC9109P:

3-5804 G

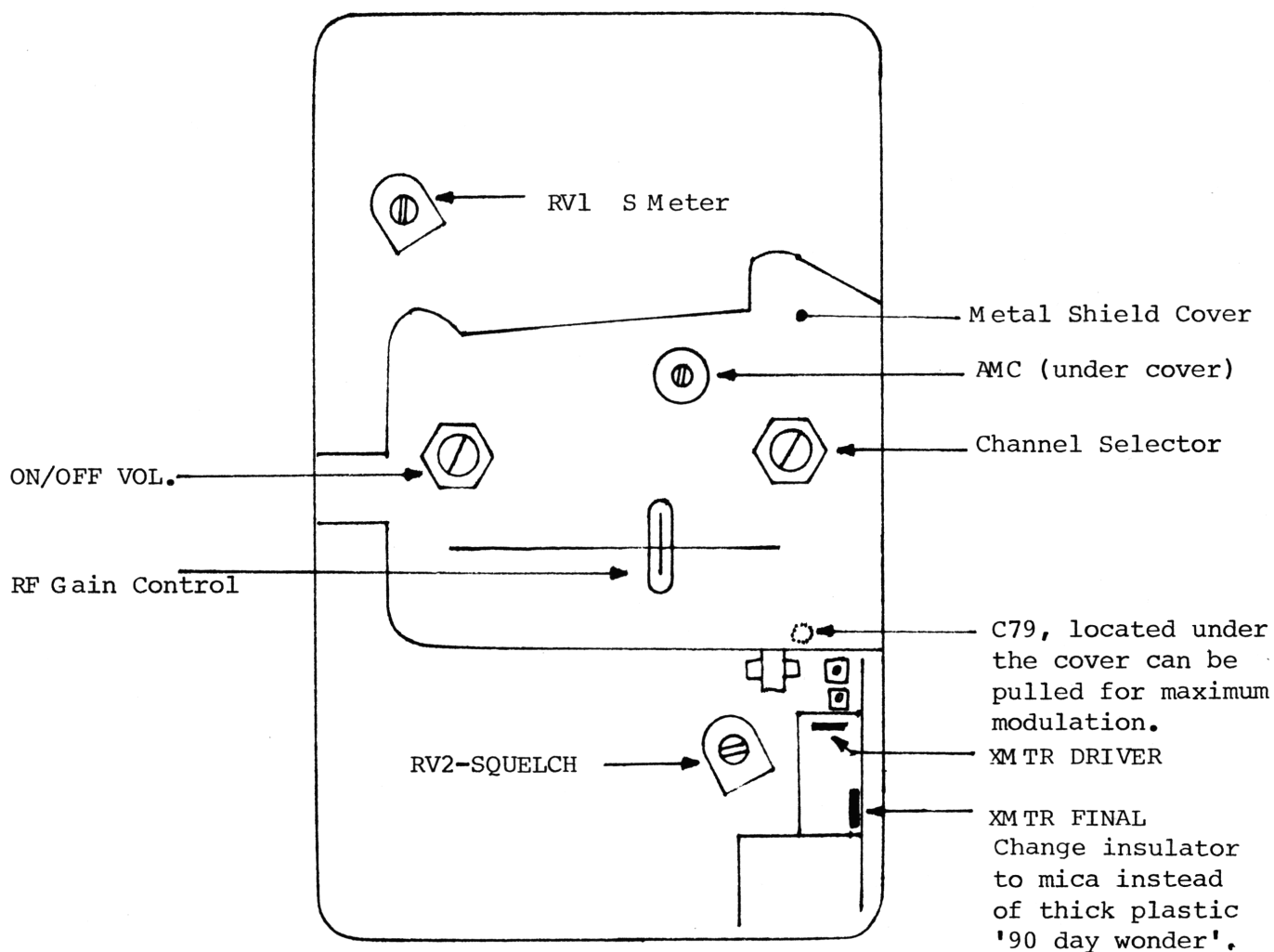
- RV2 AGC
- RV3 Squelch Range
- RV4 S Meter

XMTR: Peak T2, T3, T4, T5, L3.

- RV5 AMC
- RV1 RF Power Meter

General Electric 3-5900A HELP:

After adjustment, Unit is a talking Fool! Throw away original antenna and install a BANDIT 24 incher Magnetic!



SPECIFIC RADIO TUNE-UPS (Cont'd):

General Motors 90BCB2 (CBD-20U)PLL03A:

RX: RV1; Squelch Range
TX: Peak T3, L4, L8, L9.
RV2; AMC

Hygain 16 Model 2716 (Works in the Mike):

This is a standard Hy-Gain 40 Channel Board with Motorola Transistors.

RX: Peak T104, T105, T111, L112, T106, T107, T108, T109.
RV103; S Meter.

TX: Peak L103, L104, L102, T103, L106, L109, L110.
L108 is T.V.I. Filter.
RV102; AM Mod. Control (remove C209).
RV104; RF Power Meter.

NOTE: Change R168 (3300) to a 2200 for better sound.

Johnson Messenger 40:

RX: R13; A.G.C.
R39; S Meter.

TX: Adj. T132, T81, T83 and L84 for max. output.
Peak L85, L86, L87
R49; AMC adjust T84, T85 for cleanest envelope on scope.

Johnson Viking 200:

RX T101; VCO Coil.
R2; If Gain
R202; S Meter.

TX: Adjust T5, T6, T7, T8, L3, L4, L6.
L7 adjust for minimum at 54 MHz.
L5 adjust for minimum at 81 MHz.
R33; AMC or Clip CR12.

For extra channels, change value of Y102 and Y103 in down osc.
Y103 must be 455KC above Y102.

Lafayette LM-100 PLL02A:

RX: RV1; Squelch Range.
RV3; S Meter.

TX: Adjust T3, T4, L7, L11, L12 for max.
RV2; AMC
RV4; RF Meter.

SPECIFIC RADIO TUNE-UPS (Cont'd):

Lafayette Model LM-300:

PLL02A Chip-see Volume 3 for frequency modification.

RX: L3; VCO Coil.
RV2; Modulation Adjust, clip D13 or remove Q17.

TX: Adjust T18, T7, T8 and L7, L11, L12.
RV4; RF Power Meter.
RV5; Alert tone level.

Lake 410 MM55108N:

RX: RV201 Squelch Range.
RV101 S Meter.

TX: Adjust L301, L302, L303, L304, L305, L301 for max.
RV202; AMC or remove Q203.
RV301; RF Power Meter.

Lake 450 MM55126N:

RX: VR302; Sq. Range.
VR402; S Meter

TX: Adjust PLL5, PLL6, TX1 for max.
VR301; AMC
RV201 RF Pwr. Meter.
PLL1 VCO coil.

Lake 600 MC14506P:

RX: VR1; Squelch Range.
VR3; S Meter.

TX: Peak PLL5, PLL6, TX1, LC202, LC203 and LC204.
VR2; AMC or remove Q15.
VR4; RF Power Meter.
PLL1; VCO coil.

Midland 3001 (77-003) LC 7130:

RX: RV101; Squelch Range.
RV103; S Meter.

TX: Peak L301, L302, L303, L304, L305, L306.
RV201; AMC
RV202; RF Power Meter.

SPECIFIC RADIO TUNE-UPS (Cont'd) :

Midland 5001 (77-005) PLL03A:

RX: RV1; Sq. Range.
RV3; S Meter

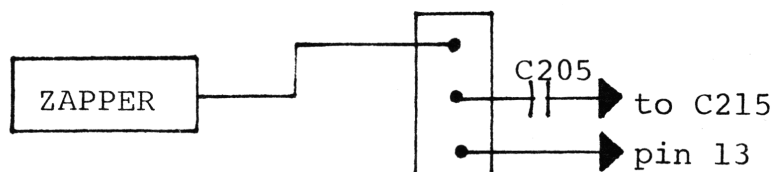
TX: Peak T2, T3, T4, L5, L10.
RV2; AMC
L2; RF Power Meter.
RV502; SWR
RV501; A.W.I.

Midland 77-101C LC7120:

RX: RV101; Sq. Range.
RV103; S Meter

TX: Peak L301, L302, L303, L304, L305 and L306.
RV201; AMC or clip D204.
RV202; RF Power Meter.

Zapper install @ C205, as shown below. L203 is VCO coil.
D201 may be replaced with Super Diode.



Midland 77-824B TC9106P:

RX: VR1; If Gain.
VR2; SQ Range.
VR3; S Meter.

TX: Adjust L16, L15, L12 for max. L9 is TVI filter.
VR5; AMC or Remove TR19.
VR4; TX Pwr. Meter.
L17 VCO Coil.

SPECIFIC RADIO TUNE-UPS (Cont'd):

Midland 77-824C LC7120:

RX: RV101; Squelch Range.
RV103; S Meter.

TX: Peak L301, L302, L303, L304, L305 and L306.
RV201; AMC or clip D203.
RV202; RF Power Meter.
RV301; A.W.I.
L203; VCO Coil.

Midland 78-574 PLL02A:

RX: RV10; RF Gain Range.
RV6; SSB AGC.
RV7; AM SQ. Range.
RV8; SSB SQ. Range.
RV5; AM S Meter.
RV4; SSB S Meter.

TX: Adjust for Max. on USB; T204, T205, T3, T209, L209, L212,
214.
RV1, RV2; Carrier Balance.
RV206; Final Bias-adjust for .7V bias at base of Q208.
RV3; SSB Mod. Gain.
RV201; SSB ALC.
RV9; AM AMC or remove C71.
RV202; RF Meter.
VR1; AM Power.

Pace 8113 MM5107N:

RX: R135; Squelch Range.
R137; S Meter Zero.

TX: Peak L301, L302, T302 and L304, L307, L308.
R220; AMC.
R325; TX Power Meter.

Zapper can be used. Insert in place of C420.

C402; VCO Coil.

SPECIFIC RADIO TUNE-UPS (Cont'd):

Pace 8155 MM55107N:

RX: R549; Squelch Range.
R544; S Meter.

TX: Peak L401, T401, T402, T403, L404, L407, L408 and C432.
R310; AMC.
R425; RF Power Meter.
L202; VCO Coil; C212-VCO XMIT.

Zapper will install @ C226 for extra Channels.

President AR-7 TC9106P:

RX: VR1; Squelch Range.
VR2; S Meter.

TX: Peak L9, L10, L12, L16.
VR3; RF Power Meter.
L3; VCO Coil.

Remove TR17, AMC Limiter.

President 1015001 James K. D2814C:

RX: VR1; If Gain.
VR3; Squelch Range.

TX: Peak L12, L13, L14, L15, L17-L20 is T.V.I.
VR2; AMC
L10 VCO Coil.

Zapper will install @ C72 and adjust L8 for extra Channels.

President AX-711 (TC9106P):

TX: Peak L20, L10, L13, L14.
VR5; AM Mod.
VR3; RF Power Meter.
VR1; S Meter.

Realistic TRC205 WT:

RX: VR101; Squelch Range.
VR104; S Meter.

TX: Adjust T9, L300, L301, L302, L303 and L100 for Max. RF output.
VR300; Controlled Carrier Bias.
VR103; RF Meter.
Modulation-Remove TR306.

SPECIFIC RADIO TUNE-UPS (Cont'd):

Realistic TRC420 HD42853:

RX: VR3; Squelch Range.
VR4; RX S Meter.

TX: Peak T113, L102, L104, L106, L109 is T.V.I.
Zapper installs @ C171 for extra frequency.
T109; VCO

Realistic TRC470 LC7110:

RX: VR7; If AGC.
VR6; RF AGC.
VR8; Squelch Range.

TX: Peak T804, T805, T806, L901, L903, L905.
F901; T.V.I. Filter.
VR10; AMC.

Replace 11.750 XTAL in down mix oscillator for high or low Channels.

Realistic TRC421:

RX: T8, T7, T6 with 455KC, 1KC, 30% Mod. to Base Q4.
Peak T5, T4, T3, T2, T1 on Ch. 19, 1KC @ 30% Mod.
VR1; IF AGC.
VR2; Squelch Range.
VR5; RX S Meter.

TX: Peak T16, T15, T17, T18, L9, L12.
L19 is T.V.I. Filter
VR6; TX Power Meter.

For Max. Mod. cut D15 or remove Q11.

To expand frequencies, use Kit #89 Zapper and install @ C39.

Royce 1-639:

TX: AM Power-Peak L3, L4, L12, T8, T9.
VR7; AM Modulation.
VR11; SSB ALC.
VR8; Mod. Meter Cal.
VR2; S Meter.
VR10; RF Power Meter.
VR9; SWR Meter Cal.

Frequency Expansion:

Ground Pin 10 of PLL Chip for 455KC drop on SSB.

SPECIFIC RADIO TUNE-UPS (Cont'd):

Royce 582 PLL3001:

RX: VR101; AGC.
VR102; Squelch Range.
VR103; S Meter.

TX: Peak T301, T302, and L303.
VR201; AMC or Clip D201.

Royce 607:

This set uses L.S.I. chips. CCl 2001 is used for the following functions:

- | | | |
|---------------|--------------|---------------|
| 1. RF AMP | 2. 1st Mixer | 3. 2nd. Mixer |
| 4. 1st if AMP | 5. AGC AMP | 6. Squelch |

Pin 7 is the output of the detected audio and feeds Pin 5 of the Audio Power AMP.

RX: T103; Tuned for Max. with 455 KC, 1KC, 30% signal injected at Pin 17 of IC101.
T101, T102; Adjust for Max. on Mid Channel.
VR101; RF AGC.
VR109; Audio Power.
VR102; Squelch Range.
VR103; S Meter.

TX: Peak T503, T504, T301, T302, L303, L304, CT301.
VR201; AMC or Clip D202.
VR301; RF Power Meter.
CT302, VR320 A.W.I.

Now on to frequency conversion. This set uses the new 3002 PLL/VCO combination chip. So you can forget about trying to get new channels out of this chassis.

SBE LCM-8 PLL03A:

RX: RV1; Squelch Range.
RV3; S Meter.

TX: Peak T8, L7, L11, L12.
RV2; AMC or Clip D13.
RV4; RF Power Meter.

SPECIFIC RADIO TUNE-UPS (Cont'd):

SBE LCMS-8 (MB8719):

Use Master Modification as shown in Volume 10 Page 25.

SBE Land Command LCB-8 UPD2816C:

RX: VR1; If Gain.
VR3; Squelch Range.
VR2; S Meter.

TX: Peak L17, L16, and L13. L10 is T.V.I. Filter.
VR6; AMC or Clip D16.
VR4; RF Power Meter.
VR5; Mod. Meter.

Zapper will install @ C79 for extra Channels.

Sharp CB2170 TC9102P:

RX: R709; Squelch Range.
R32; S Meter.

TX: Peak T301, T302, T303, T304, L302, and L301.
R110 AMC
R315; RF Power Meter.

Zapper installs @ C210 for extra frequency.
T202; VCO Coil.

Sharp CB4370:

RX: R709; Squelch Range
R32; S Meter

TX: Peak T301, T302, T303, T304, L302 and L301.
R110; AMC
R315; RF Power Meter.
L304; T.V.I. Filter (54MHz).
L303; 3rd Harmonic Filter (81MHz).

SPECIFIC RADIO TUNE-UPS (Cont'd):

Sharp CB-4470:

RX: R43; SQ. Range

TX: Peak T301, T302, T303, T304, L302, L301.
R110; AMC
T202; VCO Coil.

Install Zapper @ C210 for extra frequencies.

Teaberry Stalker IV TC9109P:

RX: VR7; If Gain.
VR3; Squelch Range.
VR4; S Meter.

TX: Adjust L10, L11, L12, L15 for Max. L18 is T.V.I. Filter
VR6; AMC or remove TR8
VR5; Power Meter.
L9; VCO Coil.

TRS Challenger 1200:

RX: VR2; AGC
VR5; SQ. Range
VR3; S Meter

TX: Peak T214, L204, CV101, L205.
VR6; AM Power
VR1; AMC or clip D201.
VR4; RF Power Meter.

Install Zapper @ C111 for extra frequencies.

TUNE-UPS FOR NEW LINE OF PRESIDENT

AX44 (TC9106):

TX: VR5; AM Mod.
Peak L10.

AX11 (LC7131) Remote:

TX: VR3; AM Mod.
Peak L12, L14.

AX711 (TC9106):

TX: VR5; AM Mod.
Peak L10.

AX14 (TC9109):

TX: Remove TR8 for Max. Mod.
Peak L10, L11, L12, L15.

AX55:

TX: Remove TR13 for Max. Mod.
Peak L12.

AX52:

TX: Remove TR13 for Max. Mod.
Peak L9, L12.

AX7 (TC9106):

TX; Remove TR18 for Max. Mod.
Peak L8, L9, L12.

AX144:

TX: Peak L40, L39, L38, L37, L27 on USB
VR6; RF Power SSB
VR10; RF Power AM
VR5; AMC or clip collector of TR29

ZAPPER 9000
REFERENCE CHART

<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SAMS</u>	<u>CHIP (PLL)</u>	<u>AMC</u>	<u>CAP. TO REMOVE</u>	<u>POINT OF REFERENCE</u>
Cobra	29GTL	217	D2816G	VR4	C87	TP11
Cobra	87GTL	243	D2816G	VR6	C79	TP 8
Cobra	89GTL	235	D2816G	VR6	C79	TP 8
Cobra	1000GTL	235	D2816G	VR6	C79	TP 8
Colt	190		LC7120	R71	C36	
Colt	222	236	LC7120	RV201	C205	P13/IC202
Convoy	Con-400	183	D861C	R129	C57	TP 5
Craig	L101	240	MC14526CP	R226	C11	G2/Q5
JC Penney	981-6221	227	D861	D501	C307	TP 2
JC Penney	981-6237	228	D861	D7	C248	base/Q208
Lafayette	Telsat 1240	242	SM5107	VR305	C133	T106
Lake	650	214	SM5107	R218	C425	TP 4
Lake	750	213	MC14526	R226	C11	G2/Q5
Midland	76-860	250	TC9102P	R218	C117	TP 3
Midland	77-101B	252	LC7120C	RV201	C205	P13/IC202
Midland	77-101C	270	LC7120C	RV201	C205	P13/IC202
Midland	77-824		LC7120	RV201	C205	P13/IC202
Midland	77-856	216	K76026	VR5	C104	L 23
Pace	8008	164	SM5107	R218	C424	T 16
Pace	8113/8117	240	SM5107	R220	C420	TP 2
President	Dwight D	229	D2816C	VR6	C79	TP 8
President	Old Hickory	187	KM5624	VR5	C79	Base-TR9
President	Thomas J	218	D2816C	VR4	C87	TP11
President	Zachary T	223	D2816C	VR6	C79	TP 8
Realistic	TRC-421/422	270	D2814C	Q11	C39	TP 2
Realistic	TRC-440	208	D861	D107	C20	TP 4
Realistic	TRC-441	291	D2814C	D109	C200	T110
Realistic	TRC-452	178	D858	VR207	C4	Pin 8
Realistic	TRC-461	180	D861	VR 2	C99	Base-Q27
Realistic	TRC-466	194	D861	148	C18	L 2
Realistic	TRC-467	171	D861	D109	C18	P3/IC2
Realistic	TRC-468	183	D861	R42	C248	Base-Q208
Realistic	TRC-469	229	KM5624	VR5	C93	TP10
SBE	Aspen 41	220	SM5107	VR203	C424	G2/Q27
SBE	Cortez 42	205	SM5107	VR203	C424	G2/Q27
SBE	Keycom 54	212	MM55106N	RV1	C425	T401
SBE	LCB-8	272	D861	VR6	C79	TP 8
SBE	Malibu 44	211	MC14526B	R226	C11	G2/Q5
SBE	Tahoe 49	173	D861	R129	C57	TP 5
SBE	Trinidad 45	204	MC14526	R226	C11	G2/Q5
Sears	370.38050700	193	SM5107	R218	C425	TP 4
Sears	934.38060700	226	D861	D7	C248	Base/Q208
Sears	934.38062700	236	D861	R42	C248	T206
Sears	934.38080700	208	D861	D7	C248	Base/Q208
Sears	934.38081700	225	D861	D501	C307	TP 2
Sears	934.38110700	209	D861	D501	C307	TP 2
Sears	934.38120700	201	D861	D501	C307	TP 2
TRS	Challenger 1200	270	TC9103C	R9	C111	Base/Q103
Teaberry	Stalker V	281	D2816G	VR4	C87	TP11
Teaberry	Stalker XII	282	D2816C	VR6	C79	TP 2

ZAPPER TROUBLESHOOTING HINTS

On some sets, (ex.2816 chip in Teaberry XII) the High and Low Frequencies lock in on transmit with a slight "tweak" of the VCO Coil. But then you notice receive is not in lock on the lower 20 channels and you wonder why.

After a little bit of analyzing the synthesizer, you find your answer. The RX and TX VCO frequencies are not the same-VCO RX is 455KC lower than VCO TX, due to the T/R switching built into the divider chip.

FREQ.	VCO RX	VCO TX
26.515	15.820	16.275
26.955	16.260	16.715
27.405	16.710	17.165
27.855	17.160	17.615

VCO frequencies are easy to calculate. In our example:

VCO TX = Channel Frequency-10.240 (26.515-10.240=16.275)

VCO RX = VCO TX - .455 (16.275-.455=15.820)

Now that we have identified the cause of the problem, what can be done about it?

Since we know the following formulas we can calculate the capacitive and inductive values at resonance.

$$X_C = \frac{1}{2\pi FC}$$

$$X_L = 2\pi FL$$

At resonance $X_L = X_C$ so $2\pi F_R L = \frac{1}{2\pi F_R C}$

ZAPPER TROUBLESHOOTING HINTS (Cont'd):

This transposes to (trust me on this one!)

$$F_R = \frac{1}{2\pi\sqrt{LC}} \text{ or } \frac{.159}{\sqrt{LC}}$$

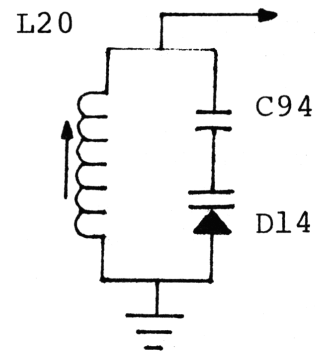
$$C = \frac{1}{(2\pi)^2 f_r^2 L} = \frac{1}{4\pi^2 f_r^2 L} = \frac{.0254}{f_r^2 L}$$

$$L = \frac{1}{(2\pi)^2 f_r^2 C} = \frac{1}{4\pi^2 f_r^2 C} = \frac{.0254}{f_r^2 C}$$

The main thing that I want you to see from the above formulas is that if you increase either the inductance (add more turns to VCO Coil) or the capacitance in the tank circuit you will lower the resonant frequency!

Now here is what we have, using our Teaberry Stalker XII example again.

D14 has a capacitance of approx. 22 pf @ 4V. C94 has a capacitance of 47 pf from the factory. By changing C94 from 47 pf to 53 pf we were able to get our VCO_{RX} to lock in at 15.820 (26.515)



That was all there was to it.

The LC7120, TC9102, TC9103, among others, have the T/R function so be careful of a dual VCO frequency on these! Also, sometimes the T/R function is not built into the chip but will have a separate T/R switching transistor.

REALISTIC TRC 209 (GRE 7189 PLL-VCO)

The following is a description of how the PLL System in this set Functions.

The PLL Circuit consists of a Phase Detector, Low Pass Filter and a Voltage Controlled Oscillator which uses a Varicap Diode as the frequency control device. A 10.240 rock is used as the reference frequency. This crystal is connected between Pins 9 and 10 of IC3. Pin 9 is the output for the 10.240 MHz and is processed by the PLL IC, as well as being used for the second mixer.

VCO Frequencies are divided by "N" as determined by the channel selector switch. Thus the resulting frequency is 2.5 KC. For channel 1, it will go like this; $16.270\text{MHz} \div 6508 = 2.5 \text{ KHz}$. Also, the reference oscillator frequency, 10.240MHz, is divided by 4096 resulting in another 2.5 KC frequency. These two 2.5KHz signals are fed to the Phase Detector. A DC Error Voltage is generated by the Phase Detector which is in proportion to the phase difference, plus effects of harmonics and noise. Pin 6 is the input to a Low Pass Filter, where the error voltage is integrated and harmonics and noises are filtered out. The resulting DC voltage is applied to the VCO varicap diode, whose capacity varies with applied DC voltage. When the Phase Detector senses no frequency or phase difference between the two 2.5 KHz signals, the system is Locked and the VCO generates a frequency which is as accurate and stable as the reference crystal oscillator. The channel selector switch provides a ROM code output which is connected to Pins 7-8, and 11-14; the IC converts these signals into binary code. The resulting code determines "N", the divisor which produces the required output frequency for each channel precisely spaced 10 KHz apart.

For transmit, the same VCO is used, which oscillates in the 13.5 MHz band. The actual transmit frequency is obtained by doubling this 13 MHz VCO frequency. These signals are divided by "N" as determined by the Channel Selector Switch. Thus, the circuits function in the same way, except for the divide by "N" number. This "N" number divisor change is controlled by Pin 5, the R/T Switch.

When the PLL is "Unlocked" an inhibit signal appears at the internal 6 BIT Counter and this signal is applied to the internal gate, turning it OFF. Thus, the Receiver and /or transmitter cannot operate in an unlocked condition.

TX:

Peak T5, T6, T7, L4, L7, L8.
VR9; Hi Power Adjust.
VR5; A.M.C.
VR6; RF Power Meter.

TC9106 PLL OPERATION ANALYSIS

1. Output Frequency of the Transmitter

Transmitting frequency, F_t is the output of the Transmitter Mixer IC2. One to the inputs of IC2 is the 1st Local frequency, F_{vco} , which is produced by the P.L.L. Local oscillator circuit, and the other is the transmitter local frequency of 10.240 MHz produced by TR 15. The sum of these frequencies make the transmitting frequency as follows.

$$F_T = F_{vco} + 10.240 \text{ Mhz}$$

2. P.L.L. Local Oscillator

The output frequency of TR 11 is designated as F_{vco} and the output frequency of TR 15 is 10.240 MHz. Both F_{vco} and 10.240 Mhz. are applied to IC 3. F_{vco} is divided by N at IC 3 and the divided frequency will be F_1 :

$$\text{Therefore, } F_1 = F_{vco} \div N$$

IC 3 also divides 10.24MHz by 2048 and the divided frequency is designated as F_2 .

$$F_2 = 10.24\text{MHz} \div 2048 = 5\text{Khz}$$

F_1 is compared with F_2 at IC3 and if they are equal in frequencies, the phase locked loop is under the locked condition. Therefore, F_{vco} is determined by the following formula:

$$F_{vco} = N \times F_2 = N \times 5\text{KHz}$$

F_{vco} is changeable at the increment of 10KHz by varying the program divide ratio, N. For example, the divide ratio, N is programmed to 3345 at the channel No. 1, the F_{vco} is calculated as follows:

$$F_{vco} = 3345 \times 5\text{KHz} = 16.725\text{MHz}$$

In the same manner, F_{vco} for channel No. 1 through No. 40 is determined as shown in Table A.

3. TRANSMITTER LOCAL OSCILLATOR

Transmitter local frequency of 10.240 MHz is produced by the oscillator, TR 15 and the output frequency is determined by the quartz crystal X 1.

4. CHANNEL SELECTION PROGRAM

The divide ratio of the programable frequency divider in IC 3 is determined through the code converter and transmit/receive mode switch in IC 3 by the voltage applied to the program input terminals, pin No. 10 through pin No. 17 of the IC 3.

The program input voltage for pin No. 10 through pin No. 17 are delivered from channel rotary switch according to channel number selected.

The Transmit/Receive mode switch in IC 3 changes the divide ratio of the programmable divider by changing the applied voltage at pin No. 8, low level for transmit and high level for receive.

Table A shows Frequency Chart of Fvco and Divide Ration vs. Antenna Frequency.

CIRCUIT DESCRIPTION

CIRCUIT FOR PREVENTION OF UNAUTHORIZED FREQUENCY EMISSION

This model is equipped with circuit which prevents transmission on unauthorized frequency at the time when the P.L.L. circuit is under unlocked condition or when the channel rotary switch is placed at the in-between channel.

When the P.L.L. circuit is not locked, or program data input is loaded which is outside of Channel 1 to 40, or channel rotary switch is switched from one channel to the next one, a program other than formulated is produced. However, even at the in-between channel, pin No. 4, in IC 3 produces low level digital control signal. This signal is delivered to the buffer amplifier, base of TR 9 and the transmitter mixer, pin No. 7 of IC 2. When this signal is in low level state, no output signal is produced from the transmitter mixer, IC 2, and TR 9. Thus the transmission of unauthorized frequency is prevented.

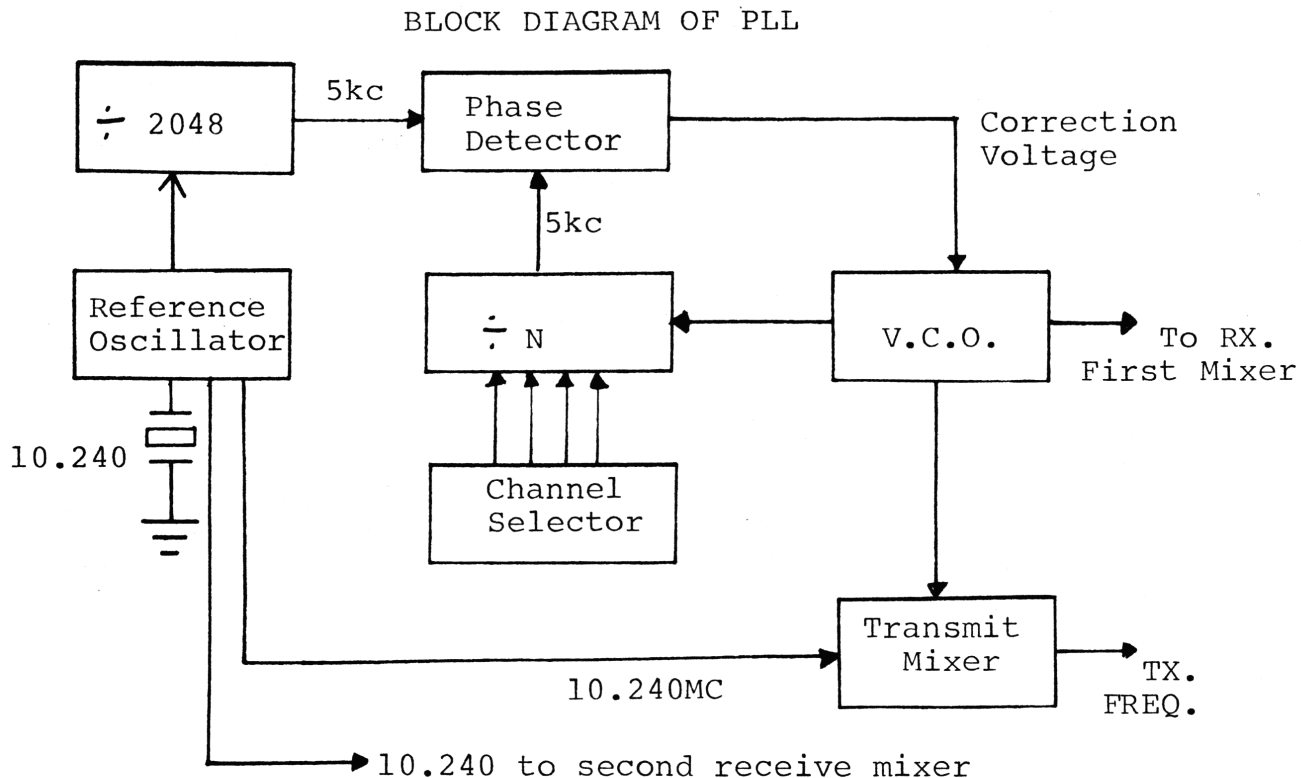


TABLE A FREQUENCY CHART OF FVCO AND DIVIDE RATIO N

Antenna Frequency (MHz)	Channel Number	For Transmit(R/T=H)		For Receive(R/T=L)	
		Divide Ratio (N)	VCO Frequency (MHz)	Divide Ratio (N)	VCO Frequency (MHz)
26.965	1	3,345	16,725	3,254	16,270
26.975	2	3,347	16,735	3,256	16,280
26.985	3	3,349	16,745	3,258	16,290
27.005	4	3,353	16,765	3,262	16,310
27.015	5	3,355	16,775	3,264	16,320
27.025	6	3,357	16,785	3,266	16,330
27.035	7	3,359	16,795	3,268	16,340
27.055	8	3,363	16,815	3,272	16,360
27.065	9	3,365	16,825	3,274	16,370
27.075	10	3,367	16,835	3,276	16,380
27.085	11	3,369	16,845	3,278	16,390
27.105	12	3,373	16,865	3,282	16,410
27.115	13	3,375	16,875	3,284	16,420
27.125	14	3,377	16,885	3,286	16,430
27.135	15	3,379	16,895	3,288	16,440
27.155	16	3,383	16,915	3,292	16,460
27.165	17	3,385	16,925	3,294	16,470
27.175	18	3,387	16,935	3,296	16,480
27.185	19	3,389	16,945	3,298	16,490
27.205	20	3,393	16,965	3,302	16,510
27.215	21	3,395	16,975	3,304	16,520
27.225	22	3,397	16,985	3,305	16,530
27.255	23	3,403	17,015	3,312	16,560
27.235	24	3,399	16,995	3,308	16,540
27.245	25	3,401	17,005	3,310	16,550
27.265	26	3,405	17,025	3,314	16,570
27.275	27	3,407	17,035	3,316	16,580
27.285	28	3,409	17,045	3,318	16,590
27.295	29	3,411	17,055	3,320	16,600
27.305	30	3,413	17,065	3,322	16,610
27.315	31	3,415	17,075	3,324	16,620
27.325	32	3,417	17,085	3,326	16,630
27.335	33	3,419	17,095	3,328	16,640
27.345	34	3,421	17,105	3,330	16,650
27.355	35	3,423	17,115	3,332	16,660
27.365	36	3,425	17,125	3,334	16,670
27.375	37	3,427	17,135	3,336	16,680
27.385	38	3,429	17,145	3,338	16,690
27.395	39	3,431	17,155	3,340	16,700
27.405	40	3,433	17,165	3,342	16,710

TABLE B TRUTH TABLE

Channel No.	Program Input Data								
	Pin #	10	11	12	13	14	15	16	17
1		H	H	H	H	H	H	H	H
2		H	L	L	L	L	H	H	H
3		H	L	L	H	L	H	H	H
4		L	H	L	H	H	H	H	H
5		L	L	L	H	L	H	H	H
6		L	H	L	L	L	H	H	H
7		L	H	H	H	H	H	H	H
8		L	L	L	L	L	H	H	H
9		L	L	L	H	H	H	H	H
10		L	L	H	L	L	L	H	H
11		H	H	H	H	H	L	H	H
12		H	L	L	L	L	L	H	H
13		H	L	L	H	L	L	H	H
14		L	H	L	H	H	L	H	H
15		L	L	L	H	L	L	H	H
16		L	H	L	L	L	L	H	H
17		H	L	H	H	H	L	H	H
18		L	L	L	L	L	L	H	H
19		L	L	L	H	H	L	H	H
20		L	L	H	L	L	H	L	H
21		H	H	H	H	H	H	L	H
22		H	L	L	L	L	H	L	H
23		H	L	L	H	L	H	L	H
24		L	H	L	H	H	H	L	H
25		L	L	L	H	L	H	L	H
26		L	H	L	L	L	H	L	H
27		H	L	H	H	H	H	L	H
28		L	L	L	L	L	H	L	H
29		L	L	L	H	H	H	L	H
30		L	L	H	L	L	L	L	H
31		H	H	H	H	H	L	L	H
32		H	L	L	L	L	L	L	H
33		H	L	L	H	L	L	L	H
34		L	H	L	H	H	L	L	H
35		L	L	L	H	L	L	L	H
36		L	H	L	L	L	L	L	H
37		H	L	H	H	H	L	L	H
38		L	L	L	L	L	L	L	H
39		L	L	L	H	H	L	L	H
40		L	L	H	L	L	L	H	L

H: High level (more than 6.0 Volts D.C.)
L: Low level (less than 2.0 Volts D.C.)

"THE SPREAD EAGLE"
ANTENNA BREAK-THRU FOR TRUCKERS

★ **NEW!** ★

Since the ever-growing use of fiberglass in hoods, doors, and roof panels has taken the place of steel and aluminum, it gets more and more difficult to achieve a good electrical ground to the cabs of trucks. Poor grounding results in high SWR and little or no ground plane. High noise levels from electrical systems and static charged air from turbos and blowers are also from poor grounding. The conventional grounded antenna systems that we are now using do not perform well under these conditions so the search was on for bigger and better antennas. Since height limitations stopped us from going bigger, we set our sights on better.

After wasting a lot of time on conventional grounded systems, we found no way to improve them for use with fiberglass cab components. We decided to try an ungrounded system. There are several ungrounded antennas on the market now but none are very popular because they don't perform too well. Thus, the Spread Eagle was developed.

We built and installed over 500 antennas at no cost to long haulers and slip seaters to prove to ourselves and our customers that this system really performs well. Whether on metal or fiberglass, it works equally well. You can hold it in your hand and it will perform just as well. Transmit and receive signals will be of higher quality due to the lack of electrical interference common to grounded systems. This antenna can have an SWR of 1.0 to a 3.0 without any loss in performance, or result in any damage to your CB. On CB's with an AWI (antenna warning indicator), you may have to adjust the AWI sensitivity to accept a higher SWR. This is just to keep the AWI light from coming on.

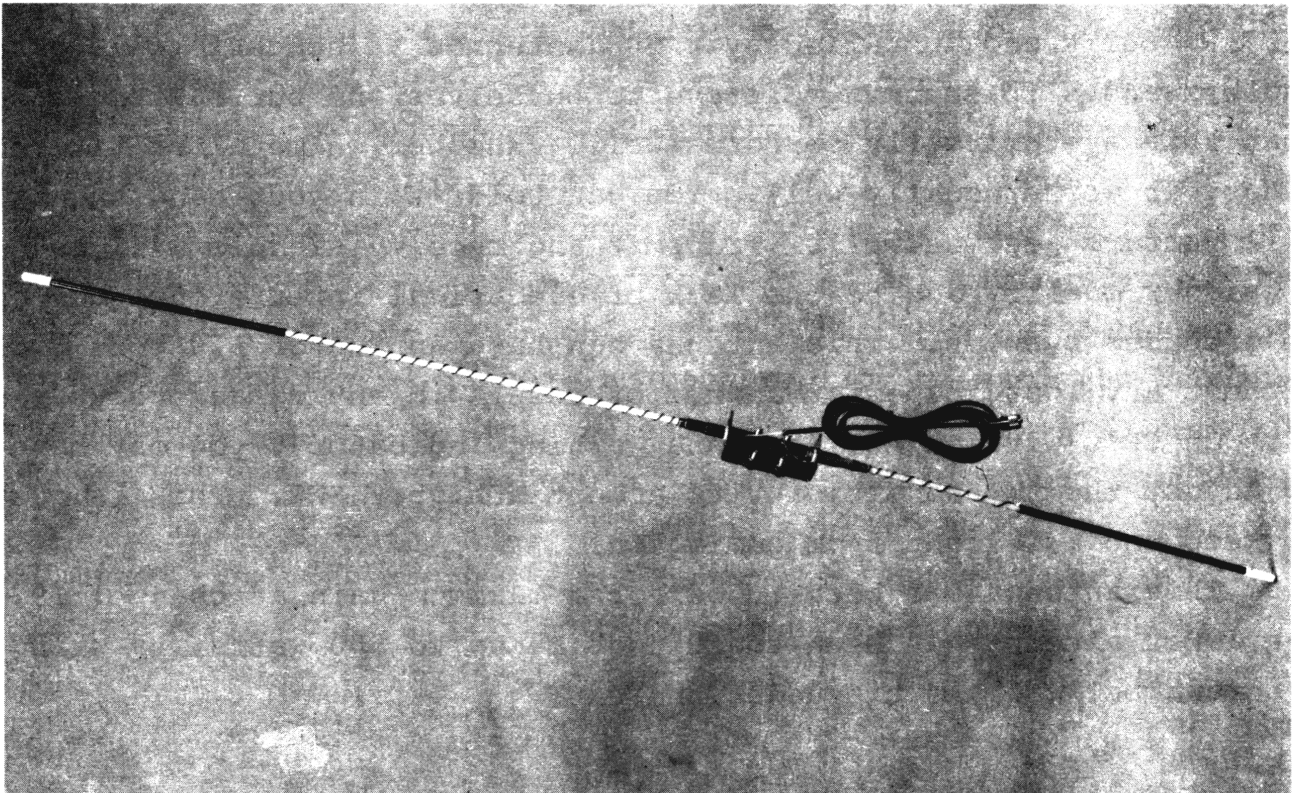
This antenna has been tuned for a maximum gain at channel 19. The lower antenna has been tuned to take up to 500 watts, by using a corona ball at the tip under the cap.

The Spread Eagle continued:

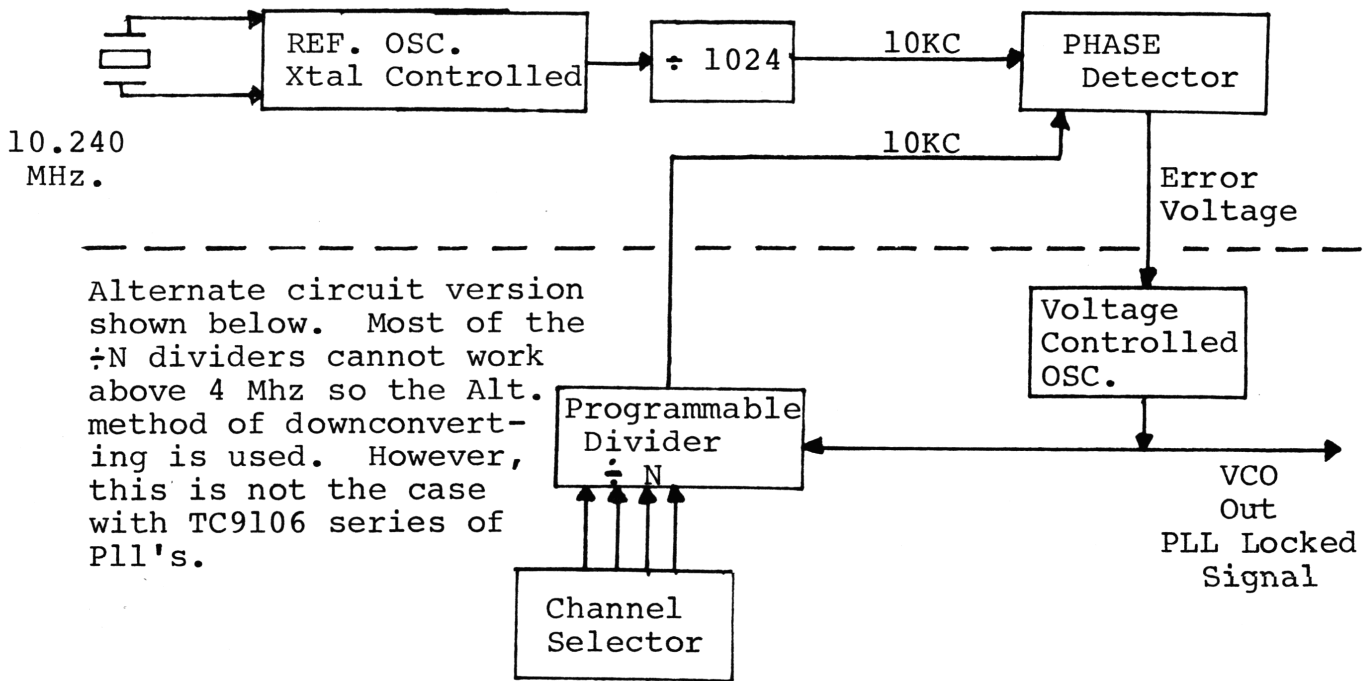
Each unit will be pretuned at the factory. If any additional tuning is needed just remove the cap and stand up a short spike of wire about $\frac{1}{4}$ inch long. Install cap and check SWR. The cap has to be on the antenna when SWR is checked. Both antennas can be tuned in this manner. If the lower whip should need to be tuned, do not forget to reinstall the corona ball. Clean insulator from wire and firmly install the ball, making sure it won't come loose under the cap. In most cases tuning will not be needed. All whips are warranted against breakage for any reason for a period of five years.

You may already have seen the Spread Eagle and wondered what it was or you may have talked to someone who is now using one. You don't have to take my word for how well it performs, just ask someone who has one or better still "Try it-you'll like it", says the inventor, who is an ex-trucker.

We here at "Secret CB" are impressed with the appearance, performance, and five year warranty.

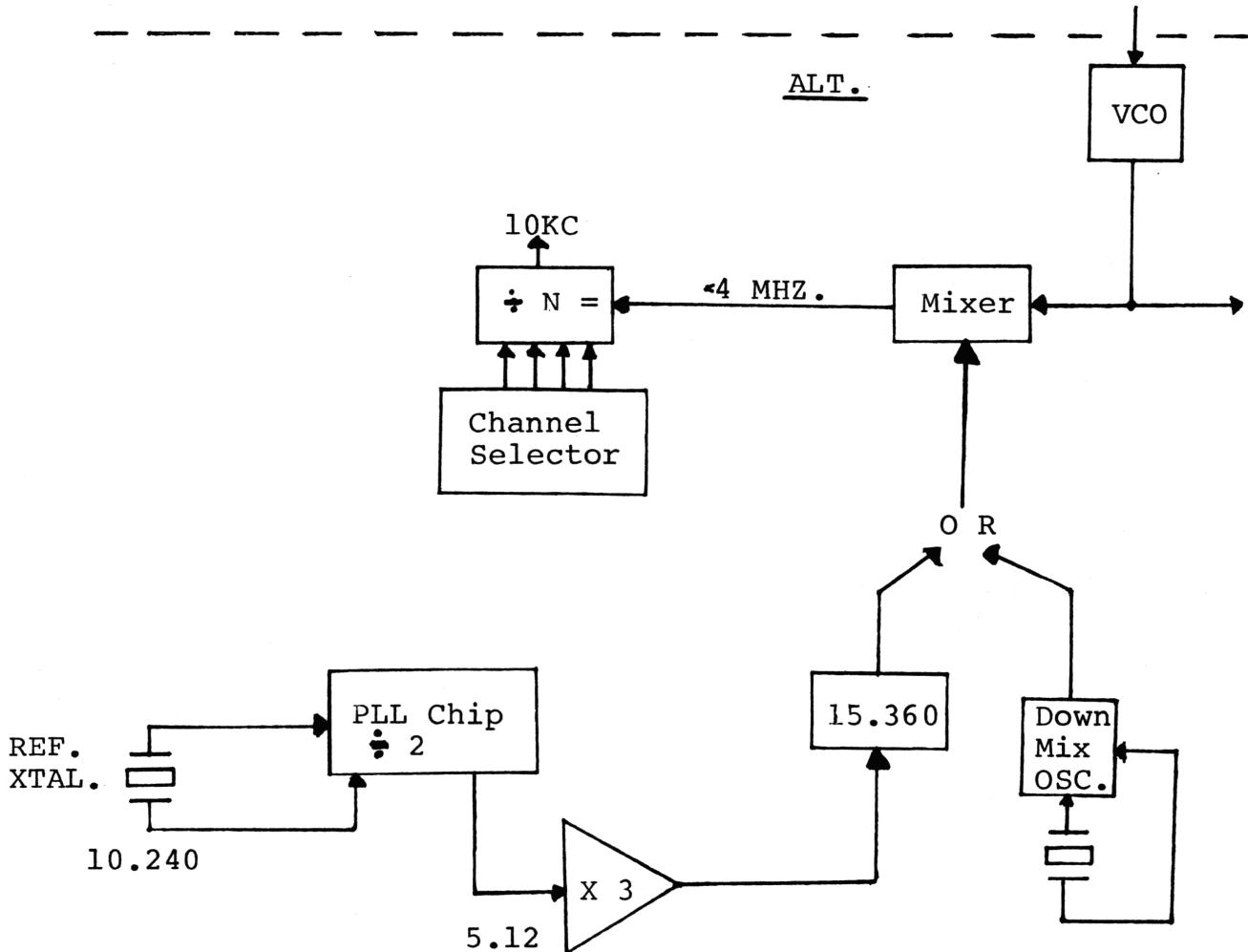


BASIC PLL



Alternate circuit version shown below. Most of the ÷N dividers cannot work above 4 Mhz so the Alt. method of downconverting is used. However, this is not the case with TC9106 series of PLL's.

ALT.



ELECTRONIC TERMINOLOGY

CROSSTALK:

Interference in a Transmitting or Receiving Channel that has its origin in another channel.

N.O. :

Abbreviation for Normally Open, such as in Relay contacts.

N.C. :

Abbreviation for Normally Closed, as in Relays, or No Connection.

NONSHORTING SWITCH:

A switch whose contact is broken from one position before contacting next position. Also called "break before make".

NULL:

A balanced condition in which there is zero output.

WAVELENGTH (feet):

$$\lambda = \frac{984}{\text{fMHz}}$$

EXAMPLE:

$$1 \lambda @ \text{ Ch. 40} =$$

$$\frac{984}{27.405} = 35.9 \text{ FT.}$$

$$\frac{1}{4} \lambda = \frac{35.9 \text{ FT.}}{4} = 8.97 \text{ Or about 9 Feet}$$

PHASE: \emptyset

An angular relationship between current and voltage in a sine wave.

PHASE DETECTOR:

A circuit in which a DC error voltage is derived to maintain (in our use) the Voltage Controlled Oscillator in sync with the reference oscillator, usually using 10 KC as reference frequency.

OPEN, CUT, CLIP:

Refers usually to a specific part or wire- indicates to physically disconnect the part or wire specified.

SHORT:

To eliminate a part from the circuit by jumping around it with a piece of wire, etc. Also used to indicate a high drain or 'fuse blowing'.

SCANNER PROGRAMMING TIPS

If you own (or sell) Regency Scanners, here is an "out of band" programming hint you will want to know about.

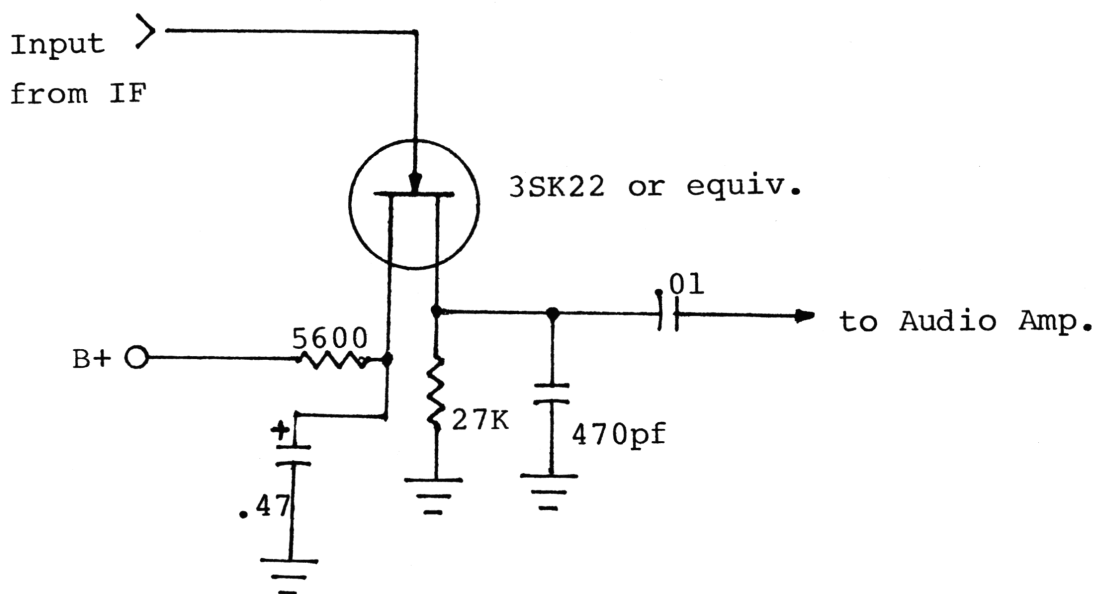
K100-Push Manual, Decimal Point, then program frequency.

K500-Push Program, Decimal Point, enter frequency.

M100-Touch Decimal Point, enter frequency.

M400-Touch Decimal Point, enter frequency.

You can pick up CB transmissions and aircraft by programming as above and adding an AM detector. A simple detector can be built as shown below:



INTO THE KNOW WITH JAPANESE SEMICONDUCTORS

All transistors "Made In Japan" will bear a 2S number. This means they are registered with the Electronic Industries Association of Japan (EIAJ.).

IDENTIFICATION SYSTEM

The type number consists of 5 Elements.

Example:

I	II	III	IV	V
2	S	C	1096	A
Number	Letter	Letter	Number	Letter

- I. Specifies the Kind of Device. This number tells the number of effective electrical connections minus one.
- II. The letter "S" tells us the device is registered with the EIAJ.
- III. Tells us Polarity and Application.
 - A. Designates PNP Transistor, High Frequency.
 - B. PNP Transistor, Low Frequency.
 - C. NPN Transistor, High Frequency.
 - D. NPN Transistor, Low Frequency.
 - E. P-Gate Thyristor.
 - G. N-Gate Thyristor.
 - H. N-Base Unijunction Transistor.
 - J. P-Channel FET.
 - K. N-Channel FET.
 - M. Bi-Directional Triode Thyristor.
- IV. Tells us the application as registered with the EIAJ.
- V. Tells us of improvements: A, B, C, D, E, and F.
An "F" can be substituted for a "C" but not necessarily a "C" for an "F".

TRANSISTOR SPECIFICATIONS



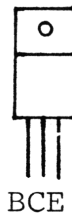
#	2SC710	2SC945	2SC1306	2SC1307	2SC1969
TYPE	NPN	NPN	NPN	NPN	NPN
CONFIGURATION	BCE 	ECB 	See Fig. 1 Below	See Fig. 1 Below	See Fig. 1 Below
VCBO	30V	50V	65V	70V	60V
VEBO	4V	5V	4V	4V	5V
IC	30MA.	100MA.	3A	8A	6A
PD	200MW.	250MW	12W	25W	20W
TJ	125°C	125°C	150°C	150°C	150°C
ICBO	1UA	.1UA	10UA	20UA	100UA
VCB	25V	40V	40V	40V	30V
HFE, PULSE	90	150	80	60	50
VCE, PULSE	6V	6V	10V	10V	12V
IC, PULSE	1MA.	1MA	500MA	2A	10MA
VCB	6V	6V	10V	10V	
IE	-1MA.	-1MA.	-150MA.	-500MA.	
FT	200MHz	250MHz	300MHz	150MHz	
COB	2pf	4.5pf	20pf	80pf	

Figure 1



RESISTOR COLOR CODE

The sequence of colors can be easily remembered by the little Rhyme I learned in school one day! Here it is for what it's worth!

		1st & 2nd BAND VALUE	3rd BAND MULTIPLIER
BAD	= BLACK =	0	$10^0 = X 1$
BOYS	= BROWN =	1	$10^1 = X 10$
ROB	= RED =	2	$10^2 = X 100$
OUR	= ORANGE =	3	$10^3 = X 1K$
YOUNG	= YELLOW =	4	$10^4 = X 10K$
GIRLS	= GREEN =	5	$10^5 = X 100K$
BUT	= BLUE =	6	$10^6 = X 1M$
VIOLET	= VIOLET =	7	$10^7 = X 10M$
GAVE	= GRAY =	8	$10^8 = X 100M$
WILLINGLY	= WHITE =	9	$10^9 = X 1G$

K = Kilo = X 1000

M = Meg - X 1,000,000

G = Giga = X 1,000,000,000

EXAMPLES: Red-Red-Orange = $22 \times 1,000 = 22,000$ or 22K

Brown-Black-Black = $10 \times 1 = 10$

Violet-Black-Green = $70 \times 100K = 7,000,000 = 7Meg$

If the third band is Gold or Silver, the value is less than 10 ohms, and is calculated the same way except the multiplier is different.

Gold = X .1

Silver = X .01

EXAMPLES: Yellow-Violet-Gold = $47 \times .1 = 4.7$

Red-Red-Silver = $22 \times .01 = .22$

RESISTOR COLOR CODE (Cont'd)

Sometimes a Fourth band is included to show tolerance. If it is Silver, it indicates that the value marked by the colors is within + or - 10%. If it were Gold, a value within + or - 5% would be indicated. If no Fourth band is present, tolerance is + or - 20%.

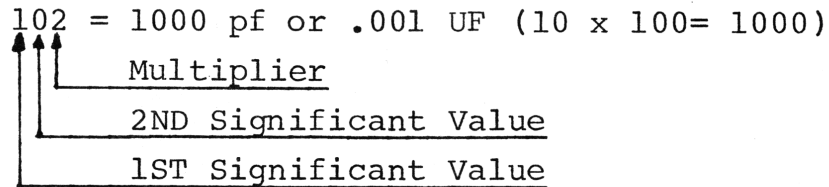
EXAMPLE: Yellow-Violet-Red-Gold

$$4 \quad 7 \quad \times 100 \quad + \text{ or } - 5\% = 4700 = 4.7\text{K} + \text{ or } - 5\%$$

This means the resistor has a resistance somewhere between 4935 (+ 5%) and 4465 (- 5%).

CAPACITOR CODES

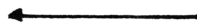
Capacitor is marked 102. What value is it?



To convert PF to UF, move decimal 6 places to the left.

$$1000.\text{PF} = 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 . = .001\text{UF}$$

6 5 4 3 2 1

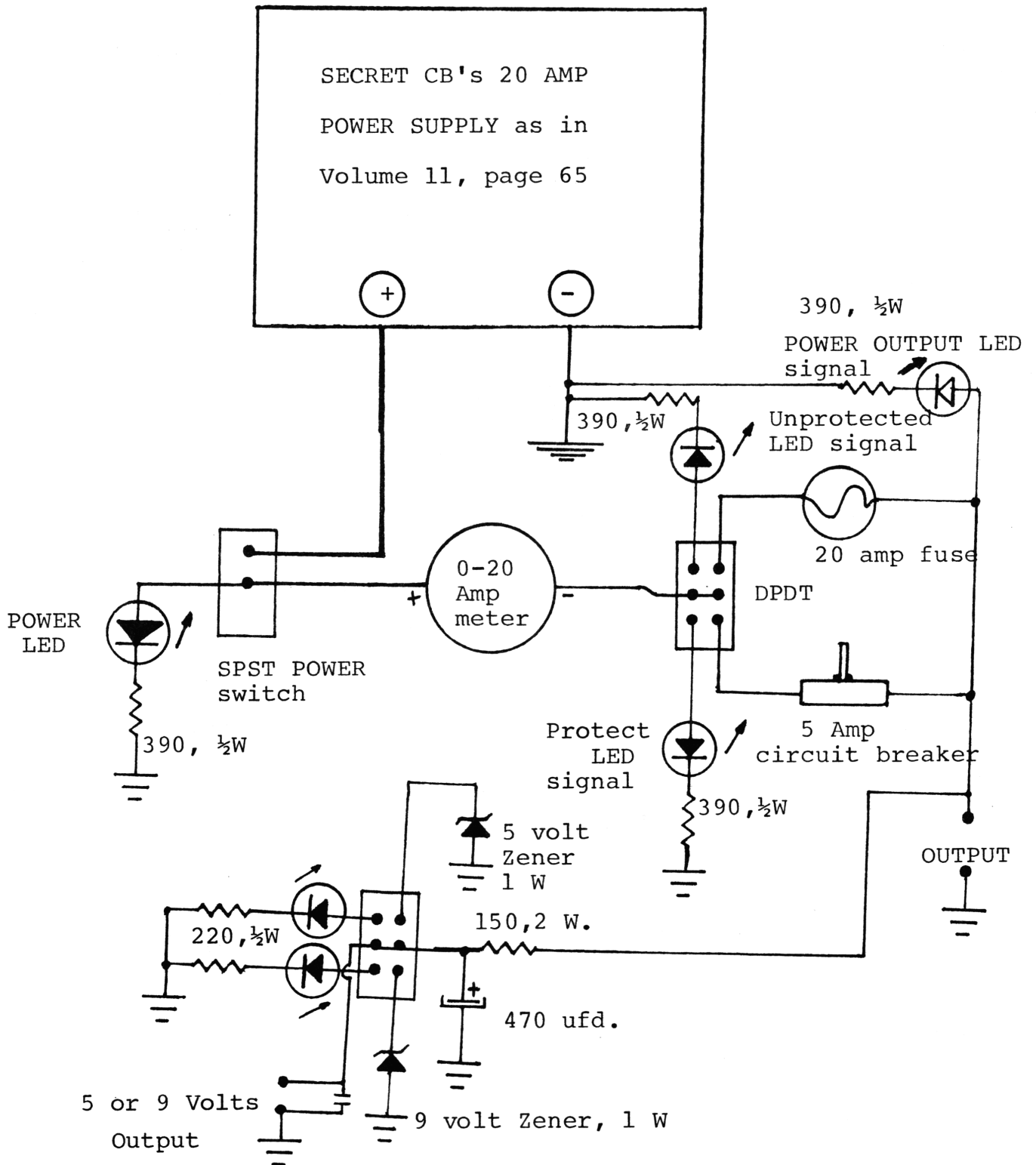


$$223 - \underline{22}000 \quad \text{or} \quad .022\text{UF} \quad (22 \times 1000 = 22000)$$

REFERENCE: Volume 11 page 59.

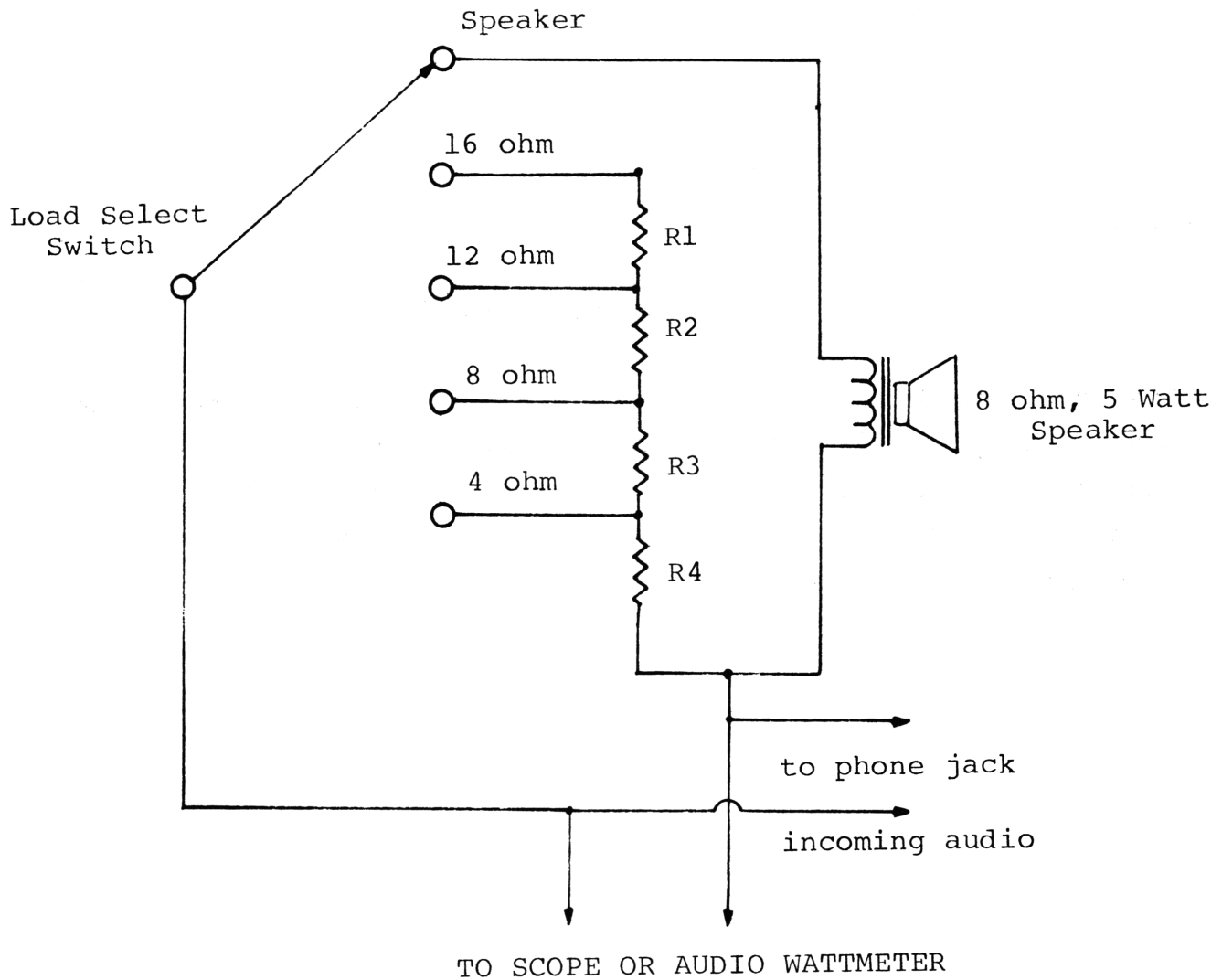
"You Can Build It"

SECRET CB'S SUPER-DUPER POWER SUPPLY CONTROLLER



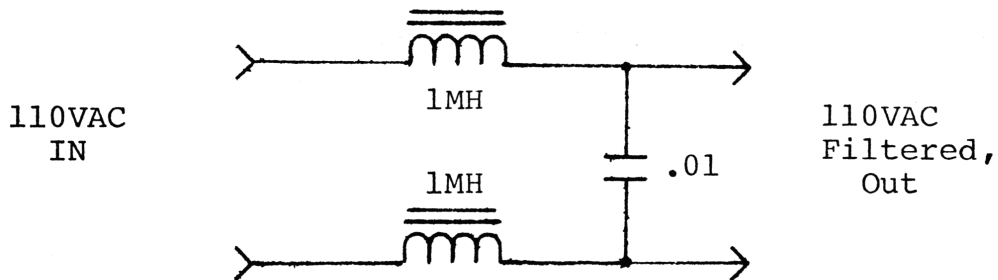
BUILD THIS AUDIO TEST STATION

At the present time, resistors R1, R2, R3, & R4 can be purchased from Ramsey Electronics 4/\$1. They are 4 ohm, 10 Watt each. You could also add a scope output in addition to the dummy loads shown below. Or even an audio wattmeter.



POWER LINE FILTER

This balanced L-type of Low Pass Filter will pass 60Hz but filter out RF.



T.V.I. FILTER

Are your neighbors THREATENING to call the F.C.C. if you keep messin' up their favorite program on the BOOB TUBE? After testing numerous filters, we have found the J.W. Miller, part number C-514-T to be the best Low Pass Filter for T.V.I. List price is under \$50.00.

"OOPS, WE GOOFED"

- VOL. 4, Page 38:** On Diagram, Crystal labeled 5.120 should be labeled 17.0555. Crystal Y is 17.215
- VOL. 10, Page 10:** VSB-1 Hook-Up: Cobra 140-142 GTL/Tram D300
Change the Expander hook-up to read as follows:
Remove C28. Solder Black wire towards collector of TR13 and White wire towards R36. Pre-amp recommended.
- VOL. 10, Page 16:** VSB-1 Hook-Up: President Washington (1001002)/
New McKinley-change the expander hook-up to read as follows: Remove C28. Solder Black wire towards collector of TR13 & White wire towards R36.
- VOL. 10, Page 28:** On the Cobra radios the Red wire goes to R415 and should be grounded. The Orange wire should be the one to go to 8V. The picture shows the correct conversion for the President Washington.
- VOL. 11, Page 3:** TABLE OF CONTENTS - The Printer Goofed! They renumbered the pages but did not change the page numbers in the Table of Contents to correspond, so add 3 to all page numbers listed in this table of contents.
- VOL. 11, Page 10:** For the Crystal 11.135, channels should read 26.515-26.955.
- VOL. 11, Page 15:** If you can't get this Mod. to work, retune the tripler, VERY CRITICAL (L18 on President Washington)
- VOL. 11, Page 16:** Under Step 2 of XTAL CHANGE, 16.511-26.955 should read 26.515-26.955
- VOL. 11, Page 71:** Item 116 has been discontinued.

WATCH OUT! NEW COLT 222's ARE COMING OUT WITH LC7131 CHIP INSTEAD OF LC7120 CHIP!

SECRET CB INDEX

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