098-2626-01
REVISION 2
SEPTEMBER 1986

Granger Associates

INSTRUCTION MANUAL

MODEL 6710
POINT TO MULTIPOINT UHF RADIO

SCANCOM
1200M/9600M MASTER
AND
1200R/9600R REMOTE
SHELF MOUNTED

001-9819
5 WATT TRANSMITTER

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5 WATT TRANSMITTER MODULE

PART NUMBER 001-9819-XX*

(* where XX = the Option Suffix number)

REFERENCE

Block Diagram	Figure 1
Schematic Diagram	071-8022
Top Assembly	001-9819
PCB Assembly/Parts List	065-2505

1. FUNCTION

1.01 The Transmitter module modulates a Voltage Controlled Oscillator (VCO) with an input signal frequency. This modulated signal is mixed with the LO signal from the Receiver assembly to upconvert it to the assigned radio frequency (RF) output. The signal is then amplified to the final level of 5 watts and applied to the output connector.

OPTIONS

-01 Scancom 1200/9600 Master
-02 Scancom 1200/9600 Remote

Options of PCB assembly 065-2505 match those of the top assembly.

INPUTS

J1-2	VF IN
J1-4	TX KEY (PTT)
J1-5	+13.6 Vdc
J1-9	TIMER
J2	RECEIVER L.O.

OUTPUTS

J1-3	TX ALARM
J3	RF OUTPUT

TEST POINTS

J1-7	AUDIO TP
J1-8	PHASE LOCKED LOOP (PLL) TP
U2-10	33.88672 kHz TP

ADJUSTMENTS

C6	PLL REF OSC FREQ ADJ
C23	DEVIATION ADJ
R43	TX ALARM ADJ.
L2	BUFFER ADJ.
C27	L.O. INPUT ADJ.
C49	TX DRIVE AMP
C58	5W OUTPUT AMP

STRAPS

E1-E2	VCO TEST

SWITCHES/INDICATORS

DS1	TRANSMIT ON

CIRCUIT DESCRIPTION
TRANSMITTER MODULE

2. VF INPUT FILTER AND MONITOR CIRCUIT

2.01 The VF signal is input to the transmitter module from the Combiner or Interface Unit at J1, pin 2.

2.02 The input level is at a -10 dBm level at 600 ohms.

2.03 Input amplifier U5 amplifies the signal 10 dB, and inputs it to high pass filter U6A (having a 300 Hz cutoff frequency) and low pass filter U6B (with a 4.0 kHz cutoff frequency). Together, these filters make a 0.3 - 4.0 kHz bandpass filter.

2.04 An isolated Test Point (TP), J1, pin 7 allows monitoring the active filter input to the Voltage Controlled Oscillator (VCO) Q3.

2.05 With a -10 dBm, 1 kHz Test Tone at J1-2, the level at pin 7 should be 0 dBm (Bridged measurement).

3. VOLTAGE CONTROL OSCILLATOR (VCO)/MODULATOR

3.01 The output of the active filter modulates the VCO Q3 (operating at 34.7 MHz) by varying the voltage level on varactor CR6, which varies the VCO frequency.

3.02 A DC control voltage from Phase Detect A of U2 is also applied to the VCO to control its output frequency.

3.03 The 34.7 MHz VCO output of Q3 is split and applied to two separate buffer amplifiers, Q4 and Q5.

3.04 The output of Q4 is divided in U1 by 64 and input to the Phase Lock Loop (PLL) circuitry of U2-1 where it is divided again, this time by 16. This gives an output frequency of 33.88672 kHz to Phase Detect A.

3.05 In Phase Detect A, the 33.88672 kHz is phase compared with the 33.88672 kHz input from a 17.35 MHz Reference Oscillator which has been divided down by 512 in U2.

3.06 The DC output voltage of Phase Detect A is input to VCO Q3 through loop filter R5/C11 to control the Q3 VCO frequency.

3.07 An additional output of Phase Detect A goes through a Lock Detect circuit and is applied to the Transmit Switch NAND gate U3 to indicate a loss of phase lock in U2.

3.08 Deviation Adjust C23 is a factory adjustment which sets the deviation at +3.5 kHz peak Scancom 9600 System (±2.0 kHz peak Scancom 1200 System) with the -10 dBm, 1 kHz Test Tone input to the Transmitter.

4. MIXER UPCONVERTER CIRCUIT

4.01 The output of buffer amplifier Q5 is fed to Mixer MXR1. Here, it is mixed with the Local Oscillator (L.O.) input from the Receiver module to upconvert the modulated 34.7 MHz signal to the assigned RF operating frequency.

5. RF AMPLIFIER CIRCUIT

5.01 The signal is filtered by C27 to remove unwanted harmonics and is amplified 28 dB by a three stage microstrip amplifier composed of Q7, Q9, and Q11.

5.02 Transistors Q6, Q8, and Q10 are used to provide auto-biasing for the amplifier.

5.03 The +28 dBm (630 mW) output of this driver amplifier is input to the 5W Power Amplifier composed of Q12 and Q13.

5.04 This amplifier will increase the output level of the modulated RF carrier by 10 dB, so that when measured at J3 TX OUT connector on the module front panel, it will have an output of +38.5 dBm, or 7 Watts, maximum.

6. POWER ALARM CIRCUIT

6.01 At the output of the power amplifier is an RF power alarm circuit consisting of CR8, U7, and Q2.

6.02 During normal operation, comparator U7 produces a logic "1" (+9.0 Vdc) and LED DS1 is illuminated.

6.03 Upon loss of RF output power, the coupled input to Q2 and the non-inverting input to U7 will go low (0 Vdc), causing Q2 to stop conducting (turning off DS1) and the output of U7, J1-3 goes to 0 volts.

7. TRANSMIT SWITCH

7.01 The "TRANSMIT SWITCH" circuitry of U3(B) and U3(C) is used to control the +9 Vdc input to the driver amplifier by turning voltage switch Q1 ON and OFF.

7.02 This removes the bias voltage to the Transmit Driver Amplifier (Q7, Q9, and Q11), disabling it and causing a POWER ALARM output from U7 which turns off the transmitter output.

7.03 To "Key on" the transmitter, three inputs to U3(B) and U3(C) are needed:

a) U2 must be in Phase Lock, with a logic "1" at Phase Lock Detect U2, pin 28.

b) The Transmit Key (PTT) input at J1, pin 4 must be at GND, which is inverted through U3(A) to a logic "1" input to U3(B) and U3(C).

c) The Timer input at J1, pin 9 must be at a logic "1," initiating the RC time constant circuit of R1 and C9.

7.04 If any of these inputs is missing, Q1 will be turned off, turning off the Transmitter RF output.

8. TIME OUT TIMER

8.01 The time-out duration of Timer circuit R1/C9 can be varied by changing the value of C9. For example, 10 uF at C9 gives approximately 10 seconds delay in transmitter turn-on.

8.02 The Timer input can be overridden by strapping J1/P1, pin 6 (+9 Vdc) to J1, pin 9 (Timer). Then only Phase Lock and PTT will control the transmitter output. Wiring harnesses for Master already contain this strap in P1.

8.03 Likewise, the Transmit Keying (PTT) input can be overridden by strapping J1, pin 1 (GND) to J1, pin 4 (PTT).

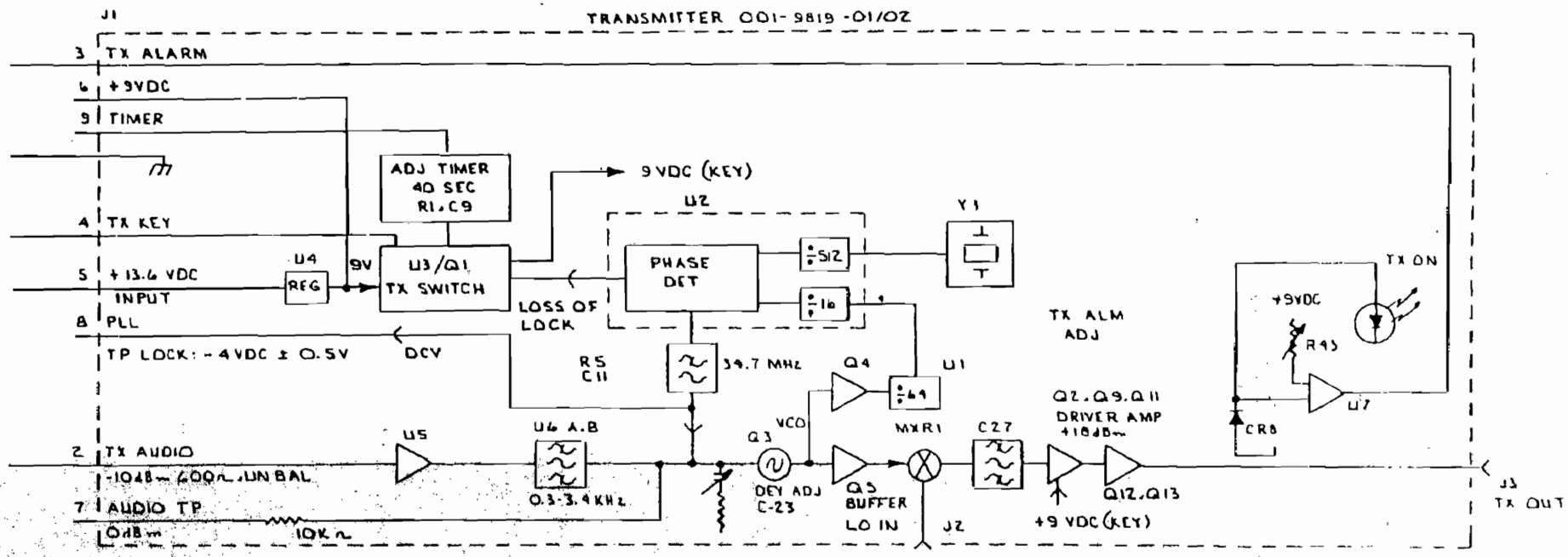
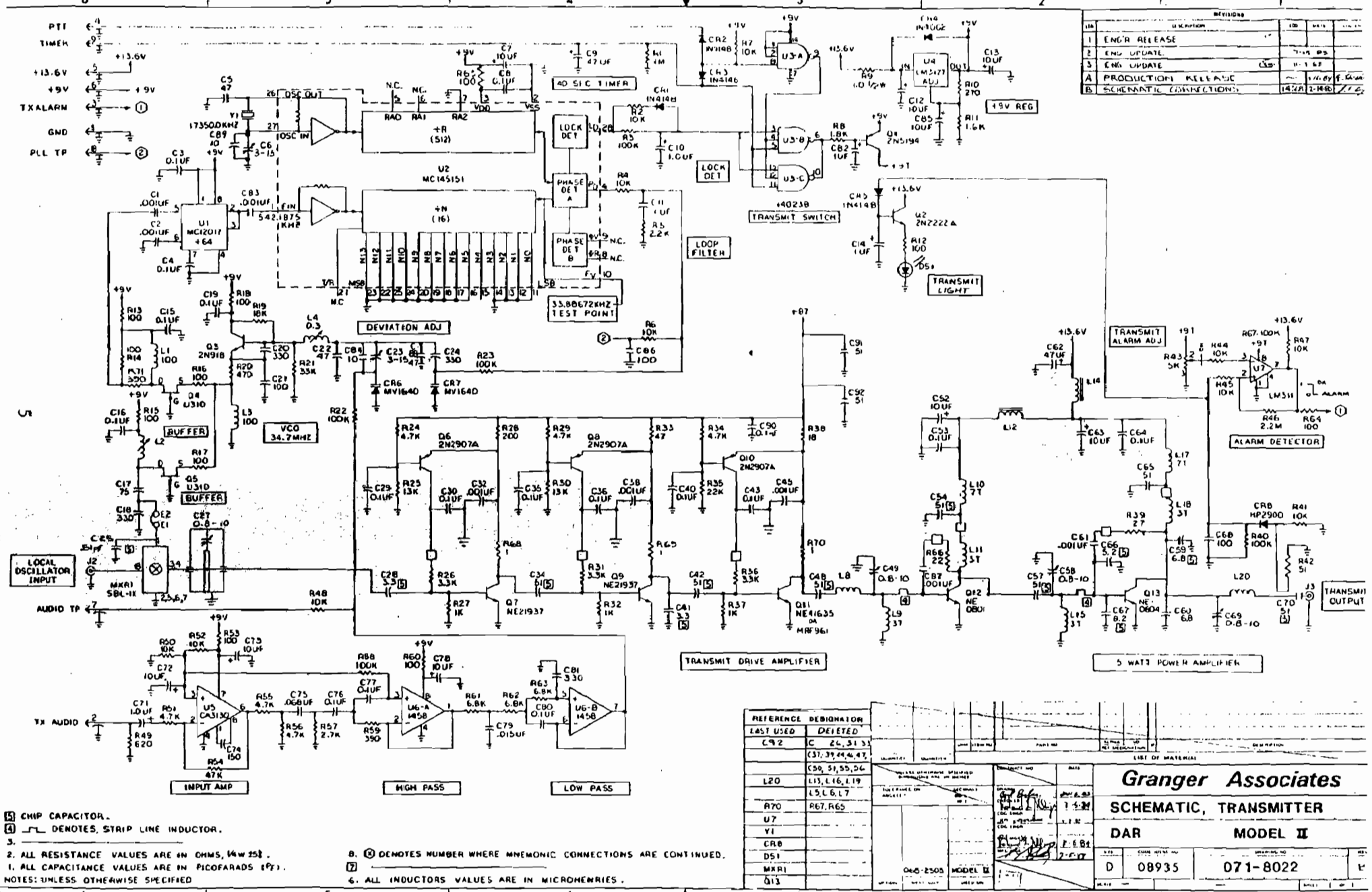


Figure 1 5W Transitter Block Diagram



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
1	ENG'R RELEASE		
2	ENG UPDATE		
3	ENG UPDATE		
A	PRODUCTION RELEASE		
B	SCHEMATIC CORRECTIONS		

REFERENCE DESIGNATOR	
LAST USED	DELETED
C92	C 24, 31 33
	C37, 39, 44, 46, 47
	C50, 51, 55, 56
L20	L13, L16, L19
	L5, L6, L7
R70	R67, R65
U7	
Y1	
CR8	
DS1	
MXR1	
Q13	

[5] CHIP CAPACITOR.
[4] ⎍ DENOTES STRIP LINE INDUCTOR.
3. ———
2. ALL RESISTANCE VALUES ARE IN OHMS, (¼w 5%).
1. ALL CAPACITANCE VALUES ARE IN PICOFARADS (PF).
NOTES: UNLESS OTHERWISE SPECIFIED

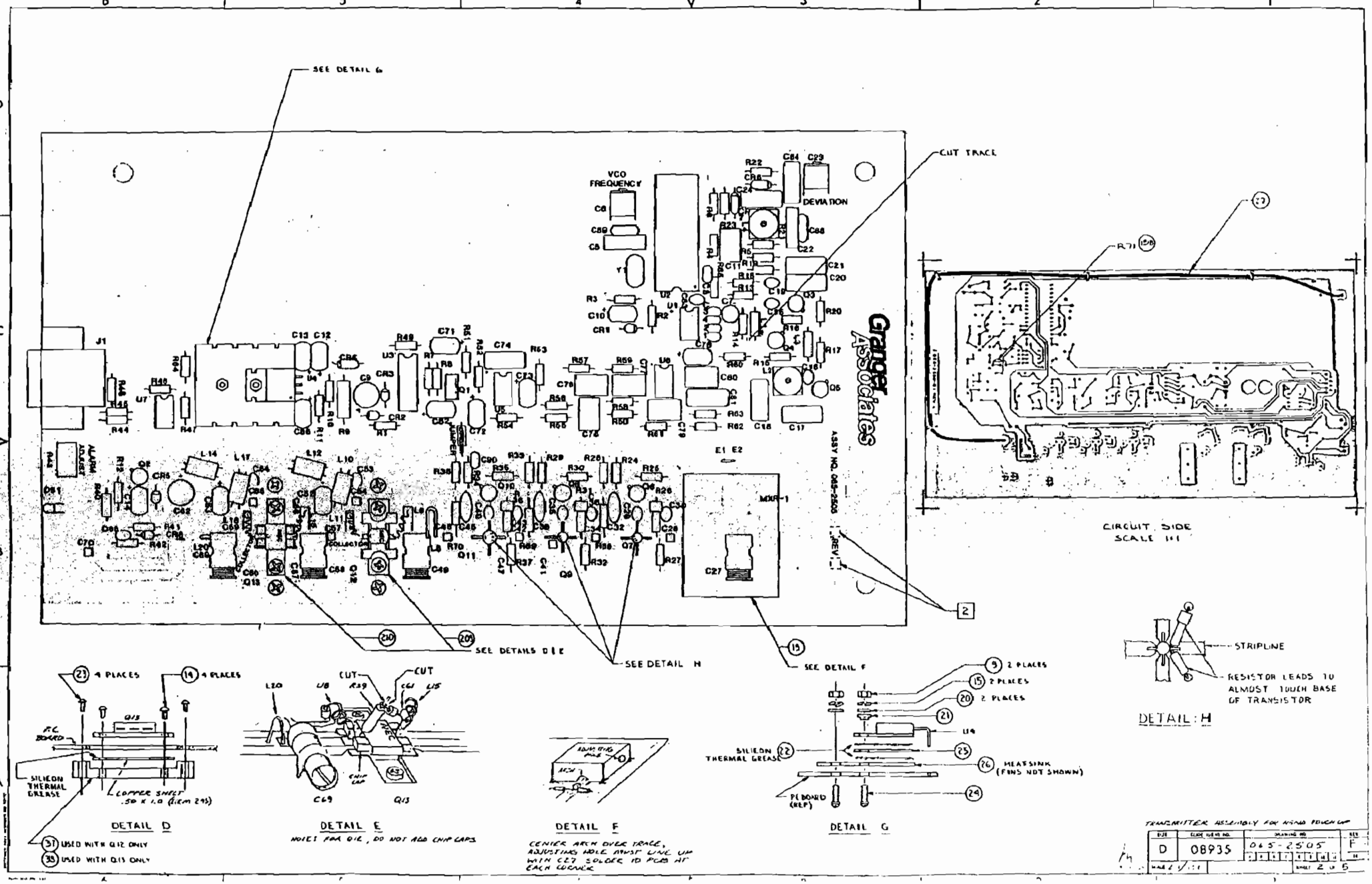
8. (X) DENOTES NUMBER WHERE MNEMONIC CONNECTIONS ARE CONTINUED.
[7] ———
6. ALL INDUCTORS VALUES ARE IN MICROHENRIES.

Granger Associates

SCHEMATIC, TRANSMITTER

DAR MODEL II

SIZE	DRAWING NO	REV
D	08935	071-8022	B


SEE DETAIL G
CUT TRACE
VCO FREQUENCY
DEVIATION
Grange Associates
ASSY NO. 065-2505 REV. L
MDR-1
E1 E2
SEE DETAILS D I E
SEE DETAIL H
SEE DETAIL F
CIRCUIT SIDE
SCALE 1:1
STRIPLINE
RESISTOR LEADS TO ALMOST TOUCH BASE OF TRANSISTOR
DETAIL H
23 4 PLACES
14 4 PLACES
SILICON THERMAL GREASE
COPPER SHEET .50 X 1.0 (ITEM 29)
DETAIL D
37 USED WITH Q12 ONLY
38 USED WITH Q13 ONLY
CUT
C69
Q13
DETAIL E
NOTE: FOR DIE, DO NOT ADD CHIP CAPS
CENTER ARM OVER TRACE, ADJUSTING HOLE AWAY LINE UP WITH C27 SOLDER TO PCB AT EACH CORNER
DETAIL F
9 2 PLACES
15 2 PLACES
20 2 PLACES
21
U9
22
SILICON THERMAL GREASE
25
HEATSINK (FINS NOT SHOWN)
24
PC BOARD (REF)
DETAIL G
TRANSMITTER ASSEMBLY FOR HAND TOUCH UP
D
08935
065-2505
F
H
SHEET 2 OF 5