

TMC SPECIFICATION

NO. S 516

REV:

K

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APPD:

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OF 13

TITLE: TEST PROCEDURE OF TIS-3, 3A, & 3D

retyped by g.a. 2/12/69

TEST PROCEDURE TIS-3

A. TEST EQUIPMENT USED:

1. SQUARE WAVE GENERATOR, MEASUREMENTS MODEL 71 OR EQUIVALENT.
2. COUNTER, MODEL 550 BERKELEY (200KC) OR EQUIVALENT.
3. SCOPE, TEKTRONIX MODEL 545A OR EQUIVALENT.
4. BATTERY SUPPLY, DC 0 TO +20 VOLTS.
5. MULTI-METER, SIMPSON MODEL 260.
6. TMC ISK OR EQUIVALENT.
7. TMC PSP-1 OR EQUIVALENT.
8. 600 OHM 1 WATT RESISTOR.
9. SONIC ANALYSER MOD. LP-LA OR EQUIVALENT.
10. AC-VTVM BALLANTINE 314 OR EQUIVALENT.

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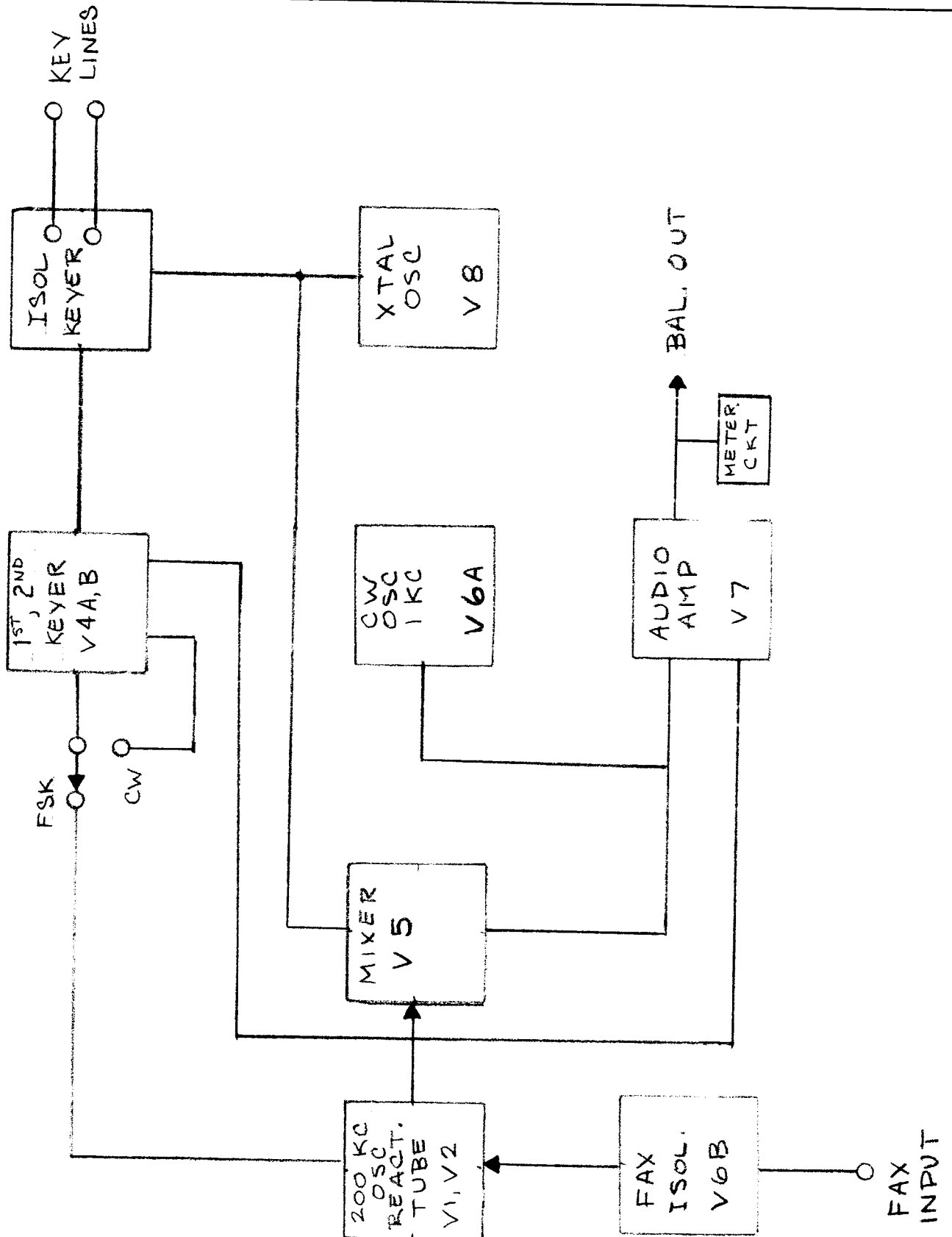
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BLOCK DIAGRAM



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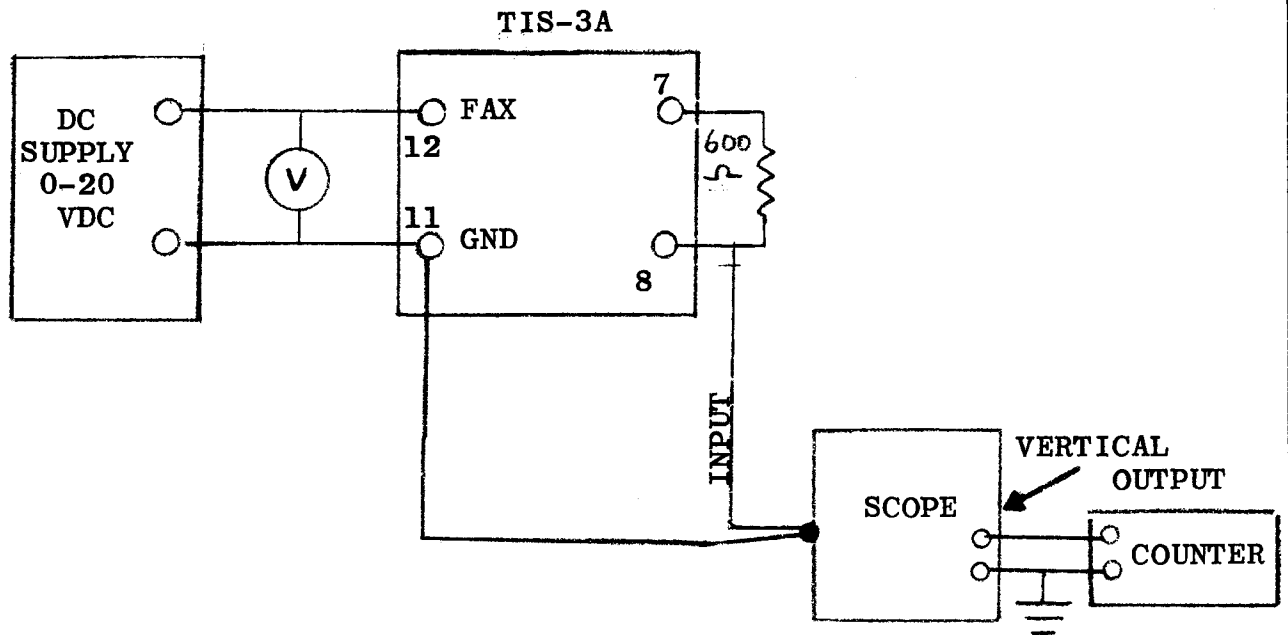
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FIGURE 1

FAX, REACTANCE TUBE TEST



NOTE: When connecting test equipment to 600 ohm output, use matching xfrmer.

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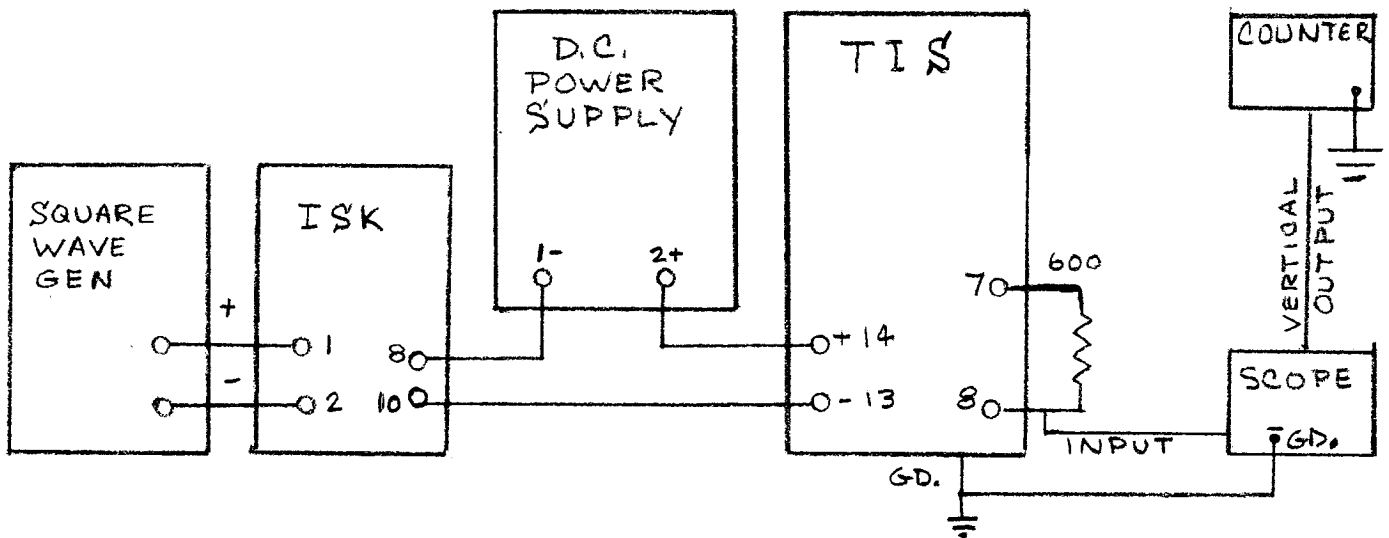
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FIGURE 2

FSK, CW KEYING TEST



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TEST PROCEDURE FOR TIS-3, 3A, & 3D

I. PRELIMINARY TEST

- A. Check unit for obvious wiring mistakes and poor solder connections, correct tubes, fuses and tube shields.
- B. With B+ switch in standby, check with ohmmeter at terminal strip E1 for following readings:

<u>E1</u>	<u>RESISTANCE READING $\pm 10\%$</u>
1	C
2	O
3	INF
4	INF
5	20K
6	18K
7	24K
8	NC

- C. Plug the unit into 110 volt AC and check the following voltages. Turn the Standby switch to B+.

<u>E1</u>	<u>VOLTAGE READING $\pm 10\%$</u>
1 to GND	6.3 VAC
2 to GND	6.3 VAC (1) *
3 to 4	110 VAC
5	+200 VDC (2) **
6	+150 VDC **
7	-150 VDC **

* - Voltage varies as Z1, Z2 thermostats make and break.

** - These voltages are removed by turning B+ switch to Standby.

- D. While oven light is on, measure the following AC volts on E2.

<u>E2</u>	<u>VOLTAGE $\pm 10\%$</u>
1 to 2	110 VAC
5 to 6	110 VAC

The oven should reach operating temperature in approximately 15 minutes and the oven should go out for start of oven cycle.

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E. B+ - Standby switch should operate B+ light.

F. Make the following check with an ohmmeter on terminal strip E3.

1. With S4, S5 in the line position, the following lines should be shorted.

1 to 7

4 to 10

3 to 8

6 to 9

2. With S4, S5 in the CW, FAX and FSK position there should be 70 ohm between 7, 8 and 9, 10.

Terminals 2, 5 and 11 should read ground. Terminal 12 should read 50K ohms. Terminals 13 and 14 infinity.

II. XTAL OSCILLATOR TEST

A. Check XTAL oven Z1 for proper crystals. T1, 198.100KC; T2, 198.000KC and Z2 for Y3, 197.450 KC. The spare XTAL position should be checked out during this test by putting Y3 into spare holder.

B. Connect scope to center tap (yellow lead) of L6, tune for maximum voltage with S6 in position 3 (2550). This should be no less than 35 V Peak to Peak. Check waveform for distortion and hum.

C. Connect counter to vertical output of Scope.

D. Turn S6 to position 1 (1900) and adjust C 35, if necessary, to 198.100 KC.

E. Turn S6 to position 2 (2000) and adjust C 36, if necessary, to 198.000 KC.

F. Turn S6 to position 3 (2550) and adjust C 37, if necessary, to 197.450 KC.

III 200 KC OSCILLATOR REACTANCE TUBE

A. Set the following controls:

(1) C3 to 1/2 capacitance

(2) C46 to mid capacitance

(3) R31 (shift CPS) to 000

(4) R28 (shift cal.) to mid resistance

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III 200 KC OSCILLATOR REACTANCE TUBE (cont'd)

A. (cont'd)

- (5) R26 (shift bal.) to mid resistance
- (6) S2 (test) to Space
- (7) S6 (center frequency) to Spare (position 4)
- (8) C18 3/4 Capacitance
- (9) S1 (function) to FSK

B. Connect the Scope Pin 2 of V5

C. Adjust C3 to within ± 10 cycles of 200 KC and lock shaft. Now set to 200.000 KC by adj. C46. Make sure that R31 is set to 000. Output should be at least 5V peak to peak. Check waveform for distortion and hum.

D. Set R31 to 1000. Frequency should decrease to 199.500 KC ± 5 cycles in Space position. Switch S2 in Mark position should increase frequency to 200.500 KC ± 5 cycles. Adjust Shift Balance R26 and Shift Calibrate R28 for equal ± 500 cycles shift from 200 KC.

E. SHIFT CPS

COUNTER READING $\pm 10\%$ OF SHIFT

	MARK	SPACE
--	------	-------

1000	200.500	199.500
500	200.253	199.755
300	200.152	199.847
100	200.052	199.950

Adjust C18 if linearity is poor. Reset 200 KC OSC. after this adjustment and proceed from Step D.

F. Frequency in Space and Line position should be the same. Make sure all controls are locked.

IV MIXER AND AUDIO TEST

A. Set controls for test in following manner:

- (1) Balance voltage on pins 3 and 8 of V5 using R67.
- (2) Connect 600 ohm load across pins 7 and 8 of E3 (ch. 1). Connect Scope to one side of load and ground.
- (3) Turn S4 (exciter channel 1) to the CW, FAX and FSK position.
- (4) Turn S6 (center frequency) to 1900 (pos. 1).

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IV MIXER AND AUDIO TEST (cont'd)

A. (cont'd)

- (4) Set R49 (level adj.) to mid resistance.
- (5) Turn S2 (test) to mark position.
- (6) Turn S1 (function) to FSK position.
- (7) Set R64 (audio bal.) to mid resistance.
- (8) Set R31 (shift CPS) to a reading of 000.

B. The output level meter should be reading approx. Odb. R49 (level adj.) should vary the output level meter reading from 0 to full scale. This indicates the mixer, audio and metering circuits are working properly.

C. With S6 (center frequency) in the following positions the counter readings should be:

<u>POSITION</u>	<u>COUNTER READING ± 5cps</u>
1 (1900)	1900
2 (2000)	2000
3 (2550)	2550
4 (SPARE)	0

D. With R49 (level adj.) set to Odb the voltage on channel 1 should be no less than .75 VPP on Pin #7 and Pin #8.

E. Set R31 (shift CPS) to the following setting with S6 (center frequency) set to position 3 (2550):

<u>SHIFT CPS</u>	<u>SPACE</u>	<u>MARK</u>
100	2500	2600
300	2400	2700
500	2300	2800
800	2150	2950
1000	2050	3050

All Readings ± 10% of shift.

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V FAX TEST

A. Set up controls in following manner:

- (1) SW S1 to FAX
- (2) R31 to 000
- (3) R66 (FAX ADJ.) maximum clockwise.
- (4) Set S6 to 1900 and Adjust R44 (FAX BIAS) for output frequency of 2500 CPS.
- (5) Refer to figure 1 for test set-up.
- (6) With 20 VDC to FAX input, adj. R66 (FAX ADJ.) for frequency of 1300 CPS.
- (7) The following readings are typical of unit working properly:

<u>+ VDC</u>	<u>CENTER FREQUENCY 1900 CPS</u>
20	1300
15	1600 ± 30 CPS
10	1900 ± 60 CPS
5	2200 ± 30 CPS
2	2380 ± 12 CPS
1	2440 ± 6 CPS
0	2500

VI CW KEYING TEST

A. Connect units as per figure 2.

- B. (1) Set S1 (function) to CW (pos. 3).
(2) Put Scope on pin 1, 1Y6A, CW oscillator. Adjust L3 with Allen Wrench for 1000 CPS. Check for distortion of wave form. Voltage should be at least .60V peak to peak.

C. Set the following controls:

- (1) R27 (Threshold adj.) to mid resistance.
- (2) Key Mode to 60 ma on TIS and ISK. With Switch S2 in Mark position, adjust the DC power supply for a 60 ma indication on its meter.
- (3) S6 (center Freq.) to 2000, Pos. 2.
- (4) S2 (test) to line.
- (5) With square wave generator set to 45 CPS, Adj. R49 (Level Adj.) for reading of 0db on output meter M1.
- (6) Connect Scope to Pin B, E3 and ground.

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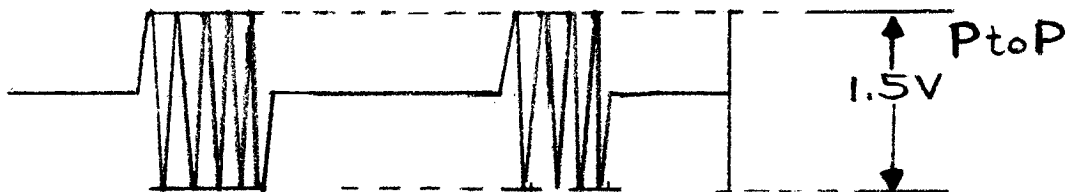
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VI CW KEYING TEST (cont'd)

C. (cont'd)

- (7) Adj. R46 (Audio Bal.) for best square wave output. Adj. R27 (Threshold Adj.) to the point where Space condition is 0 Volts. In the Mark condition the output wave form should be at least 1.5 peak to peak.

SAMPLE PATTERN



- (8) With S2 in Mark position the output frequency should be 1000 CPS.
- (9) Check 20 ma, 50 V and 100 V Key Mode positions. Output waveform should not change.
- (10) With S5, CH2 (Exciter) SW, in FSK, FAX, CW position, check output on 9, 10 of E3.
- (11) Disconnect the Keying line and measure the output in the unkeyed condition. Should be 45DB below LINE condition.

VII FSK TEST

A. Set controls to following positions:

- (1) S1 (FUNCTION) to FSK.
- (2) Set shift to 1000 CPS.
- (3) Adj. R49 to Odb.
- (4) Adj. square wave gen. to 5 CPS.
- (5) Check shifted tone for clean waveshape from 1000 to 0 CPS shift.

VIII AUDIO DISTORTION

- A. Connect Sonic Analyzer to 600 ohm output, use matching transformer.
 - (1) Set S1 (Function) to FSK, S6 (Center Freq.) to 2550 cps, and Shift CPS to 0.
 - (2) Adjust Audio output level to 0 DBM.
 - (3) The resulting distortion, as viewed on analyzer, should be at least 40 db down.
 - (4) Check at 2000 cps and 1900 cps.

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THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, NEW YORK

TEST DATE FOR TIS-3 _____

SERIAL NO. _____

MFG. NO. _____

A. PRELIMINARY TESTS

1. MECHANICAL DEFECTS _____ OK
2. CONTINUITY AND VOLTAGE MEASUREMENTS _____ OK

B. CRYSTAL OSCILLATOR TEST

1. CRYSTAL OVEN CHECKED _____ OK
2. OSCILLATOR OUTPUT CHECKED _____ OK
3. ALIGNMENT
- POSITION 1 _____ KC
- POSITION 2 _____ KC
- POSITION 3 _____ KC

C. 200KC OSCILLATOR AND REACTANCE TEST

1. FREQUENCY AT PIN 2 OF V5 _____ KC
2. OSCILLATOR OUTPUT CHECKED _____ OK
3. FREQUENCY SHIFT ALIGNMENT
- SHIFT CPS
- 100 ± _____ CPS
- 300 ± _____ CPS
- 500 ± _____ CPS
- 1000 ± _____ CPS

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D. MIXER AND AUDIO TEST

- | | | |
|-------------------------------|-------|-----|
| 1. OUTPUT LEVEL METER CHECKED | _____ | OK |
| 2. CENTER FREQUENCY CHECKED | | |
| POSITION 1 | _____ | CPS |
| POSITION 2 | _____ | CPS |
| POSITION 3 | _____ | CPS |
| POSITION 4 | _____ | CPS |
| 3. CHANNEL 1 OUTPUT CHECKED | _____ | OK |
| 4. FREQUENCY SHIFT CHECKED | _____ | OK |

E. FAX TEST

PLUS VDC

- | | | |
|----|-------|-----|
| 20 | _____ | CPS |
| 15 | _____ | CPS |
| 10 | _____ | CPS |
| 5 | _____ | CPS |
| 2 | _____ | CPS |
| 1 | _____ | CPS |
| 0 | _____ | CPS |

F. CW KEYING

- | | | |
|--|-------|-----|
| 1. L3 ALIGNED FOR 1000CPS AND 25VRMS AT PIN 1 OF V6. | _____ | OK |
| 2. FREQUENCY AT PIN 1 OF V6 WITH RELAY SHORTED | _____ | CPS |
| 3. TONE LEVEL IN UNKEYED STATE | _____ | DB |
| 4. WAVESHAPe AND VOLTAGE CHECKED AT 60ma | _____ | OK |

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5. WAVESHAPE AND VOLTAGE CHECKED AT 50V _____ OK

100V _____ OK

20ma _____ OK

G. FSK WAVESHAPE AND RESPONSE CHECKED _____ OK

H. AUDIO DISTORTION _____ DB

TESTER: _____

DATE: _____

