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FORWARD:

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 1997, Part 2 Subpart J, Paragraphs 2.905, 2.911, 2.913, 2.925, 2.926, 2.981 through 2.999, 2.1003, and Part 90 Subpart i, Paragraphs 90.201 through 90.215; the following is submitted:

List of Test Equipment

A Hewlett Packard 8591EM and or 8562A Spectrum Analyzer was used as the measuring device for the emissions testing. The analyzer settings used are described in the following table. Refer to Appendix for a complete list of Test Equipment.

HP SPECTRUM ANALYZER SETTINGS		
CONDUCTED EMISSIONS:		
RBW	AVG. BW	DETECTOR FUNCTION
9 kHz	30 kHz	Peak/Quasi Peak
RADIATED EMISSIONS (30 - 1000 MHz):		
RBW	AVG. BW	DETECTOR FUNCTION
120 kHz	300 kHz	Peak/Quasi Peak
RADIATED EMISSIONS (1 - 40 GHz):		
RBW	AVG. BW	DETECTOR FUNCTION
1 MHz	1 MHz	Peak/Average
ANTENNA CONDUCTED EMISSIONS:		
RBW	AVG. BW	DETECTOR FUNCTION
100 kHz	300 kHz	Peak

2.983 Application for Type Acceptance

a. Manufacturer: KUSTOM SIGNALS, INC.
9325 Pflumm
Lenexa, KS 66215-3347

b. Identification: Model: TALON
FCC I.D.: IVQ TAL

c. Plan to produce quantity production.

d. (1) Emission Type: NON (CW Doppler)

(2) Frequency Range: 35.5 GHz

(3) Operating Power Level: 15 Milliwatts C.W. No provision is made for variation of the operating power level.

(4) Max P_o: 18 Milliwatts.

(5) DC Voltages and Currents of PA Final:

The final amplifier runs at 0.41A @ 4.9V, 2.01 Watts.

(6) Function of Each Semiconductor Device in Transmitter:

Refer to attached circuit diagram and reference material.

(7) Circuit Diagrams:

Refer to attached circuit diagram and reference material.

(8) Instruction Book:

Refer to attached instruction manual attached.

(9) Tune Up Procedure for Output Power:

Refer to attached circuit diagram and reference material.

(10) Frequency Plan:

A Gunn Diode oscillator located in a waveguide cavity determines all frequency determination and stabilization. Mechanical adjustment is provided to set the Gunn oscillator on frequency.

(11) Spurious and Limiting Circuits:

The oscillator runs at final frequency of 35.5 GHz. The oscillator cavity is coupled to a duplexer, which feeds a horn antenna. The horn is covered with a one-half wavelength Plexiglas radome and has a gain of approximately 23 dB. The 3 dB horizontal beamwidth of the horn is approximately 12 degrees.

(12) Digital Modulation: N/A

e. Measurement Procedures:

Standard Engineering practices were used in collecting the test data.

Reference Material: ANSI 63.4 - 1992

f. Refer to Appendix for identification plate data.

g. Refer to Appendix for photographs of equipment.

2.985 RF Power Output

Measurements Required:

Measurements shall be made to establish the radio frequency power delivered by the transmitter into the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted below:

If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

Test Arrangement:

The radio frequency power output was determined by optimally coupling the horn antenna to the radar transmitter antenna. Then reading the power in dBm from the screen of the spectrum analyzer. The data was taken in dBm and converted to watts as shown in the following Table.

P_{dBm} = power in dB above 1 milliwatt.
Milliwatts = $10^{(PdBm/10)}$
Watts = (Milliwatts)(0.001)(W/mW)

Results:

FREQUENCY GHz	[illegible]	[illegible]	[illegible]
35.5	12.0	15.85	0.015

The specifications of Paragraph 2.985(a) and applicable Parts of 90 are met. There are no deviations to the specifications.

2.987 Modulation Characteristics

Measurements Required:

A curve or equivalent data, which shows that the equipment will meet the modulation requirements of the rules, under which the equipment is to be licensed shall be submitted.

Test Arrangement:

TRANSMITTER	—	SPECTRUM ANALYZER

Results:

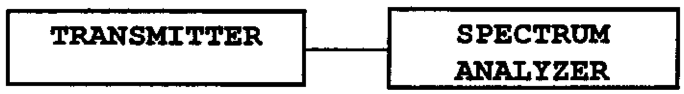
Not Applicable. This unit operates as a dopler shift radar and therefore does not have a modulator.

2.989 Occupied Bandwidth

Measurements Required:

The occupied bandwidth, that is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are equal to 0.5 percent of the total mean power radiated by a given emission.

Test Arrangement:



Results:

A Hewlett Packard Spectrum Analyzer was used to observe the radio frequency spectrum with the transmitter operating in a normal mode. Since the system is CW with no modulation, the occupied bandwidth is represented by the noise characteristics of the Gunn oscillator circuitry. The CW spectrum is shown in Figure 1. The occupied bandwidth of the unit was measured to be 5 kHz. Refer to figure 1 showing a plot of the 99.5% output power of the transmitter.

Requirements of 2.989 and applicable parts of Paragraph 90 are met . There are no deviations to the specifications.

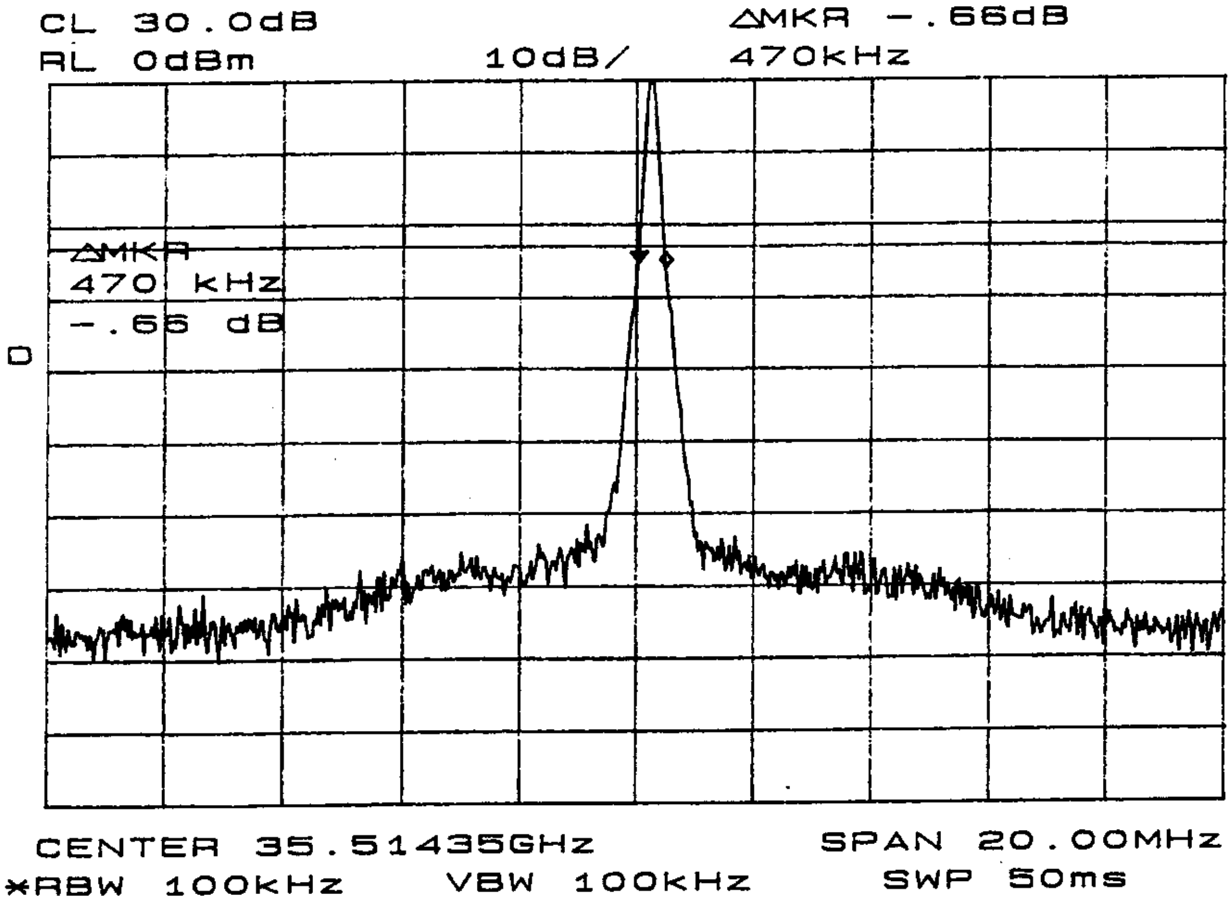


Figure 1: Occupied bandwidth.

2.991 Spurious Emissions at Antenna Terminals

Measurements Required:

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna.

Test Arrangement:

The radio frequency output was coupled to an HP 8562A Spectrum Analyzer. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operated in a normal mode. The frequency spectrum from 0 to 45 GHz was observed with a receiving antenna and mixer coupled to the transmitter at a 3-

meter distance. Data taken per 2.991 and applicable parts of Part 90.209.

Results:

Data taken per 2.991 and applicable parts of Part 90. Specifications of Paragraphs 2.991 and 2.997 are met. There are no deviations to the specifications.

[illegible]	[illegible]	[illegible]
None		

2.993 Field Strength of Spurious Radiation

Measurements Required:.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.

Test Arrangement:

The transmitter was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 3 meters from the FSM antenna. The transmitter was activated and the frequency spectrum of the fundamental was observed. The turntable was rotated though 360 degrees to locate the position registering the highest amplitude emission. The amplitude of the fundamental frequency was measured and recorded. The frequency spectrum was then searched for spurious emissions generated from the transmitter. Raising and lowering the FSM antenna maximized the amplitude of each spurious emission and rotating the turntable before data was recorded. A log periodic antenna was used for frequencies of 200 MHz to 5 GHz and pyramidal horn antennas were used for frequencies of 5 GHz to 45 GHz. Emission levels were measured and recorded from the spectrum analyzer in dBμV. This level was then added to the antenna factor less the amplifier gain to calculate the field strength at 3 meters. Data was taken at the ROGERS LABS, INC. 3 meters open area test site (OATS). A description of the test facility is on file with the FCC, Reference: 31040/SIT, 1300F2, dated February 6, 1998. The testing procedures used conform to the procedures stated in the ANSI 63.4-1992 document.

Calculations made are as follows:

CFS = Calculated Field Strength
FSM = Field Strength Measurement
CFS = FSM + Antenna Factor - Amplifier Gain
CFS =

The limit for emissions are defined by the following equations:

Limit = Amplitude of spurious emission must be attenuated by this amount below the level of the fundamental.

Calculating the field strength at 3 meters for the 15-watt transmitter was done as follows:

$E = \frac{5.5\sqrt{PG}}{d}$ where E is V/m, P is Watts, G = 1.64 and d is meters.

$E = \frac{5.5\sqrt{.015(1.64)}}{3}$ = 0.287 V/m = 287.5E3μV/m at 3 meters.

This was converted to dBμV/m using (20*log μV/m) for convenience.

20*Log(0.287E6) = 109.1 dBμV/m @ 3 meters

$$\begin{aligned} \text{Attenuation} &= 43 + 10\,\text{Log}_{10}(P_w) \\ &= 43 + 10\,\text{Log}_{10}(0.015) \\ &= 24.7\ \text{dB} \\ \text{Limit} &= 109.1 - 24.7 \\ &= 84.3 \end{aligned}$$

Results:

Frequency (MHz)	FSM Horz. (dBμV)	FSM Vert. (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	CFS Horz.@ 3m (dBμV/m)	CFS Vert. @ 3m (dBμV/m)	Limit
108.5	52.6	52.3	8.4	35	26.0	25.7	84.3
216.5	57.9	56.8	10.6	35	34.6	32.5	84.3
240.0	57.2	55.1	12.4	35	34.6	32.5	84.3
288.0	54.2	55.0	13.5	35	32.7	33.5	84.3
384.0	52.7	54.9	15.6	35	33.3	35.2	84.3

Specifications of Paragraph 2.993, 2.997 and 90.210 are met. There are no deviations to the specifications.

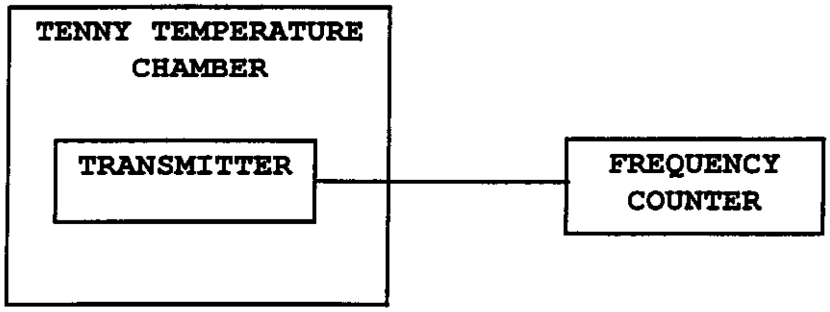
2.995 Frequency Stability

Measurements Required:

The frequency stability shall be measured with variations of ambient temperature from -30° to +50° centigrade. Measurements shall be made at the extremes of the temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. In addition to temperature stability the frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
(2) For hand carried, batteries powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.
(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

Test Arrangement:



The measurement procedure outlined below shall be followed:

Step 1: The transmitter synthesizer shall be installed in an environmental test chamber whose temperature is controllable. Provision shall be made to measure the frequency of the unit.
Step 2: With the transmitter inoperative (power switched "OFF"), the temperature of the test chamber shall be adjusted to +25°C. After a temperature stabilization period of one hour at +25°C, the transmitter shall be switched "ON" with standard test voltage applied.
Step 3: The carrier shall be keyed "ON", and the transmitter shall be operated unmodulated at full radio frequency power output at the duty cycle for which it is rated, for a duration of at least 5 minutes. The radio frequency carrier frequency shall be monitored and measurements shall be recorded.
Step 4: The test procedures outlined in Steps 2 and 3, shall be repeated after stabilizing the transmitter at the environmental temperatures specified, -30°C to 50°C in 10 degree increments.

The frequency stability was measured with variations in the power supply voltage from 85 to 115 percent of the nominal value and at the battery end point. An Sorensen DC Power Supply was used to vary the DC voltage for the power input from 10.8 Vdc to 15.0 Vdc. The frequency was measured and the variation in parts per million was calculated. Data was taken per Paragraphs 2.995 and 90.203.

Results:

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
35.5173	-8.4	-337	-346	-298	-191	0	5.6	183	239

[illegible]	[illegible]	[illegible]	[illegible]
35.5173	0	0	0

Specifications of Paragraphs 2.995 and Paragraph 90.203 are met. There are no deviations to the specifications.

APPENDIX

Model: TALON

1. Photos of Radiated Emissions Test Set Up.
2. Test Equipment List.
3. Rogers Qualifications
4. FCC Site Approval Letter
5. Instruction Manual.
6. Circuit Diagrams.
7. FCC Label.
8. Photographs of Equipment per 2.983(g)(4).

TEST EQUIPMENT LIST FOR ROGERS LABS, INC..

The equipment is used daily and kept in good calibration and operating condition. Calibration of critical items are checked for accuracy each time used.

List of Test Equipment:	Calibration Date:
Scope: Tektronix 2230	2/98
Wattmeter: Bird 43 with Load Bird 8085	2/98
Power Supplies: Sorensen SRL 20-25, DCR 150, DCR 140	2/98
H/V Power Supply: Fluke Model: 408B (SN:573)	2/98
RADIO FREQUENCY Generator: Boonton 102F	2/98
RADIO FREQUENCY Generator: HP 606A	2/98
RADIO FREQUENCY Generator: HP 8614A	2/98
RADIO FREQUENCY Generator: HP 8640B	2/98
Spectrum Analyzer: HP 8562A,	2/98
Mixers: 11517A, 11980A & 11980K	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591 EM	6/97
Frequency Counter: Weston 1255	2/98
Frequency Counter: Leader LDC 825	2/98
Antenna: EMCO Log Periodic	9/97
Antenna: BCD 235/BNC Antenna Research	9/97
Antenna: EMCO Dipole Set 3121C	2/98
Antenna: C.D. B-100	2/98
Antenna: Solar 9229-1 & 9230-1	2/98
Antenna: EMCO 6509	2/98
Microline Freq. Meter: Model 27B	2/98
Dana Modulation Meter: Model 9008	2/98
Audio Oscillator: H.P. 200CD	2/98
RADIO FREQUENCY Power Amp 65W Model: 470-A-1000	9/97
RADIO FREQUENCY Power Amp 50W M185- 10-500	9/97
RADIO FREQUENCY PreAmp CPPA-102	9/97
Shielded Room 5 M x 3 M x 2.5 M (100 dB Integrity)	
LISN 50 µHy/50 ohm/0.1 µf	9/97
LISN Compliance Eng. 240/20	2/98
SCS Power Amp Model: 2350A	2/98
Power Amp A.R. Model: 10W 1000M7	2/98
Linear Amp Mini Circuits: ZHL-1A (2 Units)	2/98
Combiner Unit Mini Circuits: ZSC-2-1 (2 Units)	2/98
ELGAR Model: 1751	2/98
ELGAR Model: TG 704A-3D	2/98
ELGAR Model: 400SD (PB)	2/98
ESD Test Set 2000i	10/95
Fast Transient Burst Generator Model: EFT/B-100	10/95
Current Probe: Singer CP-105	8/97
Current Probe: Solar 9108-1N	8/97
Field Intensity Meter: EFM-018	10/95

02/01/98

QUALIFICATIONS

of

SCOT D. ROGERS, ENGINEER

ROGERS LABS, INC.

Mr. Rogers has approximately 11 years experience in the field of electronics. Six years working in the automated controls industry and five years working with the design, development and testing of radio communications and electronic equipment.

POSITIONS HELD:

Systems Engineer:	A/C Controls Mfg. Co., Inc. 6 Years
Electrical Engineer:	Rogers Consulting Labs, Inc. 5 Years
Electrical Engineer:	Rogers Labs, Inc. Current

EDUCATIONAL BACKGROUND:

1) Bachelor of Science Degree in Electrical Engineering from Kansas State University.

2) Bachelor of Science Degree in Business Administration Kansas State University.

3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.

Scot D Rogers
Scot D. Rogers

Oct. 14, 98
Date

7/1/98

FEDERAL COMMUNICATIONS COMMISSION

7435 Oakland Mills Road
Columbia, MD 21046
Telephone: 301-725-1585 (ext-218)
Facsimile: 301-344-2050

February 6, 1998

IN REPLY REFER TO
31040/SIT
1300F2

Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053

Attention: Scot D. Rogers

Re: Measurement facility located at above address
(3 and 10 meter site)

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for certification or notification under Parts 15 or 18 of the Commission's Rules. Our list will also indicate that the facility complies with the radiated and AC line conducted test site criteria in ANSI C63.4-1992. Please note that this filing must be updated for any changes made to the facility, and at least every three years the data on file must be certified as current.

Per your request, the above mentioned facility has been also added to our list of those who perform these measurement services for the public on a fee basis. This list is updated monthly and is available on the Laboratory's Public Access Link (PAL) at 301-725-1072, and also on the Internet at the FCC Website www.fcc.gov/oet/info/database/testsite/.

Sincerely,

Thomas W. Phillips
Electronics Engineer
Customer Service Branch

EXHIBIT 2.983(d)(6)

KUSTOM SIGNALS, INC.

ACTIVE FUNCTION DEVICES

Talon RADAR

The following is a listing of the active IC devices for the Talon radar in the transmitter (Gunn oscillator) and Schottky receiver.

MFG. Part Number	Part Description	KSI p/n
Texas Instruments TLE2426CD	Rail Splitter	122-7007-00
Analog Devices SSM2275S	Rail to Rail Op Amp	122-7012-00
Analog Devices ADG419	Analog switch	122-7015-00
Micrel Semiconductor MIC29371-5.0BU	Fixed Low Voltage Dropout Voltage Regulator	122-7018-00
Micrel Semiconductor MIC29372BU	Variable Low Voltage Dropout Voltage Regulator	122-7019-00
Linear Technology	Low Noise Switching Voltage Regulator	122-7020-00

EXHIBIT 2.983(d)(7)

KUSTOM SIGNALS, INC.

K_A-BAND TALON

RADAR UNIT

CIRCUIT DIAGRAMS

and

Theory of Operation

The K_a-Band microwave antenna for the Kustom Signals, Inc., ***Talon*** police traffic radar system consists of a Ka-Band Gunn oscillator, Schottky medium barrier detector diode, transition waveguide assembly, two power supplies and a preamplifier.

The microwave Gunn transmitter oscillates in the 33.5 to 35.9 GHz, Ka spectrum. Each unit is factory set for frequency, with a tolerance of ±100 MHz. The Gunn oscillator's microwave energy is fed into the waveguide cavity where it is converted from a linear to a circular polarization pattern with a turnstile junction. This junction also provides isolation between the transmitted signal and the reflected received signal.

Due to the action of the turnstile, the transmitted waveform exits the waveguide through a lensed circular horn antenna. The 3 dB beamwidth is maintained at 12 degrees with the use of a Rexolite 14222 material lens. Part of the transmitted signal is reflected back to the turnstile and downward across the Schottky detector diode also mounted in the waveguide cavity. This small portion of the transmitted signal is used by the detector diode for the mixing frequency (homodyning).

When the transmitted signal strikes an object in its path, the signal is reflected back to the antenna. If the object is stationary, the returned signal is the same frequency as the transmitted signal and except for a DC voltage shift, no mixing frequency is developed. But if the object is moving toward or away from the transmitter, a Doppler frequency shift occurs and the returned signal's frequency will be changed by the speed of the object.

Mixing occurs at the detector diode. The "plus" mixing is choked out be an RF choke in the output cable lead and the "minus" mixing (frequency shift of approximately 104 Hz/mph) will pass through to the preamplifier.

The input signal from the waveguide is fed into the preamplifier through a "pi" RF choke. This will eliminate most high frequencies not needed by the radar unit. The maximum amplitude is limited by a series diodes D1, D2, then fed into a high gain amplifier U3. The output of this amplifier is fed to an active highpass filter U2A and U2B, where the output is sent to the Digital Signal Processing (DSP) board.

The Gunn oscillator, U6, is a low voltage dropout, adjustable IC voltage regulator. The output voltage is sensed and fed back into the regulator to maintain the set output voltage over varying load conditions. The output level is set by variable resistor R9. Capacitor c16, 10uF, smoothes any voltage spikes and controls ripple during the Gunn oscillator turn on and off times. Transistor Q2, an NPN switching transistor, is used to set the regulator in a "0" volt output, turning the Gunn oscillator off, without turning the voltage to the entire unit off. This is used by the operator to defeat radar detectors.

U4, a fixed, low voltage dropout, regulator is used for all amplifier voltages, VCC. The output of the regulator is aided by capacitor C17.