Class II Permissive Change Test Report

EUT Name: Transceiver

EUT Model: 6359N

FCC ID: KAV-6359

FCC Title 47, Part 90

Prepared for:

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Report/Issue Date: 19 April 2001
Report Number: 0912LAW

Statement of Compliance

Manufacturer:	Law Enforcement Association 100 Hunter Place Youngsville, NC 27596 919-554-4700
Requester / Applicant:	Jim Isaacs
Name of Equipment:	Transceiver Model No. 6359N
Type of Equipment:	Information Technology Equipment (ITE)
Class of Equipment:	Class B
Application of Regulations:	FCC Title 47, Part 90
Test Dates:	23 March, 2001 to 23 March, 2001

Guidance Documents:

FCC Title 47, Part 90

Test Methods:

TIA/EIA 603

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by Flextronics Compliance Laboratories, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

Michael Cantwell

19 April 2001

Michael Cantwell, PE, NCE
Operations Manager
NVLAP Signatory

Date

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Title 47, Part 90 based on the results of testing performed on *23 March*, 2001 through *23 March*, 2001 on the *Transceiver* Model No. *6359N* manufactured by Law Enforcement Association. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components.

1.2 Purpose

The EUT is an existing, previously approved, repeater, FCC ID: KAV-6359. The purpose of this testing is to reduce the allowed bandwidth from 25 kHz to 12.5 kHz. Law Enforcement Associates intends to continue manufacturing the existing wide-band model, but would like it to also be certified for the narrower band operation.

Testing performed includes the application of emission mask D and the measurement of Transient Frequency Behavior.

1.3 Class II Permissive Change

As a result of the testing detailed in this report, the grant for the 6359 repeater (FCC ID: KAV-6359) should be modified as follows:

1. Emission designator should read 16K0F3E/11K0F3E to authorize both, the 25 kHz and 12.5 kHz allowed bandwidth versions.

1.4 Product Changes

The following lists the manufacturers changes to the existing wide-band (25 kHz) model to convert it to a narrow-band (12.5 kHz) model:

1. The transmitter section requires no component changes. The wide-band version has the deviation adjusted for ±5 kHz maximum. The narrow-band version will be adjusted for ±2.5 kHz deviation.
2. The receiver section of the repeater will change FL4 (see attached schematic) from a Murata CFU455C2 to a Murata CFU455G2 (see attached Murata specifications sheet). R32 and R33 will also be changed from 1.5 k? to 2.0 k? to match the impedance of the new FL4 filter.
3. The modulation acceptance specification on the receiver portion of the repeater will be changed from ±7 kHz to ±3.5 kHz for the narrow-band version.

2 Equipment Under Test

Figure 1 - EUT showing underside of top cover

Figure 2 – Top Cover of EUT

3 Laboratory Information

3.1 Accreditations & Endorsements

3.1.1 US Federal Communications Commission

Flextronics Compliance Laboratories is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory has been fully described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

3.1.2 NIST / NVLAP

Flextronics Compliance Laboratories is accredited by the National Voluntary Laboratory Accreditation Program which is administered under the auspices of the National Institute of Standards and Technology.

The laboratory has been assessed and accredited in accordance with ISO Guide 25 and ISO 9002 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

3.1.3 TUV Rheinland of North America, Inc.

TUV Rheinland of North America, Inc. is a Nationally Recognized Testing Laboratory (NRTL). Flextronics Compliance Laboratories has been assessed and approved in accordance with EN 45001 and has been authorized to carry out EMC tests based on a Contract for the Co-Operation of TUV Rheinland of N.A., Inc with a Sub-Contracted EMC Laboratory.

3.1.4 NEMKO

NEMKO is a Nationally Recognized Testing Laboratory (NRTL). Flextronics Compliance Laboratories has been assessed and approved in accordance with EN 45001 and Nemko Document ELA 10 (Aut. No.: ELA 185).

3.1.5 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. Flextronics Compliance Laboratories has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174 and C-1236).

3.1.6 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all Flextronics Compliance Laboratories' test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

3.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

3.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The site is listed with the FCC and accredited by NVLAP (code 200094-0).

3.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The Flextronics Compliance Laboratories test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The conducted test system has a combined standard uncertainty of ? 1.2 dB. The radiated test system has a combined standard uncertainty of ? 1.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

3.4 Calibration Traceability

All measurement instrumentation are traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 25.

4 Transmitter Characteristics

Testing was performed in accordance with 47 CFR 15 and ANSI C63.4:1992. These test methods are listed under the laboratory's NVLAP Scope of Accreditation.

4.1 Emission Mask D – 12.5 kHz channel bandwidth equipment

4.1.1 Test Methodology

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f_o to 5.625 kHz removed from f_o: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but to more than 12.5 kHz: At least $7.27(f_d - 2.88$ kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least 50 + 10log (P) dB or 70 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two to three times the channel band-width) to capture the true peak emission of the equipment under test. In order to show compliance with the emissions mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of

the authorized bandwidth, see paragraph (m) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, then an alternate procedure may be used provided prior Commission approval is obtained.

4.1.2 Test Results

The emission mask has been applied to the transmitter output and is shown below:

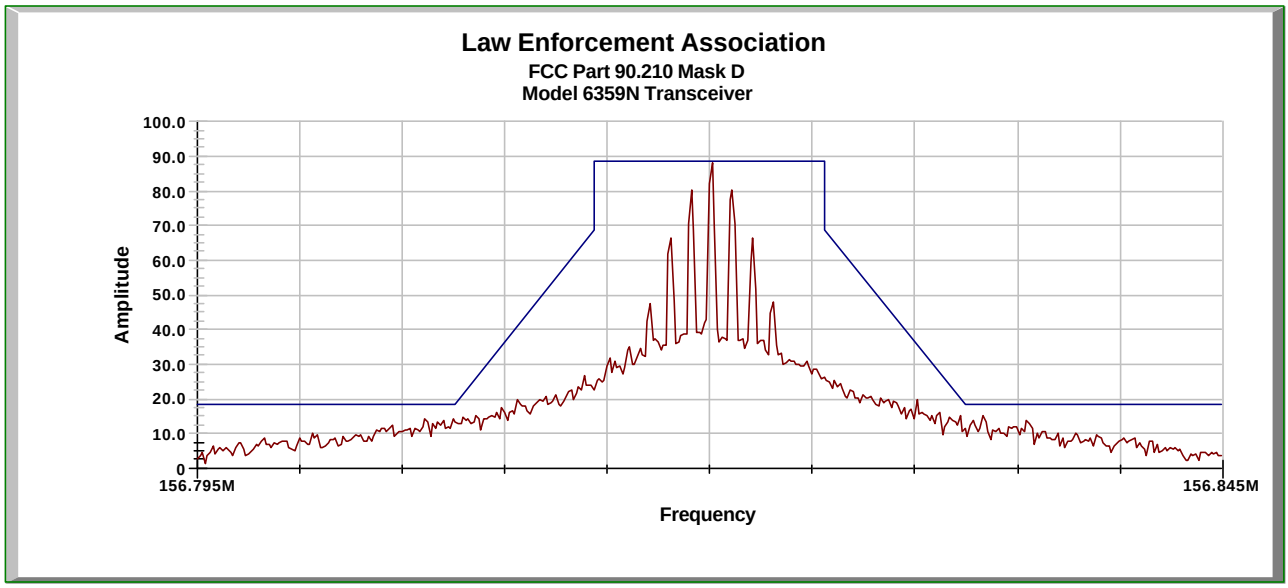


Figure 3 - Part 90.210(d) Emission Mask

4.1.3 Photos

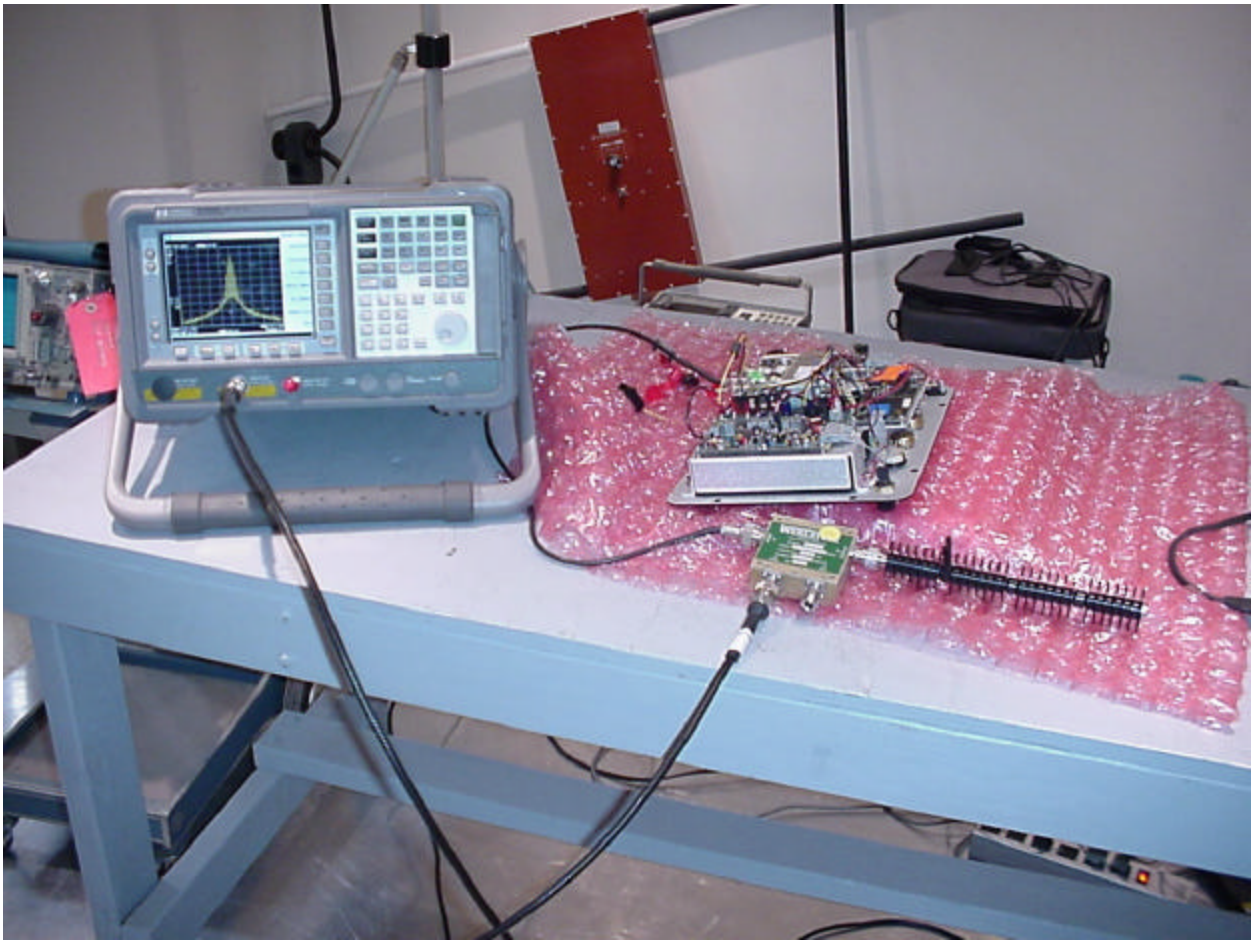


Figure 4 – Emissions Mask Test Setup

4.2 Transient Frequency Behavior

Testing was performed in accordance with 47 CFR 15.214 and EIA/TIA 603. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test is the measure of the difference, as a function of time, of the actual transmitter frequency to the assigned transmitter frequency when the transmitted RF output power is switched on or off.

4.2.1 Test Methodology

Connect the equipment as illustrated in the figure below.

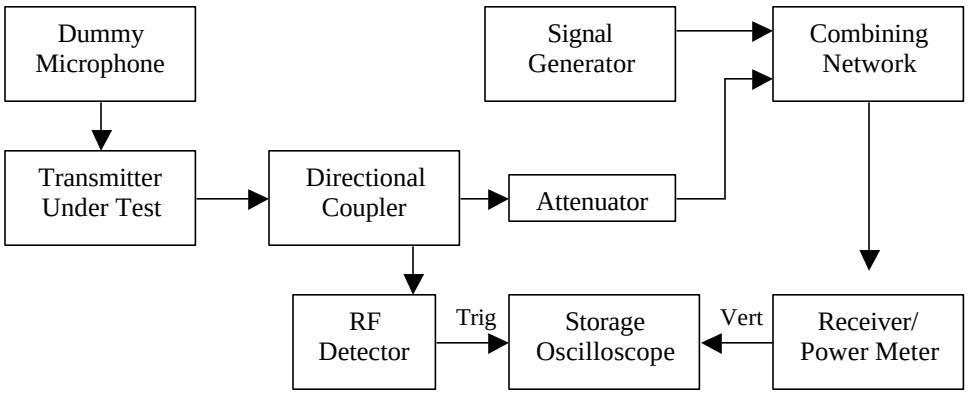


Figure 5 – Transient Frequency Behavior Set-Up Block Diagram

With the Receiver's audio output connected to the vertical channel on the storage oscilloscope, set the amplitude of the signal generator to –100 dBm and frequency modulate the output with a 1 kHz tone (± 25 kHz deviation). The attenuator should be sufficient to ensure that the level at the input to the receiver is approximately –40 dBm. Turn the transmitter on and measure the output level with the receiver. Turn the transmitter off.

Turn on the signal generator and set it's level to 20 dB below the measured level of the receiver and verify that the 1 kHz tone is visible on the oscilloscope display.

Turn on the transmitter and observe the stored display. The audio output of the receiver, due to the change in power between the signal generator and the transmitter will, because of the capture effect of the receiver, produce a change in the display. The display will initially show the 1 kHz test signal, which, once the receiver's demodulator has been captured by the transmitter power, will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the 1 kHz test signal is completely suppressed is t_{on}.

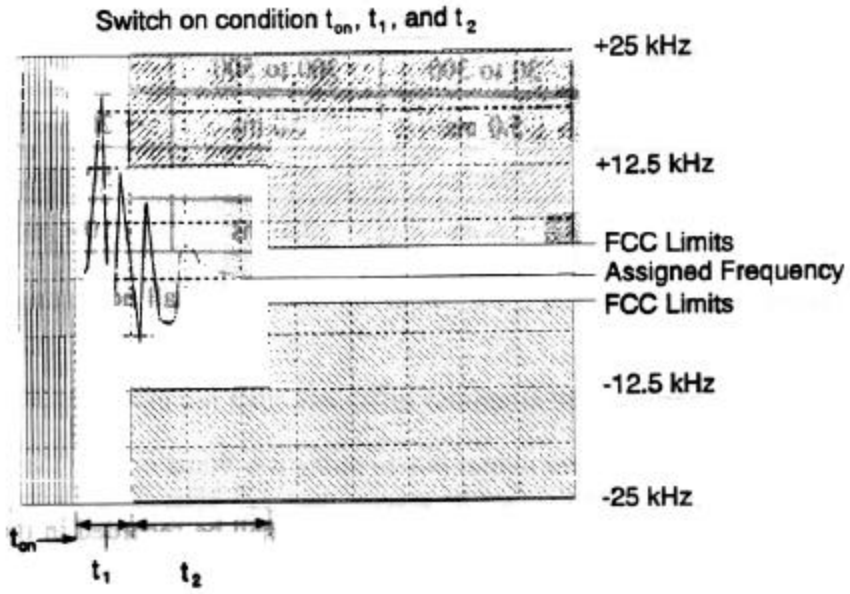


Figure 6 - Transient Frequency Behavior Expected Oscilloscope Display

4.2.2 Test Results

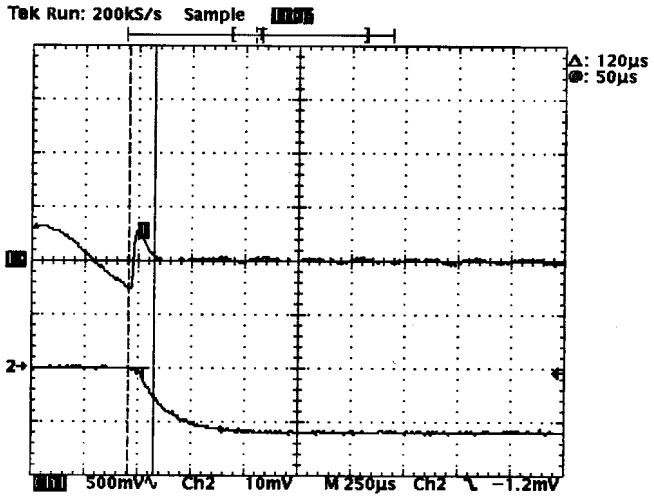


Figure 7 - Transient Frequency Behavior Plot

Per 47 CFR 90.214, t_1 must be less than 5 msec, and the test results show t_1 at approximately 0.12 msec, with t_2 being immeasurable. It was deemed unnecessary to measure t_3.

4.2.3 Photos

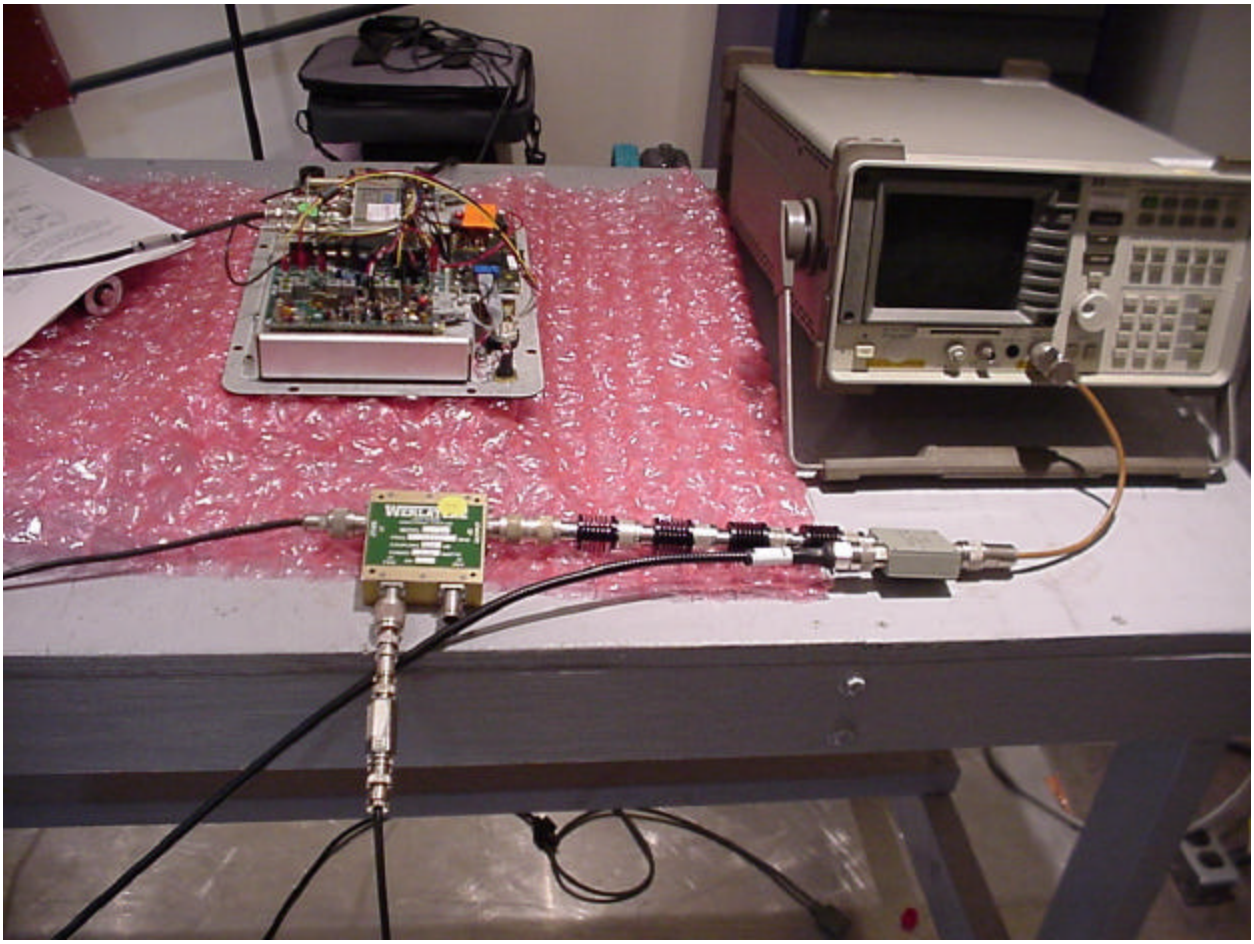


Figure 8 – Transient Frequency Behavior Test Setup

5 Environmental Assessment

The following sections of 47 CFR were reviewed to determine compliance with the RF safety requirement of Section 90.129(g):

?? Section 1.1307(b)(1): The EUT does not fall under any of the categories listed in Table 1, *Transmitters, Facilities And Operations Subject to Routine Environmental Evaluation*.

?? Section 1.1307(b)(2): The EUT is not subject to authorization under Subpart H of Parts 22, 24, 25, 26, 27, 80, and is not subject under Unlicensed PCS, unlicensed NII or Millimeter Wave Devices. The EUT is also not considered to be a Private Land Mobile Radio Service Specialized Radio Service operating in the 800 MHz to 900 MHz bands.

?? Section 1.1307(c): No interested person has alleged that the EUT may have a significant environmental effect.

?? Section 1.1307(d): N/A.

Therefore, the EUT is categorically excluded from routine environmental evaluation for RF exposure under Section 2.1091 and 2.1093 of the Rules.

6 Test Equipment Use List

	Equipment	Manufacturer	Model #	Serial/Inst. #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
SOP 1 - Radiated Emissions (Electric and Magnetic Field)						
	Cable, Coax	Belden	RG-213	005	08 Feb 01	08 Feb 02
	Cable, Coax	Belden	9273 M17	006	08 Feb 01	08 Feb 02
	Spectrum Analyzer	Agilent Tech.	E7405A	US39440157	20 Dec 00	20 Dec 01
	Spectrum Analyzer	Agilent Tech.	E7405A	US39440161	26 Dec 00	26 Dec 01
	Spectrum Analyzer, QP	Hewlett Packard	8591A	3009A01066	21 Aug 00	21 Aug 01
	Digital Oscilloscope	Tektronix	TDS320	B030514	07 Feb 00	07 Feb 01
	100 Watt Dummy Load					
	Directional Coupler					
	Signal Generator	Rohde & Schwarz	SMY-01	837396/013	06 Nov 00	06 Nov 01
	10 db atten					
	20 db atten					
General Laboratory Equipment						
	Meter, Multi	Fluke	79-3	69200606	21 Aug 00	21 Aug 01
	Meter, Temp/Humid/Barom	Fisher	02-400	01	22 Aug 00	22 Aug 01
	Meter, Temp/Humidity	Dickson Company	TH550	6215304	19 Apr 00	19 Apr 01
	Oscilloscope	Tektronix	475	B272866	CNR Condition III	Not for Data

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

7 Attachments

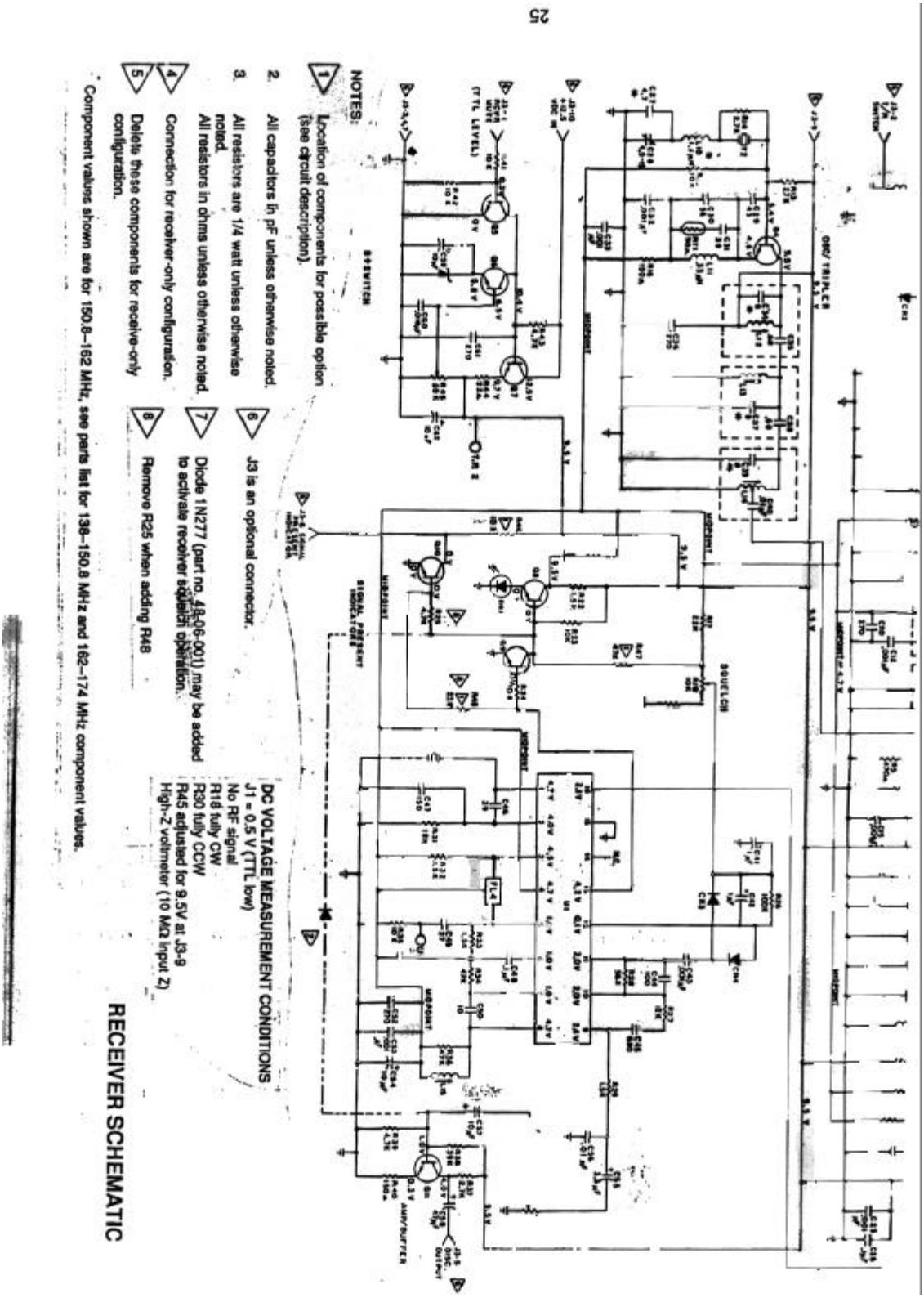
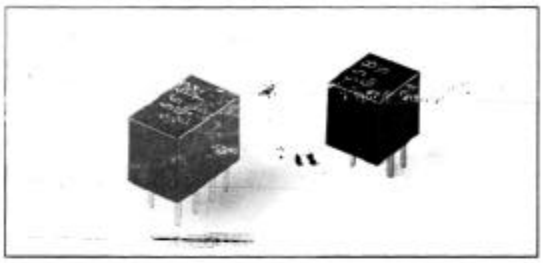


Figure 9 – Schematic

MULTI-ELEMENT, RESIN MOLDED, HIGHLY SELECTIVE CERAMIC FILTERS

CFU/CFW 455 KHz



The CFU 455 line of ceramic filters are 4-element devices connected in ladder form while the CFW 455 line of ceramic filters contain 6-elements. These compact, highly selective filters are recommended for use in applications ranging from two-way radio to auxiliary filters in high class transceivers.

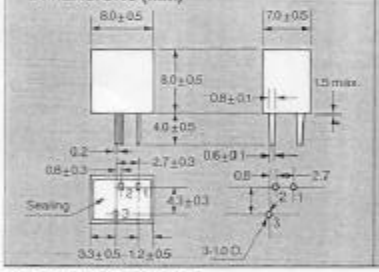
(OLD) WIDE BAND

(NEW) NARROW BAND

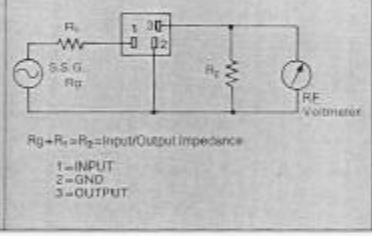
SPECIFICATIONS — CFU 455 KHz

Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	40dB Bandwidth (KHz) max.	Attenuation 455±100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFU455B2	455±2	±15	±30	27	4	1500
CFU455C2	455±2	±12.5	±24	27	4	1500
CFU455D2	455±1.5	±10	±20	27	4	1500
CFU455E2	455±1.5	±7.5	±15	27	6	1500
CFU455F2	455±1.5	±6	±12.5	27	6	2000
CFU455G2	455±1	±4.5	±10	25	6	2000
CFU455H2	455±1	±3	±9	25	6	2000
CFU455I2	455±1	±2	±7.5	25	6	2000
CFU455HT	455±1	±3	±9	35	6	2000
CFU455IT	455±1	±2	±7.5	35	6	2000

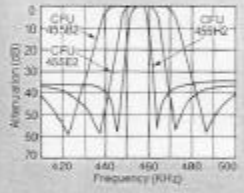
DIMENSIONS (mm)



CIRCUIT



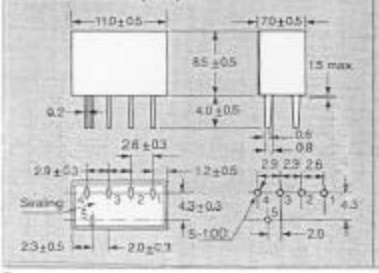
CHARACTERISTICS



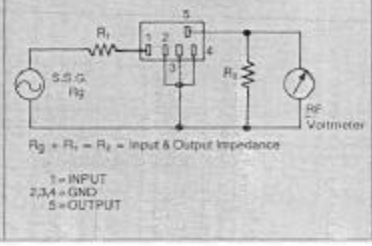
SPECIFICATIONS — CFW 455 KHz

Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	50dB Bandwidth (KHz) max.	Attenuation 455±100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFW455B	455	±15	±30	35	4	1500
CFW455C	455	±12.5	±24	35	4	1500
CFW455D	455	±10	±20	35	4	1500
CFW455E	455	±7.5	±15	35	6	1500
CFW455F	455	±6	±12.5	35	6	2000
CFW455G	455	±4.5	±10	35	6	2000
CFW455H	455	±3	±9	35	6	2000
CFW455I	455	±2	±7.5	35	7	2000
CFW455HT	455	±3	±9	60	6	2000
CFW455IT	455	±2	±7.5	60	7	2000

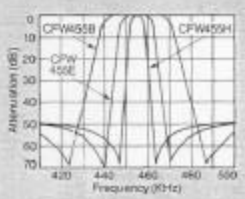
DIMENSIONS (mm)



CIRCUIT



CHARACTERISTICS



B

Figure 10 – Murata Specification Sheet