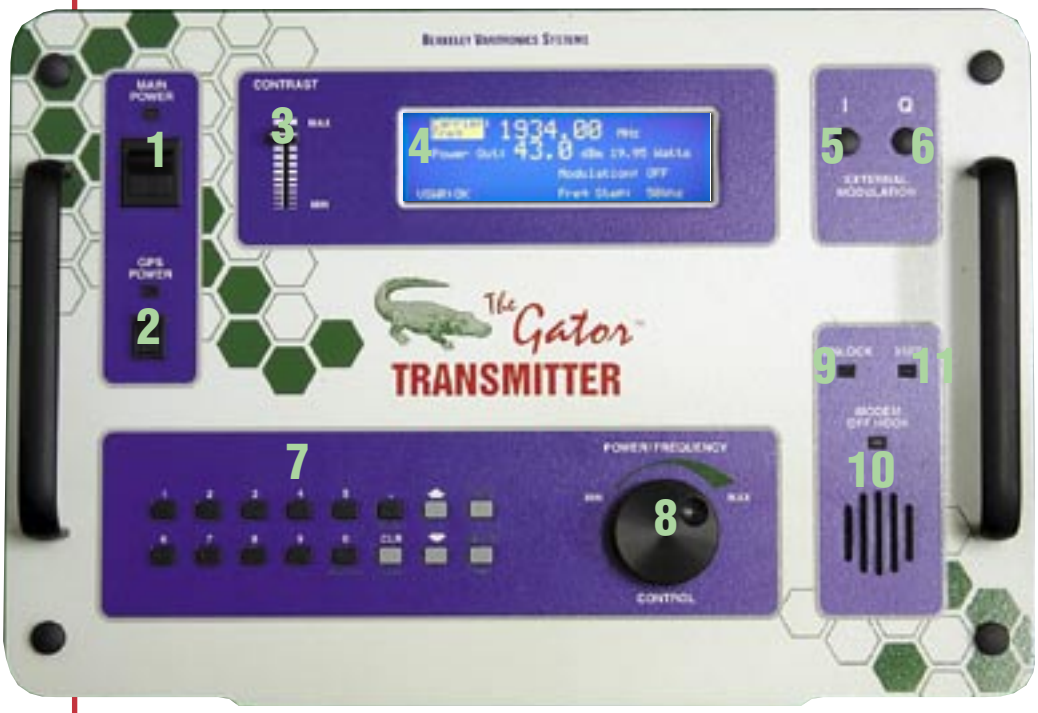
Gator

manual version 3.0

CONTENTS

This manual covers features available in all Gator frequencies and models including modulation.



GATOR Transmitter Front Panel

1 Main power ON/OFF switch and indicator light (yellow)

2 GPS receiver ON/OFF switch and indicator light (green)

3 DISPLAY CONTRAST lever control for liquid crystal display

4 LCD shows screens for display of frequency, RF output power, and operating status

5 I - BNC connector for external modulation

6 Q -BNC connector for external modulation

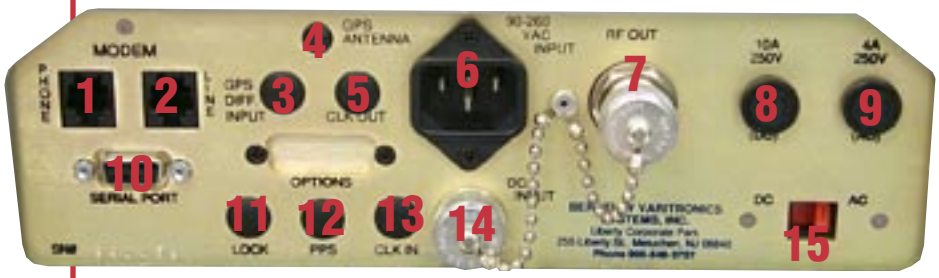
7 Multifunction Keypad for controlling transmitter operation

8 POWER / FREQUENCY CONTROL for adjusting RF power and frequency

9 'UNLOCK' light (red) indicates synthesizer is unlocked

10 'MODEM OFF HOOK' indicator light (yellow)

11 'XMIT' light (green) indicates transmitter is 'ON'



former Gator model

GATOR Rear Panel Connections

1 Phone handset Line In (RJ-11)

2 Modem Line In (RJ-11)

3 GPS Differential Input

4 GPS Antenna

5 Clock Out

6 90-260 VAC Input (use included cable)

7 RF Out

8 15A DC Fuse

9 4A AC Fuse (former Gator models only)

10 Serial Port for communication with PC (DB-9)

11 Lock

12 PPS

13 Clock In

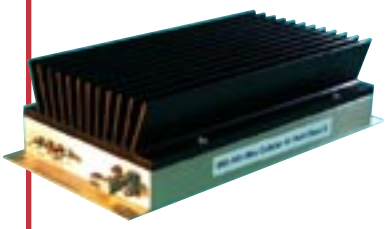
14 12 VDC Male Input (PCS model) or 24 VDC Male Input (Cellular model)

15 AC/DC Switch

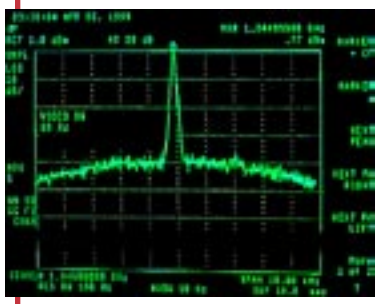
GATOR's integrated cooling system is an extremely efficient dual-fanned vent system. However, this system can only work well if both intake and outtake fans are free of obstructions and maintain steady airflow within the transmitter!

TRANSMITTER INTRODUCTION

The Berkeley Varitronics Systems GATOR™ Transmitter is a stable synthesized signal source which can be used for measuring PCS, Cellular, GSM, iDEN/SMR and LMR band signal propagation, antenna position evaluation, or for validating network area coverage. The transmitter covers 860 to 900 MHz in the Cellular band, 1.85 to 2.10 GHz in the PCS band, 850 to 870 MHz in LMR and 900 to 930 in Paging. Other newly emerging custom frequencies are also available from stock such as GSM and IS-136. All GATOR's integrate Class A amplifiers and are FCC type accepted and CE approved.



The Class A, RF amplifier is internally protected against overheating and high VSWR. When the antenna mismatch is less than 3:1, but greater than 1.1: 1, the GATOR will compensate by increasing RF power output accordingly. When the VSWR is greater than 3:1, the amplifier will shut down automatically and the front panel display will indicate 'BAD MATCH.'



TRANSMITTER INSTALLATION

Familiarize yourself with the PCS Transmitter front panel controls and connectors and the rear panel connectors. See GATOR Transmitter Front Panel and GATOR Transmitter Rear Panel Connections. Remember that this manual does not illustrate all possible frequency and amplifier combinations in its examples but all function description and controls do apply to all GATOR transmitters by BVS.

A 50 ohm antenna system, designed for the intended frequency band of operation, should be connected to the N-type RF output connector. The transmitter will not operate properly without an appropriate antenna system. If remote control of the transmitter is to be used, connect a telephone line and telephone set. Be sure to use the supplied AC power cord for connection to an outlet. Always use some sort of weather resistant protection for the unit such as the BVS Raincoat or other waterproof material. Remember that extreme heat can adversely affect your GATOR's output power so check that all air inlet and outlet vents are free from obstructions. Also be sure to avoid long exposure in direct sun, especially when the cover up leaving the metal top panel exposed. This panel can absorb a great deal of heat so it is recommended that the cover on the case be closed and locked securely, even while transmiting.

TRANSMITTER OPERATION

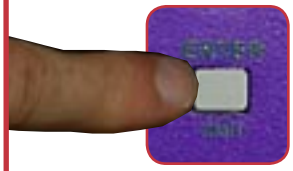
After the transmitter has been properly installed, turn on the power, using the main power switch. The display will momentarily show the power-up screen. Use the CONTRAST lever to adjust the LCD display for optimum viewing conditions for your viewing angle of the screen. This startup screen will disappear after a few seconds and the Main Screen will appear. Remember

that the screens displayed are some examples of existing BVS transmitters in the **GATOR** series and do not necessarily match all custom frequencies that Berkeley sells.

The Main Menu displays Carrier Frequency, Power Output, Modulation Status, Frequency Steps and VSWR Status. Use the **UP / DOWN ARROW** Keys to toggle through the selections. You may enter the Setup Menu at any time from the Main Menu by pressing the ESC key.

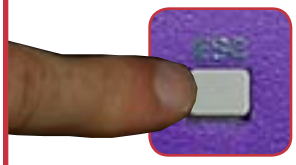
The selected mode of control will be highlighted on the screen. Use the **POWER / FREQUENCY CONTROL** knob to select the increment desired for frequency control. The following increments will appear in succession on the screen as the knob is rotated: 50 kHz, 100 kHz, 200 kHz, 500 kHz, 1 MHz, 5 MHz, 10 MHz, and 50 MHz (depending upon which frequency the **GATOR** operates under). This step may be omitted if the current value shown in Frequency Step is acceptable.

Next, select the desired frequency of operation. First, using the Up / Down Arrow keys, select Carrier Freq, which will be highlighted on the screen. Adjust the **POWER / FREQUENCY CONTROL** knob clockwise or counter clockwise to increase or decrease frequency in increments which are displayed next to Freq Step. The transmitter operating frequency will be displayed next to Carrier Freq. The frequency may also be selected using the keypad. Use the number keys and press **ENTER**.

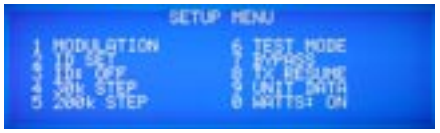


While the Setup Menu screen is displayed, press **1 / MOD ON** key for the **MODULATION** type menu. Select options by pressing the corresponding

Now adjust the transmitter output power. Using the Up / Down Arrow keys, select Power Out, which will be highlighted on the screen. Then adjust the **POWER / FREQUENCY CONTROL** knob to the power level desired. The RF power output level will be displayed on the screen next to Power Out, in increments of .5 dBm from +20 dBm to +43 dBm (+46 dBm is available depending on model). The **UP / DOWN ARROW** keys are used for fine power adjustment of 0.1 dB per key press.Press **ESC** at any time when in the Main Menu to enter the Setup Menu. Pressing the **ESC** key again will exit the Setup Menu and return back to the Main Menu.



LMR Model Setup Screen Shown



Cellular Model Setup Screen

PCS Model Setup Screen

GATOR SETUP MENUS

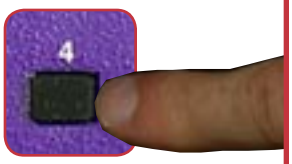
The **GATOR** contains **SETUP MENU** options **0** through **9**. Some of these selections are simply toggles (ON and OFF) while others point to SETUP submenus. Selections **4,5** and **6** can only be accessed by BVS labs in order to maintain unit calibration and functionality unless you have a PCS or Cellular frequency model Gator. See Note.

Note: Keypad buttons 4 and 5 select 30 or 200 kHz frequency steps in **Cellular** Gator models only. Buttons 4, 5 or 6 select between 30 , 50 or 200 kHz frequency steps in **PCS** Gator.

key shown on the screen. There will be 4 available choices:

1 CW - Unmodulated CW signal (cannot turn on modulation from the main screen)

2 External - Will modulate with user-supplied filtered I and Q data from an external source. This is via BNC connectors located on top.

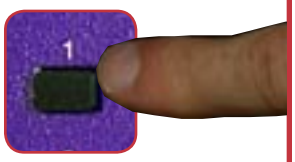


3 GSM - GSM modulation with randomly generated data.

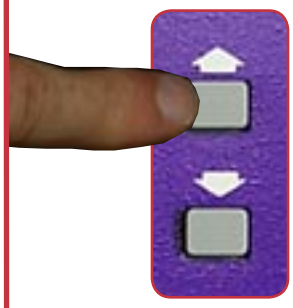
4 IS-136 - Will generate IS-136 modulation.
note: the options **GSM** and **IS-136** are not supported in the same unit at the same time. If the user is transmitting **GSM** they will have the follow-ign two options:
GSM RND - Outputs GSM modulation with internally-generated and random PN (pseudo-random) data.

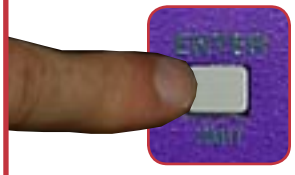
GSM BUFF - GSM modulation with user-downloaded BCCH (base station control channel) stored data, downloaded by the user with PC loader software.

see pages 19-25 for modulation software loader procedures



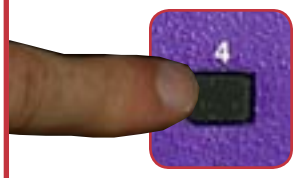
The modulation can be turned on by highlighting 'Modulation' on the main screen and pressing **1 / MOD ON**. The screen will then change to, 'Modulation: ON' indicating that the modulation is now on. To turn the modulation off, Highlight 'Modulation' on the main screen and press **0 / MOD OFF**. The screen will change to 'Modulation: OFF' indicating that the modulation is now off. To exit press the **ESC** key.





While the Setup Menu screen is displayed, press **2** for **ID SET**. This menu is for any FCC licensed user to enter their appropriate code. Licensed users will recognize the code shown as inaccurate as U.S. identifiers are generally longer and begin with a 'W'. The letter 'A' will be displayed as a prompt. Use the **UP / DOWN ARROW** keys to scroll through the alphanumeric characters until the first character of the call sign is displayed on the screen. Press the **ENTER / XMIT** key. The letter 'A' will appear in the second position. Repeat the process of selecting characters and pressing the **ENTER / XMIT** key until all the letters of the call sign have been successfully entered. If a mistake is made, pressing the **CLR / RECALL** key will move back one character at a time. When the call sign displayed is correct, press the **ESC** key, The SETUP MENU screen will appear.

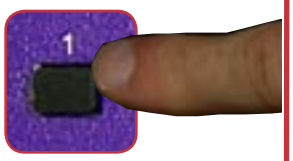
While the Setup Menu is displayed, pressing 3 will toggle ID ON or OFF. There is no submenu for this option. Be sure to choose Setup Menu option 2 before turning the ID on and transmitting. BVS has left this menu selection as optional feature for users who have been approved and hold an FCC license to transmit.

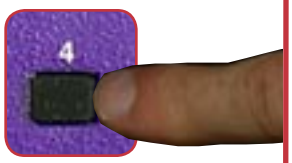


While the Setup Menu screen is displayed, press 4 for CAL OUTPUT. The CAL OUTPUT screen will be displayed. RF output calibration is normally done at the factory so this menu can only be accessed and displayed but not edited. To exit and return to the Setup Menu, press the ESC key.

While the Setup Menu screen is displayed, press 5 for CAL VSWR. The CAL VSWR screen will be displayed. VSWR calibration and power output calibration are both calibrated at the BVS and should not be altered unless otherwise instructed by BVS technical staff. VSWR calibration is normally done at the factory so this menu can only be accessed and displayed but not edited.. To exit and return to the Setup Menu, press the ESC key.

When in the Setup Menu, press the 6 key to display the TEST MODE screen. TEST MODE can only be enabled by BVS. This screen is intended only for BVS staff in the calibration process of the GATOR Transmitter and should not be accessed by the end user. TEST MODE menu selection can only be accessed and displayed but not run by the user.

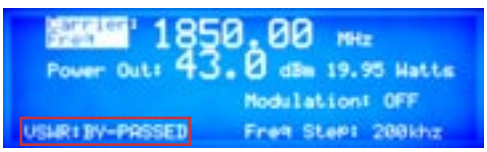


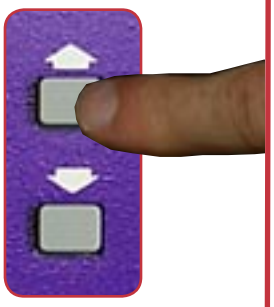


While in the Setup Menu, press 7 to enter the BYPASS menu. In this menu, the user can override the auto settings that come standard from the factory. The user has the option to turn off auto power output, auto VSWR protection or both in this menu. It is recommended that these auto levels normally remain activated except under special conditions (i.e. VSWR protection should be bypassed when transmitting in the vicinity of other high power base stations.) Bypass modes 2 and 3 allow output power to be adjusted using the control knob and the up/down arrow keys. These modes are intended to be used in conjunction with an external watt meter. When 2 or 3 are selected, the internal GATOR watt meter is bypassed. In addition, the internal VSWR check is also bypassed in mode 2. Mode 2 and 4 should only be used when GATOR is located near sources of high power RF.

When Bypass modes 2 or 3 are first selected, the initial power output when the transmitter is turned on is the last level that has been used before modes 2 or 3 were selected. At this point, the control knob is used for course power adjustment (about .5 dB per step of the knob). The UP / DOWN ARROW keys are used for fine power adjustment of .1 dB.

With Bypass modes 2 or 3 selected, there is no power indicated on the GATOR display (since the internal watt meter is bypassed). An external watt meter must be used to set the GATOR output power. Either of these selections will be indicated on the bottom left corner of the Main Menu. In bypass mode 3, bad antenna matches are reported as usual and the transmitter is shut off. When in these modes, the display indicates:



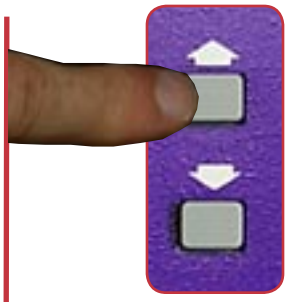


Power Out: Adjustable, Ext. Wattmeter

Once an output power has been set using the external wattmeter, this level can be tracked by pressing the **SAVE** key. The display will change to:

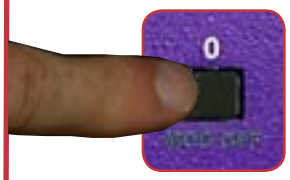
Power Out: Tracking, Ext. Wattmeter

In this mode, the output level set using the knob and arrow keys is tracked and held by the **GATOR**. In this mode, turning the knob has no effect. All keys but the **CLEAR** key will unlock the knob and the **UP / DOWN ARROW** keys and return to the adjustable power out mode. Remember that Power Out must be highlighted in order to adjust the output power with either the knob or the arrow keys.

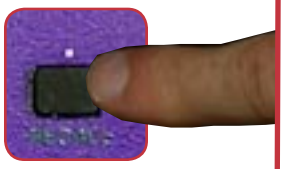


While in the Setup Menu, press **8** to enter the **TX RESUME** selection. In the TX Power-On Restore menu, select ON using the **UP / DOWN ARROW** keys and the transmitter will sound and display a 10 second warning as soon as power is restored. This can be helpful in warning the user or any nearby operators that the transmitter will resume RF transmission on its own. If the **GATOR** is turned off while transmitting, the power setting is saved and restored when **GATOR** is turned back on if the **TX RESUME** mode is on.This function should be set to ON when using an unstable power source or limited power sources such as a diesel or gas generators. Press any key to stop the warning message in progress.

While in the Setup Menu, press 9 to enter the UNIT DATA display. This menu option simply displays all of the current GATOR's parameters including Boot ROM version, Firmware version, frequency range, power range, serial number and last calibration date performed at Berkeley labs. This screen cannot be edited by the user. To exit and return to the Setup Menu, press the ESC key.



While in the Setup Menu, press 0 to toggle the WATTS display on and off. When the WATTS display is off, the power output is displayed in dBm only. When WATTS is on, the GATOR displays its power output in both dBm and Watts. Notice this PCS unit's maximum power of 43 dBm is equivalent to 19.95 Watts.



The GATOR Transmitter provides the ability to store and recall frequently used settings. These settings include frequency, power level, modulation type and modulation status (ON / OFF).To save a setup, set the desired frequency, power level and modulation type. The modulation can also be turned on or off. (The save feature will remember this also.) Go to the

main screen and hit the **CLR / SAVE** key, making sure there is not an edit (inverted numbers) field currently displayed.
To recall a saved setup, make sure you are in the main screen and there are no edit fields (inverted numbers) currently displayed. Press the **. / RECALL** key and the RECALL screen will be displayed. Your screen may be different based on the model of transmitter you have. This screen shows custom SMR frequency and power settings that are already saved in memory. To save your settings, press the number corresponding to the line you want to replace. The transmitter will then return to the main screen and your settings will have been saved. If you get to the save screen and decide that you don't want to save the settings, press the **ESC** key to abort.

While the main screen is shown, use the **ENTER/XMIT** key at any time to toggle the transmitter power output on and off. The green XMIT light should be lit, indicating that the transmitter output power is on. In addition, the screen should also read VSWR: OK. If the antenna system VSWR is excessively high, the screen will read 'VSWR: BAD MATCH'. This indicates VSWR > 6: 1. The transmitter has protection circuitry which will prevent damage to the final output amplifier, by turning it off. If the VSWR is less than 3:1, but greater than 1.1:1, the transmitter will compensate by increasing the power output, provided the auto RF output level control is turned on.

Note: If the antenna system has an excessively high VSWR, the condition must be corrected before the transmitter will operate!

GATOR Remote Control

The remote software allows control of a transmitter via a data modem or RS-232 serial cable. With this software, you can set power output level, frequency of transmission, activate or deactivate modulation, and turn transmission on and off. You can also observe the status of the Transmitter at any time, if it is transmitting or not.

The GATOR Transmitter may be controlled by a remote telephone. The transmitter must be connected to a telephone line as shown in GATOR Transmitter Rear Panel Connections. The transmitter's main power must be on and the carrier frequency must be set.

To change the GATOR Transmitter's power output level and RF output on-off status using a remote telephone do the following:

1) Dial the telephone number that the transmitter is connected to.

2) Wait for the transmitter to answer. The transmitter answers with three beeps.

3) Within five seconds, press the # key to access the transmitter's DTMF answer mode.

4) After successfully accessing the transmitter's answer mode, use the following telephone keys to control the transmitter functions shown:

Key	Function
1	turns transmitter output on
0	turns transmitter output off
3	increases transmitter's RF output power level
9	decreases transmitter's RF output power level

The transmitter will respond with three beeps after successfully receiving and executing a command. The transmitter will not respond to an invalid command such as pressing the 2 key on the telephone keypad. During such time, the power level will not increase with the amplifier ON. The power level may be decreased by the user but neither are recommended until the amplifier is OFF.

When the MODEM OFF HOOK light (yellow) is illuminated, the GATOR's internal modem has made connection to its control source and may be controlled remotely.

When the UNLOCK light (red) is illuminated, the GATOR's internal synthesizer has been damaged and unlocked requiring service. See back cover for complete warranty policy.

Phone Number - This option brings up a dialog box which allows the user to set the phone number to dial. To change the number, click on the box with the phone number in it (there should always be a number there). Change the number to the one you want. Then, to accept this number, click OK. To throw away the changes, click cancel. When you click OK, the phone number is saved to a setting file, so you only have to change number when it is different.

Communications - This selection brings up a dialog box for the com port and type of connection you plan to use with the transmitter. When the dialog box is first entered the currently selected Com Port will be highlighted. To change this port, just click another port in the list (the list will only show available ports).

The connection box selects the type of connection. This is either modem or direct connect via a serial cable.

To select these changes click the OK button. They will be saved to a setting file.

Phone - Dial - Hangup - The status of call progress is reported by these messages.

Control - Transmit ON/OFF - These functions control transmission. If the transmitter is not transmitting, a menu option will read: TRANSMIT ON; so you can commence transmission by selecting this to start transmitting.

If the transmitter is transmitting, the menu will say TRANSMIT OFF. Choose this option box by clicking on it to stop transmitting. Please note, these menu items will be disabled if there is no connection to the transmitter.

Transmitter ON/OFF can also be controlled by the Xmit button in the upper right hand corner of the screen window.

A circle next to the Xmit button indicates if the transmitter is transmitting or not. If the circle is empty, the instrument is not transmitting. If the circle is green, the transmitter is transmitting.

Modulation ON/OFF - controls optional modulation. Turns it on or off, and works similar to transmit ON/OFF

Set Carrier Frequency or Power Level- Brings up a dialog box to set the power level and operating frequency.

These parameters may also be changed by double clicking next to either the frequency or power level window box.

Help - Provides supplemental information on transmitter operation.--- Displays a dialog box giving product information.

To Install - Under the Program Manager File Menu, choose RUN, then Type A:\setup and click OK. The setup program will step you through the software installation procedure.

GATOR UPGRADE PATHS (v2.2)

To determine version numbers of Gator, use setup option 9 (UNIT DATA). Both Boot ROM and FIRMWARE version is displayed. If the Gator does not have the UNIT DATA option, assume upgrade option 2 or 3.

1) If unit has flash and is version 2.1 or 3.1 (PCS), upgrade requires:
   a) Download new code
   b) Calibration
   c) Reset chip installed (if not already)

2) If unit has flash and is verison 2.0 or 3.0 (PCS), upgrade requires:
   a) New Boot ROM (if current is V1.0)
   b) Download new code
   c) Calibration
   d) Reset chip installed (if not already)

3) If unit is ROM based (any version), upgrade requires:
   a) New V2.2 ROM
   b) Calibration
   c) Reset chip installed (if not already)

CALIBRATION TIMES (GATOR V2.4)

Unit	# Frequencies Calibrated	Total Calibration Time (Minutes)
1850-2100	25	100
1930-1990	13	55
1805-1880	11	45
2300-2360	3	15
851.0125-865.9875	10	40
849.190-850.990	1	5
850.02-900.00	10	40
869.04-893.97	10	40
930-960	1	5
935-940	1	5
868-894	10	40
800-900	10	40

TROUBLESHOOTING

GATOR operation is basically trouble-free. However, when powering the Gator using a portbale generator, certain Honda models output a noisy AC sine wave. These generators will operate other appliances fine but the GATOR requires clean AC input. Without a clean power source, the GATOR will not even power up. This problem is FIXABLE. Simply use an inexpensive AC surge suppressor which can be purchased at any hardware or convienence store. This will filter the power input allowing full operation of the GATOR. Please email our technical team at info@bvsystems.com with the make and model number on any generator that hinders the GATOR's performance. Be sure to include the serial number of the GATOR as well.

BVS GATOR Controller (v2.50) Application Software

Introduction

The GATOR Controller application soffivare is the Windows® 95/98/ME interface that enables a user of the GATOR Transmitter to control the unit for desired performance.

Certain operations such as modification of frequency and transmit power can be accomplished from a remote location by using the GATOR Controller sofware.

The following sections outline the operation of the GATOR Controller in greater detail.

Application Overview

The GATOR Controller application munics the display panel for the GATOR, With the exception of the VSWR status. The status is reported once a second troin the GATOR and updated on the PC display. Different commands can be sent to the GATOR from the software to control certain parameters of the transmitter.

The main menu contains three different submentis. The first submenu is FILE. The user may exit the application from this submenu.

The second submenu is COMMUNICATION. In this submenu, the user can select the port to which the GATOR is connected. This is the same screen that comes up upon launching the Gator Controller application.

The final submenu is HELP. In this submenu, this user manual can be brought up. The About box displaying version information is also available.

The main screen of the GATOR Controller can be seen in Figure 1. In addition to tile status being updated

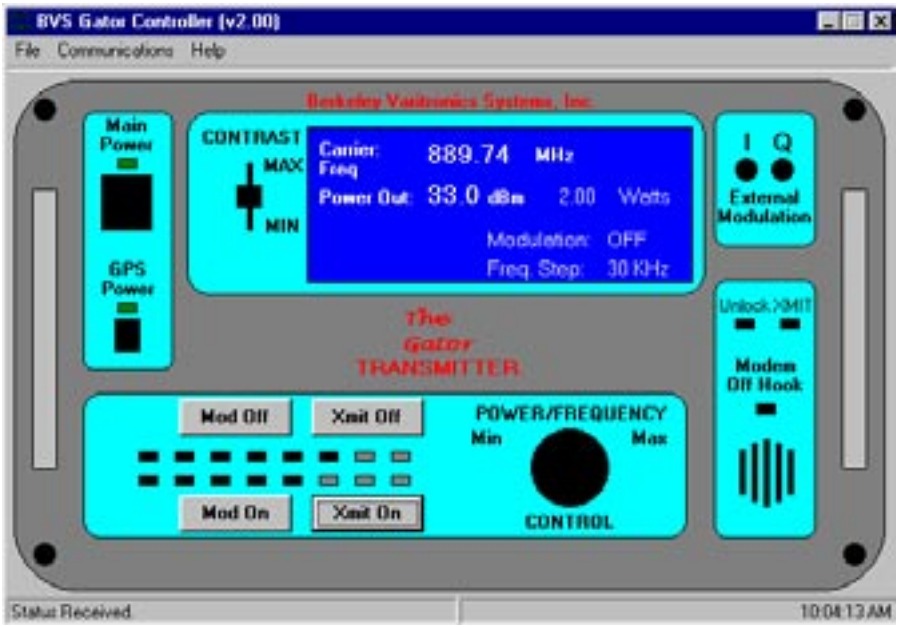


Figure 1 - BVS GATOR Controller

inl the display, the Xmit and Unlock simulated LED's will light up for the appropriate conditions. The status bar of the GATOR Controller displays any system messages and the PC system clock.

The individual features of the application software are discussed in the following sections.

Installing the Application

The application is installed by placing tile diskette provided into a 3.5” drive. Run the SETUP.EXE application and InstallShield will prompt for further installation questions. After the installation is completed, an icon will be created in the folder specified during the installation process.

Starting the Application

Make sure that the GATOR is running and connected to a serial port on a PC using the cable packed with tile unit. The GATOR Controller application may be started by clicking on the GATOR Controller icon. When the PORT screen appears, choose tile port to which tile GATOR is connected. Leaving tile choice as AUTOMATIC will put the GATOR Controller into search mode, and it will poll COM1 thru COM4 inan attempt to find an operating GATOR.

When the main screen appears, clieck tile status bar for verification that the connection mas made to the GATOR. ‘File status bar should read “Status Received”. You are now ready to control the GATOR.

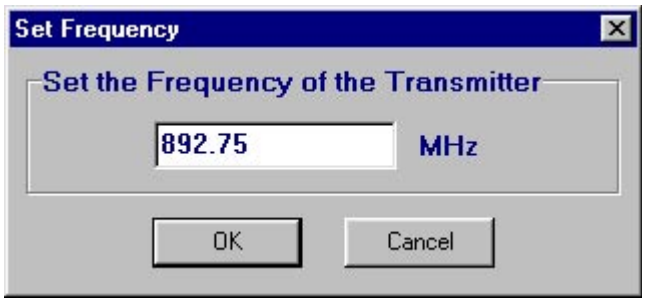


Figure 2 - Update Frequency Dialog

Setting the Frequency

The frequency of the GATOR may be set by clicking once on the frequency in the display box. The dialog box shown in **Figure 2** then appears. Enter a frequcticy in the range of the GATOR and click OK. Within a couple of seconds the status will reflect the new frequency. If the frequency selected is between channels, the GATOR will correct to the nearest channel. NOTE: If the GATOR is transmitting. transmission will cease when a request to change this parameter is received. This is norinal and intended to prevent accidental interference with other licensed users.

Figure 3 - Update Power Dialog

Setting the Power

The power of the GATOR may be set by clicking once on the power in the display box. The value range is typically 26 dBm to 46 dBm in .5 dBm steps. The dialog box shown in **Figure 3** appears. Enter in a power in the range of the GATOR and click on OK. Within a couple of seconds the status will reflect the new power output setting. If the power selected is out of range, the GATOR will correct to the nuirest valid power value. NOTE: If the GATOR is transmitting, transmission will cease when a request to change this parameter is received.

Transmission

Transmission inay be started or stopped by using the two buttons provided on the application main screen.

Modulation

If your GATOR has this option, modulation may be started or stopped by using the two buttons provided on the application main screen. See the following pages for the loader instructions thatapply to your GATOR's modulation.

IS-54 / IS-136 Loader Software (version 1.0)

Overview

The IS-54/IS-136 Loader software allows data to be loading into the internal nonvolatile buffers on the IS-54/IS-136 Transmitter from a PC running Windows 95. This data can then be modulated with by the IS-54/IS-136 transmitter at a later time.

The Transmitter can hold up to 1024 frames of data. Which frames actually get transmitted is determined by a play list, which can be set using the IS-54/IS-136 Loader software. A play list contains up to 16 entries, which consist of a start frame (any one of the 1024 posible frames, starting at frame 0) and the number of frames to transmit (between 1 and 1024). The entries in the play list are transmitted in rotation with no gaps between entries.

The IS-54/IS-136 Loader software controls the loading of both the data and the play list into the IS-54/IS-136 Transmitter's memory. Play lists can be created, edited, saved to disk, and loaded back from disk in addition to being sent to the transmitter.

Installation

Launch Windows and select RUN from the File menu of the Program Manager. A dialog box will appear. In the Command Line edit field, enter "a:\setup" (if drive A is being use to load the software). The installation program will allow the destination drive and directory to be chosen.

Connecting the Transmitter

There is a nine pin serial port connector located on the back of the IS-54/IS-136 Transmitter. This port is connect by a one-to-one cable to the serial port of the computer running the IS-54/IS-136 Loader software. Once the IS-54/IS-136 Transmitter is loaded with the desired data and play list, it can be disconnected. After this, the transmitter can be modulated by the data buffer (following the loaded play list) or a random pattern. This selection is made on the IS-54/IS-136 Transmitter.

Running the Program

To start the IS-54/IS-136 Loader program, double click on the program item that you created during installation. Without the IS-54/IS-136 Transmitter connected to a serial port of your computer, Play Lists can be created, edited, saved to disk, and loaded from disk.

Working with Play Lists

A Play List instructs the IS-54/IS-136 Transmitter to transmit the data stored in the IS-54/IS-136 Transmitter in a particular sequence. There are up to sixteen entries allowed in a play table. Each entry consists of a starting slot and the number of slots to transmit. This provides a great deal of user programmability. Consider the following play table:

Start frame	Number of Frames
0	408
0	408
0	408
0	408
408	1
1	407

In this example, a block of frames is repeated four times. This is followed by a block of frames that differ only in the first frame. The entire group of five blocks will be repeated indefinitely. Since there are a total of 1024 frames that can be stored in nonvolatile RAM in the IS-54/IS-136 Transmitter, there is a great deal of flexibility in selecting the data sequence to be transmitted.

In order to create a new Play List, the starting frame and number of frames for the first entry in the Play List are entered in the edit fields in the upper left portion of the IS-54/IS-136 Loader window. These edit fields are selected with the mouse and values are entered from the keyboard. After the desired values have been entered, click on the "ADD" button. This will enter the data that was entered into the first line of the Play List on the right side of the IS-54/IS-136 Loader window. More entries can be added in the same manner.

An entry of the play list can be changed, but clicking on that entry in the Play List (it will become highlighted), entering new data into the edit boxes, and clicking on the "UPDATE" button.

An entry can be added between two existing entries or at the top of the Play List by entering the desired values into the edit fields, clicking on the entry at the position that you wish the new data to be inserted, and clicking on the "INSERT BEFORE" button.

Entries selected (highlighted) in the Play List can be removed by clicking on the "DELETE" button.

The "SAVE TO FILE" and "LOAD FROM FILE" buttons below the Play List are used to read and write the Play List to disk.

Loading the Data into the IS-54/IS-136 Transmitter

The IS-54/IS-136 Transmitter is connected to the PC running the IS-54/IS-136 Loader software through an unused serial port (see connect the Transmitter above). Before attempting to send data to the transmitter, the serial port must be selected using the "SET COMM PORT" button. Only serial ports that are available are shown in the list. If another program is using a port, it will not be displayed in the list.

The Play List which is displayed in the IS-54/IS-136 Loader window can be send to the transmitter by clicking on the "LOAD PLAY TABLE" button. A dialog box will briefly show up indicating that the transfer is in progress, and then disappear when the operation is complete. This message may flash by quickly. If there is an error that dialog box will be replaced by a dialog box clearly indicating an error. The error dialog box will remain until the user clicks on the OK button.

The frame data for the transmitter must be loaded from a file. This is a regular ASCII text file that be made with any text editor (such as notepad or DOS' edit). The format of this file is given in the next section.

Clicking on "LOAD BUFFER FROM FILE" displays a file selection dialog. By default, the dialog will display files that have the extension ".BUF", although a file with any name can be loaded (provided it contains data in the required format). After the file selection is make, the data will be transferred to the IS-54/IS-136 Transmitter. A dialog will appear indicating that the transfer is in progress. Since the transfer could take some time, depending on the amount of data in the file, a "CANCEL" button is also present to abort the operation.

Data File Format

In order to load data into the IS-54/IS-136 Transmitter, the user must create a data file. The data file can be created with a regular ASCII text editor such as notepad in Windows or Edit in DOS. The data file consists of one or more blocks. Each block contains a starting slot number, the number of slots in the block, and

the data for each slot. A separate line must be used for each time slot (1/6 of a frame). The following is an example of a block in a file (this could be the entire file):

```
0  1
0123456789ABCDEF0…123456789ABCDEF01234
0123456789ABCDEF0…123456789ABCDEF01234
0123456789ABCDEF0…123456789ABCDEF01234
0123456789ABCDEF0…123456789ABCDEF01234
0123456789ABCDEF0…123456789ABCDEF01234
0123456789ABCDEF0…123456789ABCDEF01234
```

In this example, the zero indicates the data is to be loaded starting with slot zero in the transmitter. The one specifies that one frame is to be loaded. The next six lines are the data to be contained in that frame. The data for each slot must be on a separate line and must start in column one. Eighty one (81) hexadecimal characters make up the entire data for a frame. The most significant bit of the left most character will be transmitted first.

Many such block may exist in a buffer data file. Blank lines may exists between the blocks, but not between lines that make up a block. One or more spaces should be placed between the starting frame and the number of frames.

GSM Digital Modulator

The system consists of a TDMA GSM Transmitter (known as Gator™) controlled by an external (host) PC. The data content, RF amplitude and carrier frequency can be set on any 200 kHz assignment in either cellular or he PCS band.

The data parameters and RF level can be set to any required level from 0.5 watts to full output of 20 watts in 1.0 dB increments via direct, 0.5 dB increments via rotary dial or 0.1 db fine tune increments via cursor buttons. Amplitude output levels are regulated to within ±1.0 dB. Transmitter output is brought to the rear panel via an N connector.

As shown in the attached diagram, the data bank has a 128K words of battery-backed memory used to hold formatted, GSM (BCCH) data. One time slot is 577µsecs. One TDMA signalling frame is 51 TDMA frames, or 235.38 ms, or 53,750 bits long. One (1) complete Superframe of data may be loaded into this non-volitale memory; this is 1,657,500 bits long, and runs 6.12 seconds.

In a typical operation, formatted data such as base station control channel data (BCCH) is downloaded from a host PC through the RS-232 serial port to the TX modulator. Up to N number of frames of data can be stored in the transmitter.

Upon transmission in the Tx modulator the memory inside the Gator™ can be selected via a Windows™ application provided by BVS and transmitted as GSMK data sequentially from these circulating memory buffers. The customer however, must provide the actual data to be broadcast, equivelent to BCCH data at basestation. The output of this SRAM memory is clocked into a parallel-to-serial register and fed to the RF modulator. Data for the I channel and Q channel are appropriately applied to the inputs of GSM base band filters. The outputs are then converted to analog I and Q signals and fed to the RF modulator. For GSM modulation, these filters are 0.3 GSMSK per specifications.

Upon completed transmission of each primary frame (buffers 1 to 8), the system checks the contents of an auxiliary, 4frame buffers (numbers 9 to 12). If any data has been deposited into these buffers, this data is next transmitted by the simulator. These auxiliary buffers are included in the system to provide for asynchronous insertion of data, such as to "seed" the bit stream with special messages or deliberate bit errors for testing forward error correction. Once the auxiliary buffer(s) has been transmitted, the system returns to normal (route) output of the primary data buffers.

Each buffer may be independently enabled or disabled, as well as set to any channel frequency in 200 kHz steps within the 800 MHz cellular model transmitter or the PCS band model transmitter. The RF output level and amplitude variations are controlled via programmable registers which, in turn, control precision digital attenuators. The rate of amplitude variations and depth of amplitude changes are also programmable from the host PC.

RF PERFORMANCE

Frequency Stability	**±2 ppm from 10 to 50° C**
Frequency Steps	**± 200 kHz**
Frequency range	**Cellular or PCS Models**
amplitude	**-30 dBm to - 110 dBm ±2 dB into 50 ohms**

DIGITAL SPECIFICATIONS

Data rate	effective rate 271k bps, per GSM spec
Modulation	0.3 GMSK (per GSM specs)
Frame length	1250 bits

GSM Loader Software (version 1.0)

Overview

The GSM Loader software allows data to be loading into the internal nonvolatile buffers on the GSM Transmitter from a PC running Windows 95. This data can then be modulated with by the GSM transmitter at a later time.

The Transmitter can hold up to 13080 time slots of data. Which time slots actually get transmitted is determined by a play list, which can be set using the GSM Loader software. A play list contains up to 16 entries, which consist of a start slot (any one of the 13080 possible slots, starting at slot 0) and the number of slots to transmit (between 1 and 13080). The entries in the play list are transmitted in rotation with no gaps between entries.

The GSM Loader software controls the loading of both the data and the play list into the GSM Transmitter's memory. Play lists can be created, edited, saved to disk, and loaded back from disk in addition to being sent to the transmitter.

Installation

Launch Windows and select RUN from the File menu of the Program Manager. A dialog box will appear. In the Command Line edit field, enter "a:\setup" (if drive A is being use to load the software). The installation program will allow the destination drive and directory to be chosen.

Connecting the Transmitter

There is a nine pin serial port connector located on the back of the GSM Transmitter. This port is connect by a one-to-one cable to the serial port of the computer running the GSM Loader software. Once the GSM Transmitter is loaded with the desired data and play list, it can be disconnected. After this, the transmitter can be modulated by the data buffer (following the loaded play list) or a random pattern. This selection is made on the GSM Transmitter.

Running the Program

To start the GSM Loader program, double click on the program item that you created during installation. Without the GSM Transmitter connected to a serial port of your computer, Play Lists can be created, edited, saved to disk, and loaded from disk.

Working with Play Lists

A Play List instructs the GSM Transmitter to transmit the data stored in the GSM Transmitter in a particular sequence. There are up to sixteen entries allowed in a play table. Each entry consists of a starting slot and the number of slots to transmit. This provides a great deal of user programmability. Consider the following play table:

Start Slot	Number of Slots

0 408
0 408
0 408
0 408
408 8
8 408

In this example, a signaling frame (consisting of 51 frames, eight time slots each) is repeated four times. This is followed by a signaling frame that differs only in the first frame (first eight time slots). The entire block of five signaling frame will be repeated indefinitely. Since there are a total of 13080 time slots (1635 frames) that can be stored in nonvolatile RAM in the GSM Transmitter, there is a great deal of flexibility in selecting the data sequence to be transmitted.

In order to create a new Play List, the starting slot and number of slots for the first entry in the Play List are entered in the edit fields in the upper left portion of the GSM Loader window. These edit fields are selected with the mouse and values are entered from the keyboard. After the desired values have been entered, click on the "ADD" button. This will enter the data that was entered into the first line of the Play List on the right side of the GSM Loader window. More entries can be added in the same manner.

An entry of the play list can be changed, but clicking on that entry in the Play List (it will become highlighted), entering new data into the edit boxes, and clicking on the "UPDATE" button.

An entry can be added between two existing entries or at the top of the Play List by entering the desired values into the edit fields, clicking on the entry at the position that you wish the new data to be inserted, and clicking on the "INSERT BEFORE" button.

Entries selected (highlighted) in the Play List can be removed by clicking on the "DELETE" button.

The "SAVE TO FILE" and "LOAD FROM FILE" buttons below the Play List are used to read and write the Play List to disk.

Loading the Data into the GSM Transmitter

The GSM Transmitter is connected to the PC running the GSM Loader software through an unused serial port (see connect the Transmitter above). Before attempting to send data to the transmitter, the serial port must be selected using the "SET COMM PORT" button. Only serial ports that are available are shown in the list. If another program is using a port, it will not be displayed in the list.

The Play List which is displayed in the GSM Loader window can be send to the transmitter by clicking on the "LOAD PLAY TABLE" button. A dialog box will briefly show up indicating that the transfer is in progress, and then disappear when the operation is complete. This message may flash by quickly. If there is an error that dialog box will be replaced by a dialog box clearly indicating an error. The error dialog box will remain until the user clicks on the OK button.

The time slot data for the transmitter must be loaded from a file. This is a regular ASCII text file that be made with any text editor (such as notepad or DOS' edit). The format of this file is given in the next section.

Clicking on "LOAD BUFFER FROM FILE" displays a file selection dialog. By default, the dialog will display files that have the extension ".BUF", although a file with any name can be loaded (provided it contains data in the required format). After the file selection is make, the data will be transferred to the GSM

Transmitter. A dialog will appear indicating that the transfer is in progress. Since the transfer could take some time, depending on the amount of data in the file, a "CANCEL" button is also present to abort the operation.

Data File Format

In order to load data into the GSM Transmitter, the user must create a data file. The data file can be created with a regular ASCII text editor such as notepad in Windows or Edit in DOS. The data file consists of one or more blocks. Each block contains a starting slot number, the number of slots in the block, and the data for each slot. A separate line must be used for each time slot. The following is an example of a block in a file (this could be the entire file):

```
0  3
0123456789ABCDEF0123456789ABCDEF01234
0123456789ABCDEF0123456789ABCDEF01234
0123456789ABCDEF0123456789ABCDEF01234
```

In this example, the zero indicates the data is to be loaded starting with slot zero in the transmitter. The three specifies that three slots are to be loaded. The next three lines are the data to be contained in those three slots. The data for each slot must be on a separate line and must start in column one. Thirty seven (37) hexadecimal characters make up the entire data for a time slot. This represents a total of 148 bits per time slot (the reserved bits are included but not the Guard Periods). The most significant bit of the left most character will be transmitted first.

Many such block may exist in a buffer data file. Blank lines may exists between the blocks, but not between lines that make up a block. One or more spaces should be placed between the starting slot and the number of slots.

Power Conversion dBm to Watts

dBm	milli Watts
26.0	398
26.5	447
27.0	501
27.5	562
28.0	631
28.5	708
29.0	794
29.5	891
30.0	1000

dBm	Watts
30.5	1.12
31.0	1.26
31.5	1.41
32.0	1.58
32.5	1.78
33.0	2.00
33.5	2.24
34.0	2.51
34.5	2.82
35.0	3.16
35.5	3.55
36.0	3.98
36.5	4.47
37.0	5.01
37.5	5.62
38.0	6.31
38.5	7.08
39.0	7.94
39.5	8.91
40.0	10.00
40.5	11.22
41.0	12.59
41.5	14.13
42.0	15.85
42.5	17.78
43.0	19.95
43.5	22.39
44.0	25.11
44.5	28.18
45.0	31.62
45.5	35.48
46.0	39.81
46.5	44.67
47.0	50.12
47.5	56.23
48.0	63.10
48.5	70.79
49.0	79.43
49.5	89.13
50.0	100.00

Return Loss v.s. VSWR

Return Loss (dB)	VSWR
32.256	1.05
26.444	1.10
23.127	1.15
20.828	1.20
19.085	1.25
17.690	1.30
16.540	1.35
15.563	1.40
14.719	1.45
13.979	1.50
13.324	1.55
12.736	1.60
12.207	1.65
11.725	1.70
11.285	1.75
10.881	1.80
10.509	1.85
10.163	1.90
9.842	1.95
9.542	2.00
8.999	2.10
8.519	2.20
8.091	2.30
7.707	2.40
7.360	2.50
7.044	2.60
6.755	2.70
6.490	2.80
6.246	2.90
6.021	3.00
5.811	3.10
5.617	3.20
5.435	3.30
5.265	3.40
5.105	3.50

Glossary of Acronyms

AC	Alternating Current
A/D or ADC	Analog to Digital Converter
AGC	Automatic Gain Control
BER	Bit Error Rate
BPSK	Binary Phase Shift Keying
BW	Band Width
CDMA	Code Division Multiple Access - a spread spectrum modulation
DC	Direct Current
D/A	Digital to Analog
dB	deciBel
dBm	deciBels referenced to 1 milliwatt
DOS	Digital Operating System
DSP	Digital Signal Processing
FIR	Finite Impulse Response
GHZ	GigaHertz
GPS	Global Positioning System (satellite based)
GPS diff.	GPS error correction signal which enhances GPS accuracy
IF	Intermediate Frequency
I and Q	In phase and Quadrature
kHz	kiloHertz
LCD	Liquid Crystal Display
LO	Local Oscillator
Mbits	Megabits
MHz	MegaHertz
modem	acronym for modulator/demodulator
PCMCIA	Personal Computer Memory Card International Association
PC	Personal Computer
PCS	Personal Communications Service (1.8 to 2.1 GHz)
PN	Pseudo Noise
QPSK	Quaternary Phase Shift Keying, 4-level PSK
RF	Radio Frequency
RSSI	Receiver Signal Strength Indicator
UTC	Universal Time Code
VAC	Volts Alternating Current
VGA	Video Graphics Array
VSWR	Voltage Standing Wave Ratio
X	horizontal axis
Y	vertical axis

IMPORTANT SAFETY INSTRUCTIONS

When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

1)Read and understand all instructions.

2)Follow all warnings and instructions marked on the product.

3)Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

4)Do not use this product near water, for example, near a bath tub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool.

5)Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.

6)Slots and openings in the cabinet and the back or bottom are provided for ventilation, to protect it from overheating these openings must not be blocked or covered The openings should never be blocked by placing the product on the bed, sofa, rug or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.

7) This product should be operated only from the type of power source indicated on the appliance. If you are not sure of the type of power supply to your home, consult your dealer or local power company.

8)Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.

9)Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.

10)Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock. Never spill liquid of any kind on the product.

11) To reduce the risk of electric shock, do not disassemble this product, but take it to a qualified service facil4 when some service or repair work is required. Opening or removing covers may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electric shock when the appliance is subsequently used.

12)Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

A) When the power supply cord or plug is damaged or frayed. B) If liquid has been spilled into the product.

C)If the product has been exposed to rain or water.

D) If the product does not operate normally by following the operating instructions. Adjust only those controls, that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.

E) If the product has been dropped or the cabinet has been damaged. F) If the product exhibits a distinct change in performance.

13)Avoid using the product during an electrical storm. There may be a remote risk of electric shock from lightning.

14)Do not use the telephone to report a gas leak in the vicinity of the leak.

INSTALLATION INSTRUCTIONS

1. Never install telephone wiring during a lightning storm.

2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

4. Use caution when installing or modifying telephone lines.

INSTRUCTION FOR BATTERIES

CAUTION: To Reduce the Risk of Fire or Injury to Persons, Read and Follow these Instructions:

1. Use only the type and size of batteries mentioned in owner's manual.

2. Do not dispose of the batteries in a fire. The cells may explode. Check with local codes for possible special disposal instructions.

3. Do not open or mutilate the batteries. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.

4. Exercise care in handling batteries in order not to short the battery with conducting materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.

5. Do not attempt to recharge the batteries provided with or identified for use with this product. The batteries may leak corrosive electrolyte or explode.

6. Do not attempt to rejuvenate the batteries provided with or identified for use with this product by heating them. Sudden release of the battery electrolyte may occur causing burns or irritation to eyes or skin.

7. When replacing batteries, all batteries should be replaced at the same time. Mixing fresh and discharged batteries could increase internal cell pressure and rupture the discharged batteries. (Applies to products employing more than one separately replaceable primary battery.)

8. When inserting batteries into this product, the proper polarity or direction must be observed. Reverse insertion of batteries can cause charging, and that may result in leakage or explosion. (Applies to product employing more than one separately replaceable primary battery.)

9. Remove the batteries from this product if the product will not be used for a long period of time (several months or more) since during this time the battery could leak in the product.

10. Discard "dead" batteries as soon as possible since "dead" batteries are more likely to leak in a product.

11. Do not store this product, or the batteries provided with or identified for use with this product, in high-temperature areas. Batteries that are stored in a freezer or refrigerator for the purpose of extending shelf life should be protected from condensation during storage and defrosting. Batteries should be stabilized at room temperature prior to use after cold storage.

The Gator CLASS A TRANSMITTER SERIES

FOR MEASURING SIGNAL PROPAGATION, POSITIONING ANTENNAS, SETTING POWER LEVELS OR VALIDATING COVERAGE

Each Gator Transmitter is housed in a high impact ABS water resistant case. It has a built in agile frequency synthesizer, dynamically controlled power amplifier and a built-in modem and DTMF (touch tone) decoding allowing remote control of all transmitter parameters via a phone line or cellular telephone. Remote adjustments include the power level, channel or frequency assignment, and transmit On/Off.

FEATURES:

- **Available in either 25 Watt Class A, or 45 Watt Class A (10 or 20 Watt Class A for PCS)**
- **Pure spectrum Class A power amplifier**
- **Weighs 25 pounds**
- **Power amplifier with continuous adjustable power output ± 0.1 dB over 32 dB range**
- **Water resistant, rugged 18" x 15" x 6" ABS plastic case**
- **Microprocessor-controlled with front panel soft-keys or remotely controlled with an internal modem allowing for user programmable modulation schemes, power levels, channels, and frequencies.**
- **240 x 64 LCD with vacuum fluorescent backlighting**
- **VSWR antenna protection and internal forward and reverse measurement**
- **Dual cooling fans**
- **Built-in thermal overheat protection for amplifier**
- **Battery backed-up SRAM stores all user selectable parameters in the event of a power loss**
- **Powered from 110-240 VAC 50/60 Hz, UL, CSA approved**
- **CW identifier for FCC CP identification**
- **All parameters can be adjusted remotely via RS-232 or the internal modem or DTMF signaling tones**

FCC Type Accepted & CE Approval

Available Frequencies:

PCS Cellular LMR GSM SMR
iDEN AMPS ETACS PACS Paging

Available from stock.

The Gator Class A Transmitters are just some of many exceptional design solutions from Berkeley Varitronics. Call us today for more information:

(732) 548-3737 / Fax: (732) 548-3404
Internet: http://www.bvsystems.com
E-mail: info@bvsystems.com

BERKELEY VARITRONICS SYSTEMS

The Gator CLASS A TRANSMITTERS

SPECIFICATIONS

FREQUENCY RANGES:

PCS Class A models available in 10 or 20 Watt output power:

Continually tunes from 1850-2100 MHz**, covering both Forward, Reverse, and unlicensed bands

Cellular, LMR, Paging, SMR, GSM, ISM, WCS, iDEN, AMPS, PACS, ETACS, IS-136, IVDS

Class A models available in 25 or 45 Watt output power:

800-900 MHz*
850-950 MHz*
930-970 MHz*
2.4-2.49 GHz**
2.5-2.7 GHz*

Please inquire about specific frequency, output power, and channel spacing when ordering.

GENERAL SPECIFICATIONS:

Display	240 X 64 pixel graphic supertwist LCD (VF backlighted) Stability Less than 1.5 PPM for first year, ± for 1 PPM for aging
Output Power	Continuous adjustable power output ± 0.1 dB over 32 dB range (below 1 GHz)
Power Adjustments	Continuously adjustable via rotary knob or direct keypad entry in 1 dBm increments over 17 dB on models above 1 GHz
Spurious Output	> 55 dBc (decibels below the carrier level)
Harmonics Output	> 55 dBc (decibels below the carrier level)
Power	110-240 VAC 50/60 Hz, autoswitching, UL and CSA approved PCS 10 and 20 Watt models may also be powered from + 12 VDC All other models from + 24 VDC * Externally powered from +24 volts DC ** Models may be powered externally for +12 volts DC
Remote Control	Via serial RS-232, internal modem or DTMF through telco
Output Power Monitoring	Both forward and reverse power monitored via internal power meters. The output is regulated to < ± 1.0 dB of setting at up to a 6:1 VSWR

MECHANICAL:

Case Size	18" x 15" x 6"
Weight	23 lbs.

OPTIONS:

Optional Portable Power Station for up to 10 hours of continuous power in remote locations

Optional Honda generator (BVS approved) quietly runs you Gator all day long (>5 hours continuous).

Optional Transmitter Raincoat keeps case clean and provides extra protection in driving rain.

Berkeley Varitronics Systems, Liberty Corporate Park, 255 Liberty Street, Metuchen, NJ 08840
Phone 732-548-3737 • Fax 732-548-3404 • Internet: http://www.bvsystems.com • E-mail: info@bvsystems.com

NATIONAL CERTIFICATION LABORATORY
8370 Court Avenue, Suite B-1
Ellicott City MD 21043
(410) 461-5548

CENELEC EMI MEASUREMENT REPORT

for

Berkeley Varitronics Systems
255 Liberty Street
Metuchen, NJ 08840

The Gator Transmitter

April 27, 2000

TABLE OF CONTENTS

1.0 Purpose of Test

The purpose of this series of tests was to verify compliance of the **Gator** (EUT) with the limits and standards of IEC 1000-4-2,3, and 4 and EN55022.

2.0 Description of Test Sample

The EUT is a stable synthesized signal source used for measuring PCS, Cellular, GSM and LMR band signal propagation, antenna position, or network area coverage. The Gator Transmitter covers the 935 - 960 MHz European band, and provides 25 watts of RF power. The system utilizes Class A amplifier. Other features include adjustable RF power output, LCD panel, RS-232 interface, 120 VAC powered, microcontroller.

3.0 References

IEC 1000-4-2.....	Part 2: Electrostatic discharge requirements, Second edition, 1991-04
IEC 1000-4-3.....	Part 3: Radiated electromagnetic field requirements, 1984, 3rd Impression 1991
IEC 1000-4-4.....	Part 4: Electrical fast transient/ burst requirements, 1988, 3rd Impression 1991
EN55022	EMI emissions requirements, CISPR 22, 1998 version

4.0 List of Required Tests

The following tests were performed in accordance with Berkeley Varitronics Systems:

5.0 Test Site

Testing was performed at **National Certification Laboratory** in Ellicott City, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch. FCC acceptance was granted on May 26, 1993.

6.0 Modifications to EUT

No modifications were made to the equipment under test, in order to comply with the standards in Section 4.0.

7.0 Modifications to Test Standard

No modifications were made to the test standards referenced in this report.

8.0 Test Configuration

The **Gator** was configured in accordance with the manufacturer's instructions and operated in a manner representive of the typical usage of the equipment. The equipment was tested with the following Host equipment:

1. 50 ohm cellular omni antenna
2. RS-232 Serial Cable

The EUT was set to full power, and tuned to a specific mid-band channel during testing.

9.0 Results Summmary

The tests referenced on page 3 were performed in accordance with the applicable standards. The severity levels used for immunity testing were chosen according to the anticipated installation environment of the EUT.

The acceptable performance criteria is determined through agreement between manufacturer and end user or client. The acceptance is based on the actual severity levels chosen for normal installation of the EUT.

Based on the above explanations, we state that the EUT (**Berkeley Varitronics Systems Gator Transmitter**) as supplied to **National Certification Laboratory**, complied with all requirements stated in this report.

Signature

Steven Dayhoff

Printed

Chief Engineer, NCL

Title

Rita Davis

Secretary

9.1 IEC 801-2 Electrostatic Discharge Requirements

Introduction

The requirements of this test call out Electrostatic Discharge (ESD) test levels and procedures. The intent of this test is to determine the effect of electrostatic discharge events on equipment operation. ESD is the result of potential build-up and the subsequent rapid discharge and equalization of that potential. The result of the discharge is a transient waveform that produces peak voltages up to tens of kilovolts, peak currents of a few amperes, and rise times on the order of a few nanoseconds (ns). This energetic discharge may produce malfunction and damage to sensitive electronic equipment.

This test requires an "air discharge" and "contact discharge" test to evaluate the immunity of electronic equipment to ESD.

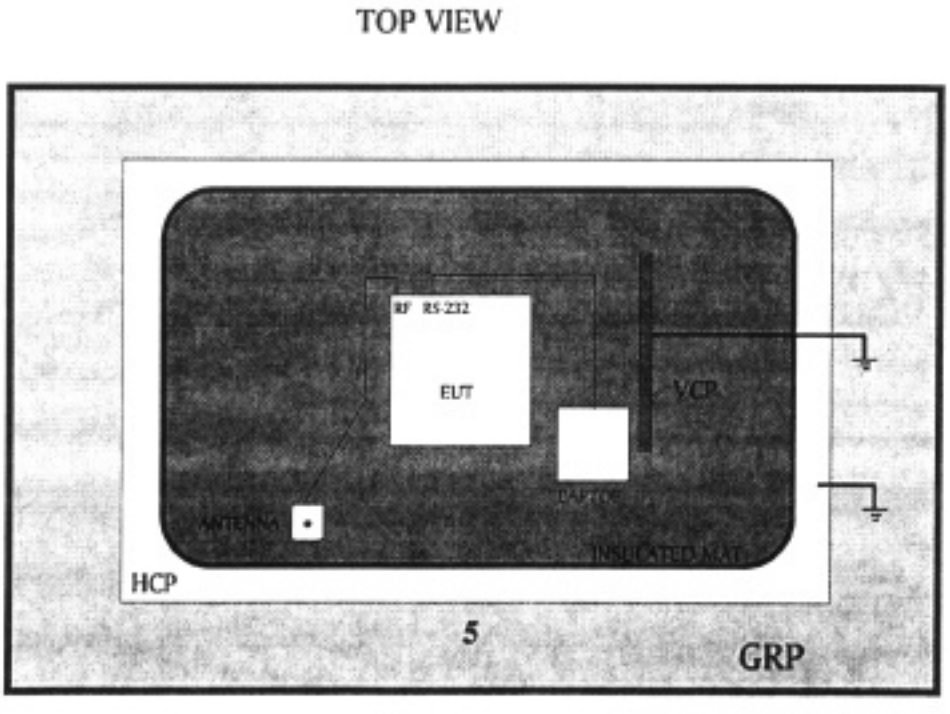
The specification limit depends on the designated "severity level," which is determined by the intended area of installation of the device. The severity levels for both contact and air discharge ESD are located in the standard.

Configuration

The EUT is situated on a .5 mm thick non-conductive mat which was placed on a horizontal coupling plane (HCP). The HCP is composed of a sheet of copper metal, the size being 1.6 m X 0.8 m, mounted to a table top. The table stands 0.8 m in height and is centered on a metallic ground reference plane (GRP), measuring 2.2 X 2.2 m. The GRP is more than 0.25 mm thick as required by IEC 801-2, Section 7.1.

A vertical coupling plane (VCP) measuring 0.5 X 0.5 m, and comprised of copper sheet is placed 0.1 m from the EUT. The HCP and VCP are connected to the GRP via two series 470 K resistors. The GRP is safety grounded with the laboratory A.C. mains network.

FIGURE 1 - IEC 1000-4-2



Procedure

The EUT was set to full power, and tuned to a specific mid-band channel during testing.

The ESD gun is repeatedly charged to the required voltage and air-discharged at all locations on the EUT that are accessible to human contact. The ESD gun was also discharged at least ten times on the HCP and at the center of the left vertical edge of the VCP. The test was repeated with the VCP facing the front, back, left side, and right side of the EUT. The functionality of the EUT was determined after each discharge.

Technique

Direct Discharge -

These discharges are made directly to the unit in the air and contact discharge modes. All tests are performed in the single discharge mode and with a negative and positive ESD pulse. On the preselected points at least ten discharges are applied with, approximately, a one second interval between discharges.

For repeatability, the ESD generator is held perpendicular to the surface of each discharge point.

The test voltage is set at a lower level than the predetermined severity level and increased until the EUT fails or until the predetermined test voltage is reached. If the EUT fails before the proper test voltage is reached then the voltage the unit failed at should be noted as the threshold.

Contact Discharge -

The tip of the discharge point should touch the EUT before the ESD discharge is made. If the surface of the EUT is painted and the coating is not declared by the manufacturer as an insulator, then the tip of the ESD generator should penetrate the coating before the discharge. If the coating is declared as an insulator by the manufacturer then the contact discharge is not applied to this surface.

Air Discharge -

The tip of the discharge point does make contact with the EUT and the discharge is made as the tip is held close to the EUT.

Indirect Discharge -

This test is done to simulate discharges made by objects installed near the EUT and is done in the contact discharge mode only (see above). It is done to the HCP and VCP as determined earlier.

HCP -

At least 10 discharges should be made to the plane at several points around the EUT and at a distance of 0.1 m from the EUT.

VCP -

At least 10 discharges should be made to the center of one of the side edges of the plane. The VCP should be 0.5 m x 0.5 m and placed parallel to the EUT and perpendicular to, but isolated by 0.5 mm from, the HCP. The discharges should be made to the plane, with the plane 0.1 m from the EUT and at different positions on the four sides of the EUT so the EUT is completely illuminated.

If during any of the above tests the unit does not meet the previously specified function criteria, the EUT does not comply.

Test Equipment/Conditions

EQUIPMENT	SERIAL NUMBER
AH Associates ESD 254 - ESD Simulator	1030
CLIMATIC CONDITIONS	MEASURED
Temperature	15 C to 35 C
Humidity	30 % to 60 %
Atmospheric Pressure	68 kPa to 106 kPa

Results

The EUT was evaluated according to the following criteria.

Performance Criteria:

1. Normal performance within the spec. limits.
2. Temporary degradation or loss of function or performance which is self-recoverable.
3. Temporary degradation or loss of function or performance which requires system reset.
4. Degradation or loss of function which is not recoverable due to damage of equipment.

The EUT was subjected to Severity Level 3 as described below, which is appropriate for a Class 3 installation.

LEVEL	CONTACT DISCHARGE VOLTAGE	AIR DISCHARGE VOLTAGE
3	6 kV	8 kV

Discharge to Coupling Planes:

Performance of the EUT complied to performance criterion 1 while air discharges were applied to **Severity Level 3** to both the vertical and horizontal coupling planes a minimum of 10 times on each of four sides.

Discharge to EUT:

Performance of the EUT complied to performance criterion 1 while contact discharges were applied to all conductive surfaces on the exterior of the EUT to **Severity Level 3** a minimum of 10 times.

9.2 IEC 801-3 Radiated Electromagnetic Field

Introduction

The requirements of this test call out radiated susceptibility test levels and procedures. The intent of this test is to determine the effect of radiated RF energy on equipment operation. Radiated RF energy from other devices in the facility or from ambient RF energy (i.e. radio and TV broadcast stations) can cause equipment to malfunction.

The specification limit depends on the designated "severity level," which is determined by the intended area of installation of the device.

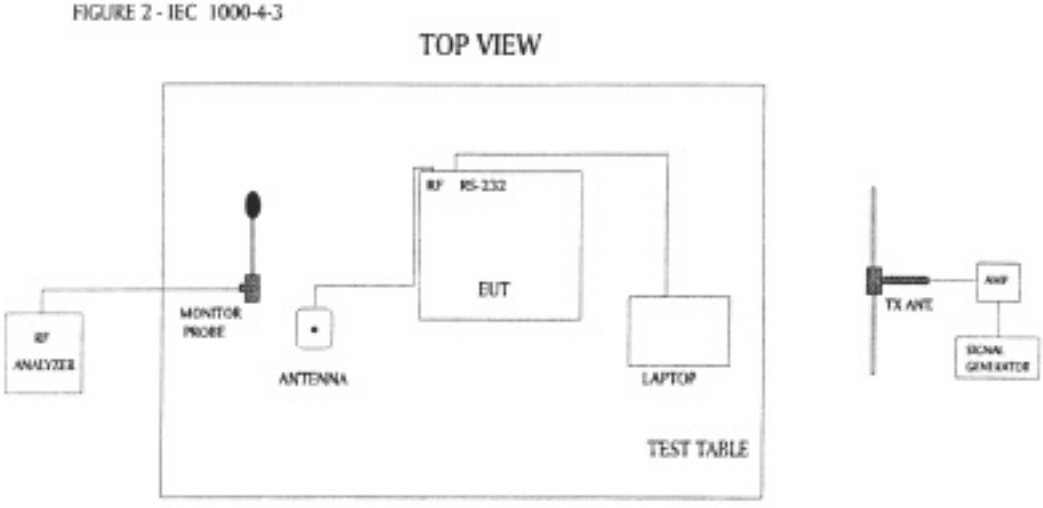
Configuration

This basic test setup applies to both types of equipment, floor standing and desktop. The equipment under test (EUT) is setup in a shielded room, so test personnel and equipment are protected from the radiated fields. If the EUT requires external interconnecting cables, they should be of the length specified by the manufacturer. If the manufacturer's specified length is greater than 3 m then the cabling should be reduced to a 3 m length by non-inductive bundling. The cables are also placed uniformly in the field.

A transmit antenna is placed 1 m from the EUT and at a height of 1 m. The antenna is then connected to the test equipment outside the shielded room via the room bulkhead. On the external end of the bulkhead a power amplifier is connected. A signal generator is then connected to the input of the power amplifier, so the necessary field can be produced. The field probe for measuring the radiated field is also placed inside the shielded room. The probe is placed as close to the EUT as possible without disturbing the radiated field. The probe is then connected, through a bulkhead, to a monitoring device outside the room.

The EUT and cables are placed on a 0.8 m high non-conductive table at a distance of 1m from the transmit antenna. The antenna height is adjusted between 1 and 2 m so that the center of the antenna aligns with the center of the EUT.

FIGURE 2 - IEC 1000-4-3



Procedure

The EUT was set to full power, and tuned to a specific mid-band channel during testing.

The signal source is swept through the frequency range of 80 to 1000 MHz, at a rate no faster than .0015 decades/s as recommended in IEC 801-3, Section 7. During testing, the amplitude of the signal generator is adjusted to maintain at least the required field strength. At a minimum of three points per octave, the achieved field strengths were recorded.

Throughout the test, the EUT is closely monitored for signs of susceptibility. The testing is performed with the antennas oriented in both horizontal and vertical polarization. If during any of the above tests the unit does not meet the previously specified function criteria, the EUT does not comply.

Test Equipment

EQUIPMENT	SERIAL NUMBER
Boonton 102F Signal Generator	43628
EMCO Model 3110 Biconical Antenna	1235
EMCO Model 3146 Log Periodic Antenna	1222
Sahand IID RF Field Probe	
ENI Model 604L RF Amplifier	47569
Advantest Model R4131D Spectrum Analyzer	54378A

Results

The EUT was evaluated according to the following criteria.

Performance Criteria:

1. Normal performance within the spec. limits.
2. Temporary degradation or loss of function or performance which is self-recoverable.
3. Temporary degradation or loss of function or performance which requires system reset.
4. Degradation or loss of function which is not recoverable due to damage of equipment.

The EUT was subjected to **Severity Level 2** as described below, which is appropriate for a Class 2 installation:

LEVEL	TEST FIELD STRENGTH (V/m)
2	3

Final

Performance of the EUT complied to performance criterion 1 while subjected to Electromagnetic fields were generated to Severity Level 2 in both the vertical and horizontal polarizations of the antennae.

Tabular data follows:

Freq. MHz	Pol.	Limit V/m	Monitor V/m	Compliance
80	H	3	3.4	COMPLIES
80	V	3	3.2	COMPLIES
100	H	3	3.6	COMPLIES
100	V	3	3.5	COMPLIES
120	H	3	3.3	COMPLIES
120	V	3	4.1	COMPLIES
150	H	3	3.9	COMPLIES
150	V	3	4	COMPLIES
175	H	3	3.1	COMPLIES
175	V	3	3.2	COMPLIES
200	H	3	3.1	COMPLIES
200	V	3	3.6	COMPLIES
266	H	3	4.3	COMPLIES
266	V	3	4.1	COMPLIES
300	H	3	4.2	COMPLIES
300	V	3	4.2	COMPLIES
366	H	3	3.7	COMPLIES
366	V	3	3.7	COMPLIES
400	H	3	3.5	COMPLIES
400	V	3	3.1	COMPLIES
466	H	3	3.8	COMPLIES
466	V	3	3.5	COMPLIES
500	H	3	4.5	COMPLIES
500	V	3	4.6	COMPLIES
525	H	3	4.4	COMPLIES
525	V	3	4.1	COMPLIES
600	H	3	4.8	COMPLIES
600	V	3	4.9	COMPLIES
650	H	3	4.5	COMPLIES
650	V	3	4.3	COMPLIES
700	H	3	4.2	COMPLIES
700	V	3	4.1	COMPLIES
800	H	3	4.1	COMPLIES
800	V	3	4.7	COMPLIES
914	H	3	4.8	COMPLIES
914	V	3	4.9	COMPLIES
1000	H	3	4.5	COMPLIES
1000	V	3	4.4	COMPLIES

9.3 IEC 1000-4-4 Electrical Fast Transients Requirements

Introduction

The requirements of this test call out Electrical Fast Transient (EFT) test levels and procedures. The intent of this test is to determine the effect of EFT's on equipment operation. EFT's are the result of switching inductive loads or relay contact bounce. This energetic discharge may produce malfunction and damage to sensitive electronic equipment.

This test requires a "coupling/decoupling network" for AC/DC supply lines and "capacitive clamp" for signal or control lines.

The specification limit depends on the designated "severity level," which is determined by the intended area of installation of the device.

Configuration

The EUT is placed on a 0.8 m high non-conductive table and the table is placed on a metallic ground reference plane (GRP), measuring 2.2 X 2.2 m. The EFT/B generator and the coupling clamp are mounted to the GRP and bonded to the protective grounding system.

Power is supplied to the EUT through the EFT/B generator, and all I/O cables exceeding 2 m in length were placed in the coupling clamp, which is also connected to the EFT/B generator. The coupling clamp is terminated into a 50 ohm impedance.

The EFT/B generator is programmed to produce an output test signal with the following parameters:

PRF ..... 5 kHz for output < 2kV, 2.5 kHz for output > 2kV

Burst Duration ..... 15 ms

Burst Period ..... 300 ms

Test Time ..... 60 s

Procedure

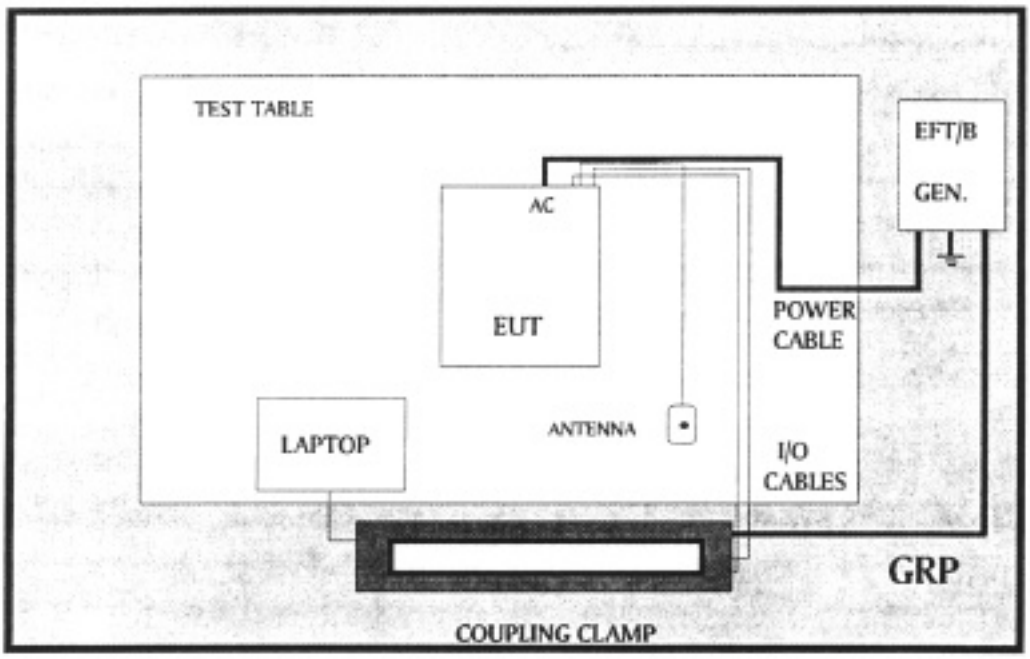
The EUT was set to full power, and tuned to a specific mid-band channel during testing.

The EFT/B generator is operated to couple the transient bursts onto the EUT I/O lines and the A.C. power input line for a period not less than one minute. This test is performed with positive transients first, and subsequently with negative transients.

Throughout the test, the EUT is closely monitored for signs of susceptibility. If during any of the above tests the unit does not meet the previously specified function criteria, the EUT does not comply.

FIGURE 3 - IEC 1000-4-4

TOP VIEW



Test Equipment

EQUIPMENT	SERIAL NUMBER
Compliance Design EFT Generator	3150129
Compliance Design Coupling Clamp	161-34

Results

The EUT was evaluated according to the following criteria.

Performance Criteria:

1. Normal performance within the spec. limits.
2. Temporary degradation or loss of function or performance which is self-recoverable.
3. Temporary degradation or loss of function or performance which requires system reset.
4. Degradation or loss of function which is not recoverable due to damage of equipment.

The EUT was subjected to **Severity Level 2** as described below, which is appropriate for a Protective Environment installation:

LEVEL	TEST VOLTAGE on A.C.	TEST VOLTAGE on I/O
2	1 kV	0.5 kV

Final

Performance of the EUT complied to performance criterion 1 while subjected to Electrically Fast Transient Burst signals generated at Severity Level 2, on both the A.C. power line and the I/O data and control lines.

9.4 EN55022 EMI Radiated and Conducted Emissions

1.0 Introduction

Radio-Noise Emissions tests were performed according to the CISPR Pub. 22 1993, titled **"Measurement of Radio Interference Characteristics of Information Technology Equipment"**. The measuring equipment conforms to CISPR Pub. 16, Section 1, Specifications for Electromagnetic Noise and Field Strength Instrumentation.

Testing was performed at National Certification Laboratory in Ellicott City, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch. FCC acceptance was granted on May 26, 1993.

1.1 Summary

The **Gator Transmitter** complies with the limits for a Class B ITE device.

2.0 EMI Countermeasures

No modifications were made to the EUT, by the project engineer to assure compliance to Class B specifications:

3.0 Test Program

The EUT was set to full power and tuned to a specific channel during testing.

4.0 Test Configuration

The EUT and support equipment were setup on the test table in a manner which follows the general guidelines of CISPR 22 Section 8.1. The support equipment consisted of a Host computer, 50 ohm whip antenna, and RS-232 cable as prescribed in Section 8.1. The EUT was centered on the table with it's rear flush with the rear of the table.

The Host notebook PC was connected to the EUT via RS-232 cable, and placed on the test table with the EUT. The 50 ohm whip antenna was placed in various locations on the table..

I/O cables were placed on top of the table and moved in position to maximize emission levels. Cables were more than 40 cm from the ground plane during radiated and conducted tests.

5.0 Conducted Emissions Scheme

The EUT is placed on an 80 cm high 1 X 1.5 m non-conductive table. Power to the CPU is provided through a Solar Corporation 50 Ω/50 μH Line Impedance Stabilization Network bonded to a 2.2 X 2 meter horizontal ground plane, and a 2.2 X 2 meter vertical ground plane. The LISN has its AC input supplied from a filtered AC power source. A separate LISN provides AC power to the peripheral equipment. I/O cables are moved about to obtain maximum emissions.

The 50 Ω output of the LISN is connected to the input of the spectrum analyzer and emissions in the frequency range of 150 kHz to 30 MHz are searched. The detector function is set to quasi- peak and the resolution bandwidth is set at 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth for final measurements. All emissions within 20 dB of the limit are recorded in the data tables.

6.0 Radiated Emissions Scheme

The EUT was initially scanned in the frequency range 0.3 to 10 GHz indoors, at a distance of 1 meter to determine its emissions profile. The EUT was then placed on an 80 cm high 1 X 1.5 meter non-conductive motorized turntable for radiated testing on the 10-meter open area test site. The emissions from the EUT are measured continuously at every azimuth by rotating the turntable. Dipole and log periodic broadband antennas are mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna is varied between 1 and 4 meters. Cables are varied in position to produce maximum emissions. Both the horizontal and vertical field components are measured.

The output from the antenna is connected to the input of the spectrum analyzer. The detector function is set to quasi-peak. The resolution bandwidth of the spectrum analyzer system is set at 120 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. All emissions within 20 dB of the limit are recorded in the data tables.

To convert the spectrum analyzer reading into a quantified E-field level to allow comparison with the CISPR limits, it is necessary to account for various calibration factors. These factors include cable loss (CL) and antenna factors (AF). The AF/CL in dB/m is algebraically added to the Spectrum Analyzer Voltage in dbμV to obtain the Radiated Electric Field in dBμV/m. This level is then compared with the CISPR limit.

Example:

Spectrum Analyzer Volt: VdBuV

Composite Factor: AF/CLdB/m

Electric Field: EdBμV/m = VdBμV + AF/CLdB/m

Linear Conversion: BuV/m = Antilog (EdBμV/m/20)

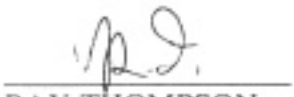
CISPR 22 CLASS B RADIATED DATA

CLIENT: Berkeley Varitronics
EUT: Gator
CPU:

10-METER TEST

FREQ MHz	POL H/V	SPEC A dBuV	AF/CL dB/m	E-FIELD dBuV/m	E-FIELD uV/m	LIMIT uV/m	MRGN dB
78.39	V	19.0	8.0	27.0	22.4	32.0	-3.1
84.19	H	20.0	9.0	29.0	28.2	32.0	-1.1
150.00	H	12.0	15.0	27.0	22.4	32.0	-3.1
165.42	H	12.0	16.0	28.0	25.1	32.0	-2.1
250.00	H	13.0	20.0	33.0	44.7	70.0	-3.9
278.76	H	10.0	21.0	31.0	35.5	70.0	-5.9
366.78	V	11.0	14.0	25.0	17.8	70.0	-11.9
500.10	V	15.0	18.0	33.0	44.7	70.0	-3.9
750.00	H	12.0	22.0	34.0	50.1	70.0	-2.9
876.84	V	12.0	23.0	35.0	56.2	70.0	-1.9
945.56	V	8.0	24.0	32.0	39.8	70.0	-4.9
1149.23	H	5.0	25.0	30.0	31.6	70.0	-6.9

TEST ENGINEER



RAY THOMPSON

CISPR 22 CLASS B CONDUCTED DATA

CLIENT: Berkeley Varitronics
EUT: Gator
CPU:

LINE 1 - NEUTRAL

FREQ MHz	QUASI PEAK dBuV	AVERAGE dBuV	QP LIMIT dBuV	AVG LIMIT dBuV
0.204	55.2	52.3	64	54
0.293	54.8	50.4	62	52
0.408	49.6	44.5	59	49
0.782	42.2	39.7	56	46
0.916	42.6	37.6	56	46

LINE 2 - PHASE

FREQ MHz	QUASI PEAK dBuV	AVERAGE dBuV	QP LIMIT dBuV	AVG LIMIT dBuV
0.204	45.8	41.8	64	54
0.289	52.6	49.3	62	52
0.397	49.2	45.4	59	49
0.779	42.1	37.5	56	46
0.911	43.2	40.1	56	46

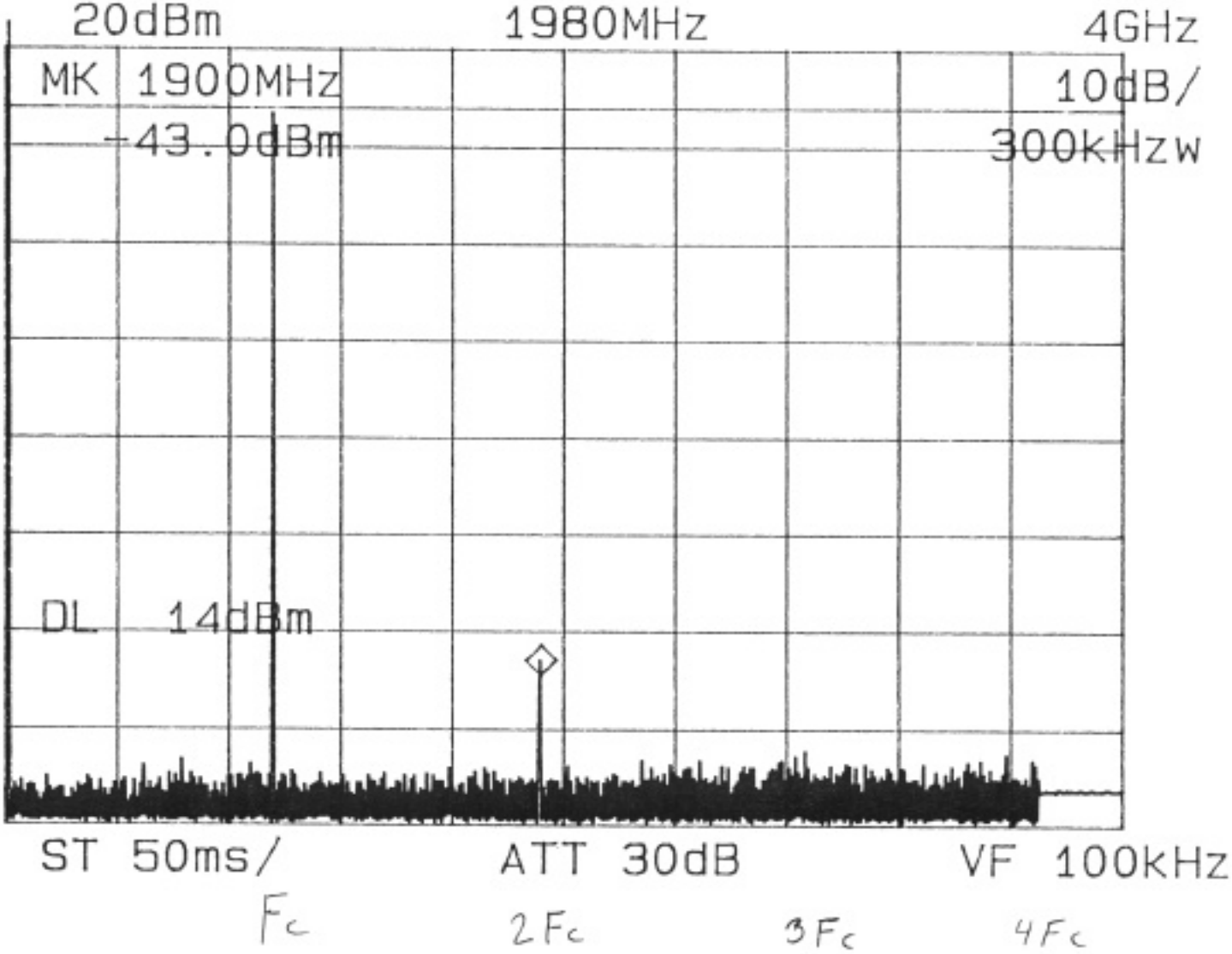
CONDUCTED SPURIOUS EMISSIONS

Frequency of Carrier = 944.50 MHz

TEST RESULTS

COMPONENT	FREQUENCY (MHZ)	RESULT (dBc)
HARMONIC	1889.00	- 57
HARMONIC	2833.50	- 67
HARMONIC	3778.00	- 70
HARMONIC	4722.00	- 72
HARMONIC	5667.00	- 74
HARMONIC	6611.50	- 73
HARMONIC	7556.00	- 75
HARMONIC	8500.50	- 77
HARMONIC	9445.00	- 77

Spurious Output



Peak RF Power - 30 dB Attn.

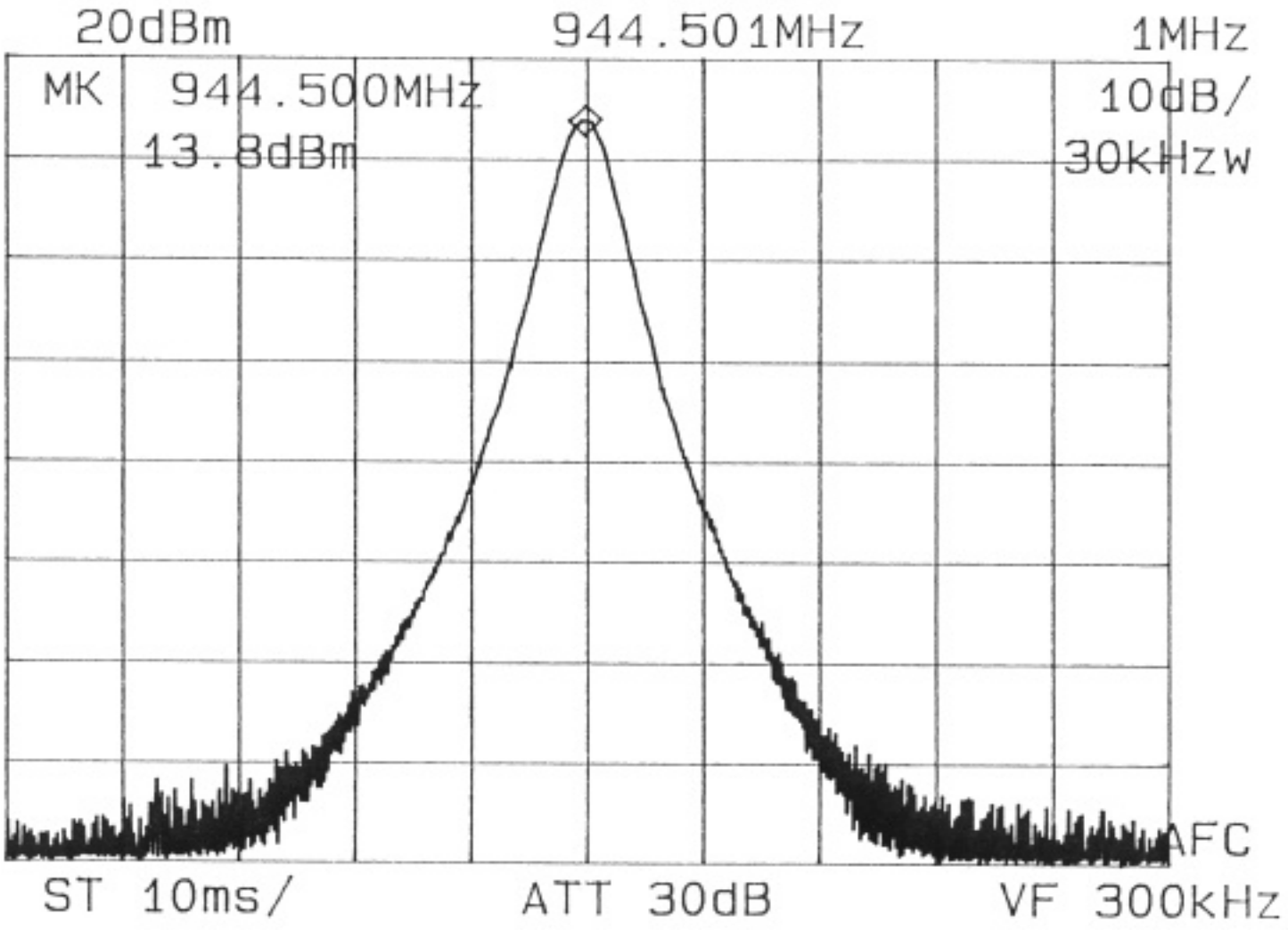


Table 1

Interface Cables Used

EUT to Notebook PC	1.8 meter bundled to 1 meter in length - unshielded
HOST Power	Shielded 120 VAC power cord
All other I/O cables such as monitor, keyboard, mouse are permanently attached to the peripherals - presume shielded.	
Note: There are no ferrite beads attached to any I/O cables for this test.	

Table 2

Measurement Equipment Used

The following equipment is used to perform measurements:

EQUIPMENT	SERIAL NUMBER
Wavetek 2410A 1100 MHz Signal Generator	1362016
EMCO Model 3110 Biconical Antenna	1619
EMCO Model 3146 Log Periodic Antenna	1222
Solar 8012-50-R-24-BNC LISN	924867
Advantest Model R4131D Spectrum Analyzer	54378A
Solar 8012-50-R-24-BNC LISN	927230
4 Meter Antenna Mast	None
Motorized Turntable	None
RG-233U 50 ohm coax Cable	None

NATIONAL CERTIFICATION LABORATORY
8370 Court Avenue, Suite B-1
Ellicott City MD 21043
(410) 461-5548

FCC REPORT OF TYPE ACCEPTANCE

for

Berkeley Varitronics Systems, Inc.
3 Price Drive
Edison, NJ 08817

FCC ID: GBL-PCS19

February 15, 1997

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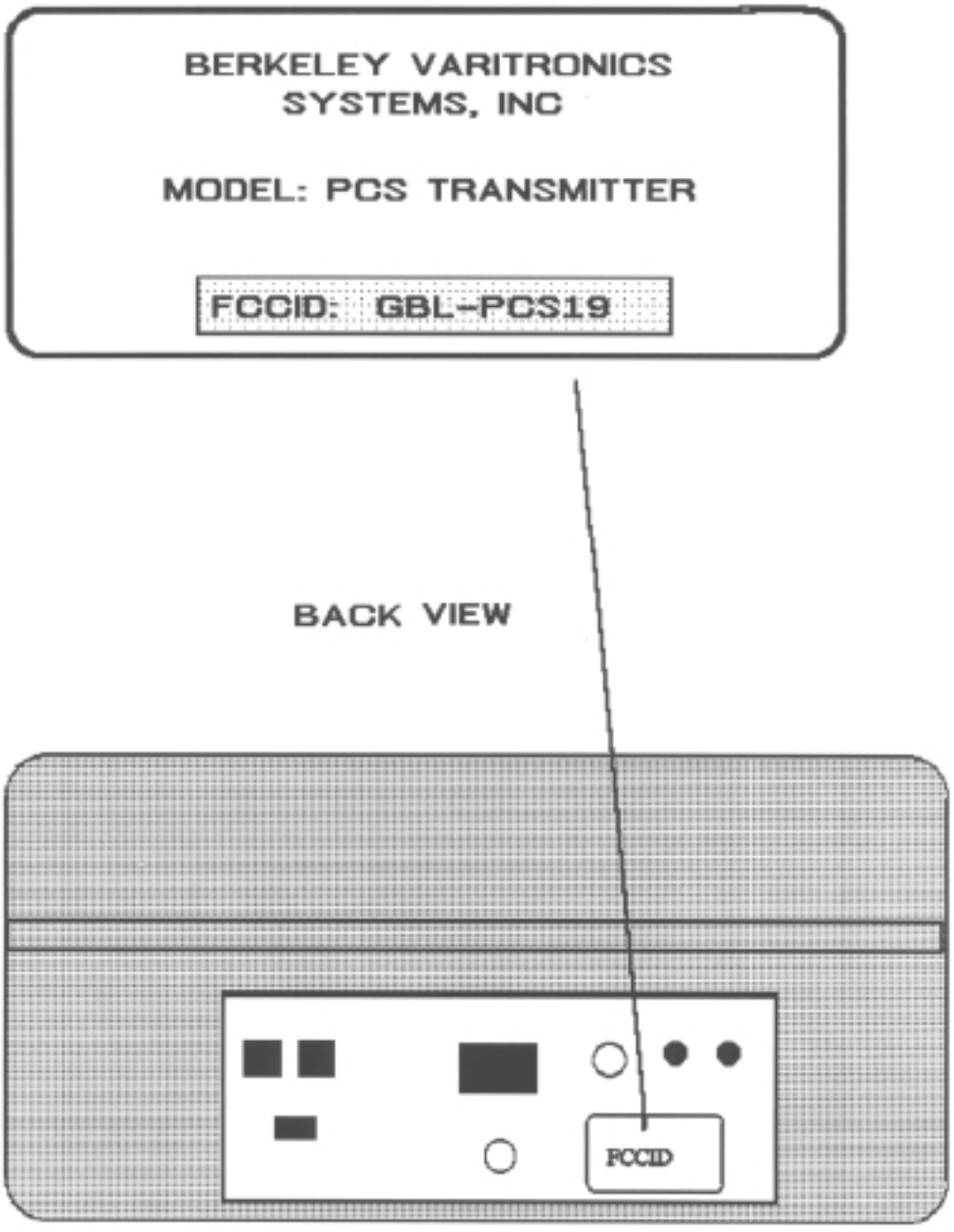
TABLES

EXHIBITS

FCC LABEL AND LOCATION



1.0 Introduction

This report has been prepared on behalf of Berkeley Varitronics Systems, Inc. to support the attached Application for Type Acceptance of a PCS Transmitter, for use under FCC Part 24, in the Personal Communication Service. The Equipment Under Test was the Berkeley Varitronics Systems, Inc. ***10 Watt PCS Transmitter.***

Radio-Noise Emissions tests were performed according to Part 2, Subpart J and 24.238 of the FCC Rules. The measuring equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

Testing was performed at National Certification Laboratory in Ellicott City, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch. FCC acceptance was granted on May 26, 1993.

1.1 Summary

The Berkeley Varitronics Systems, Inc. ***10 Watt PCS Transmitter*** complies with the technical standards for transmitters operating under FCC Rules Part 24.238, in the PCS Service.

2.0 Description of Equipment Under Test (EUT)

The EUT Features:

1.85 - 2.1 GHz Operation

10 Watts Max Power Rating

50 kHz minimum Tuning Steps

CW Signal Output only

400 milliwatts minimum Power Rating

50 Ohm RF Impedance

Absolute RF Output Power Display

120 VAC Operation

3.0 Test Program

Testing was performed on the EUT to demonstrate performance to the following FCC Rule Parts:

24.238 ---------- Power Rating

2.993 ---------- Radiated Harmonics & Spurious Levels

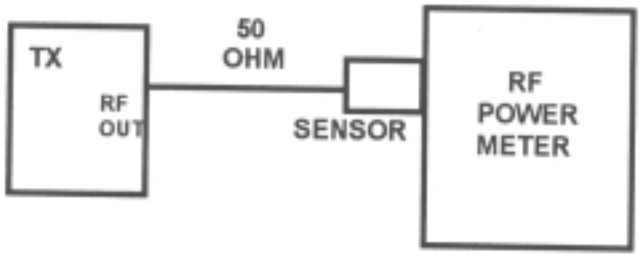
2.991 ---------- Conducted Harmonics & Spurious Levels

2.995 ---------- Frequency Stability

The following Section 4.0 of this report provides Testing Configurations and Data.

FCC Part 24.238 Power Output Rating

Test Configuration

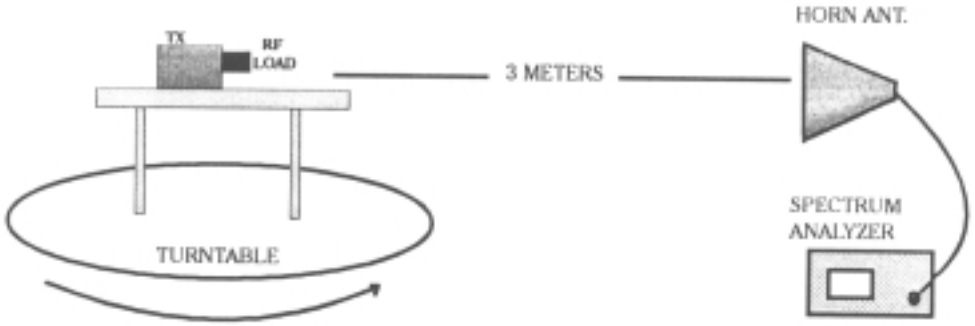


RF Power Reading = <u>10 Watts Max / 400 mW Min</u>

RADIATED EMISSIONS MEASUREMENT

TEST CONFIGURATION

RADIATED EMISSIONS ARE TAKEN ON A 3-METER OUTDOOR SITE



PEAK CARRIER FIELD STRENGTH
CALCULATION FOR HALF-WAVE DIPOLE @ 3 METERS

$$FS\ (V/m) = \sqrt{\frac{(49.2 * 10\ \ WATTS)}{3\ METERS}} = 7.39\ V/m\ @\ 3\ M$$

$$= 137\ dBuV/m\ @\ 3M$$

$$FS\ (V/m) = \sqrt{\frac{(49.2 * .4\ \ WATTS)}{3\ METERS}} = 1.47\ V/m\ @\ 3\ M$$

$$= 123\ dBuV/m\ @\ 3M$$

FCC PART 2.993 - RADIATED SPURIOUS EMISSIONS

Power Level = 40 dBm
Frequency of Carrier = 2.028 GHz
Limit = 43 + 10 (log 10 Watts) dB = 53 dBc

TEST RESULTS

LIMIT: -53 dB FROM PEAK CARRIER (84 dBuV/m @ 3 M)

COMPONENT	FREQUENCY (GHZ)	RESULT (dB FROM PEAK)
HARMONIC	4.056	- 57
HARMONIC	6.084	- 60
HARMONIC	8.112	- 58
HARMONIC	10.140	- 63
HARMONIC	12.168	- 66
HARMONIC	14.196	- 70
HARMONIC	16.224	- 71
HARMONIC	18.252	- 73
HARMONIC	20.280	- 77

FCC PART 2.993 - RADIATED SPURIOUS EMISSIONS

Power Level = 26 dBm
Frequency of Carrier = 2.028 GHz
Limit = 43 + 10 (log .4 Watts) dB = 39 dBc

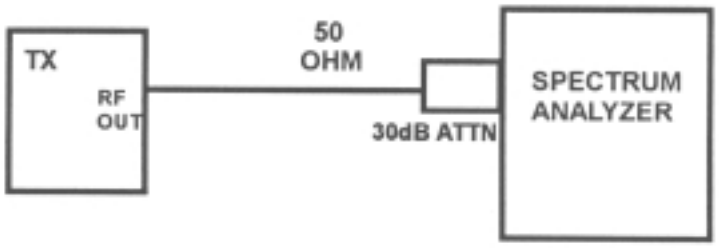
TEST RESULTS

LIMIT: -39 dB FROM PEAK CARRIER (84 dBuV/m @ 3 M)

COMPONENT	FREQUENCY (MHZ)	RESULT (dB FROM PEAK)
HARMONIC	4.056	- 59
HARMONIC	6.084	- 63
HARMONIC	8.112	- 62
HARMONIC	10.140	- 66
HARMONIC	12.168	- 70
HARMONIC	14.196	- 67
HARMONIC	16.224	- 70
HARMONIC	18.252	- 75
HARMONIC	20.280	- 78

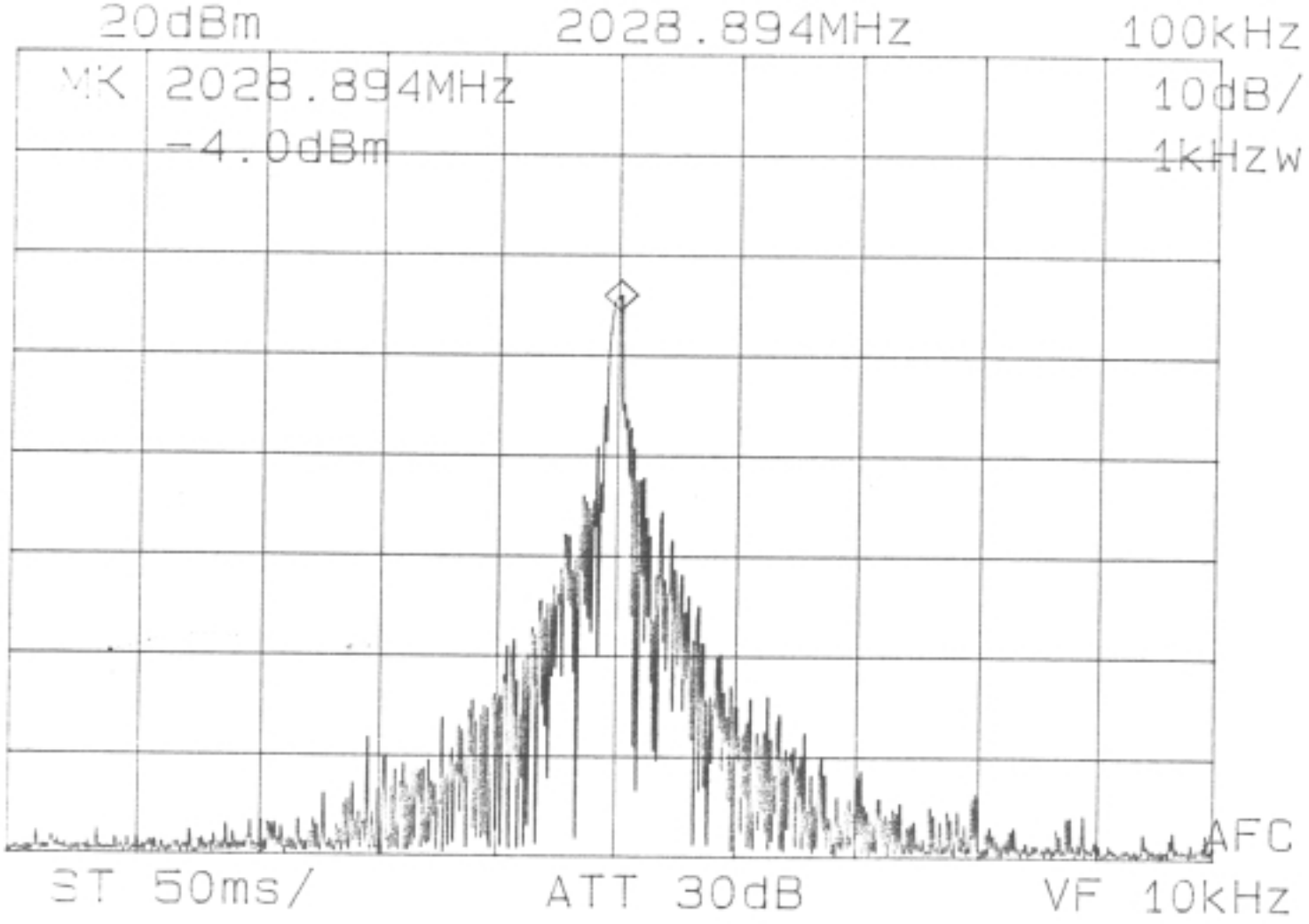
CONDUCTED EMISSIONS MEASUREMENT

TEST CONFIGURATION



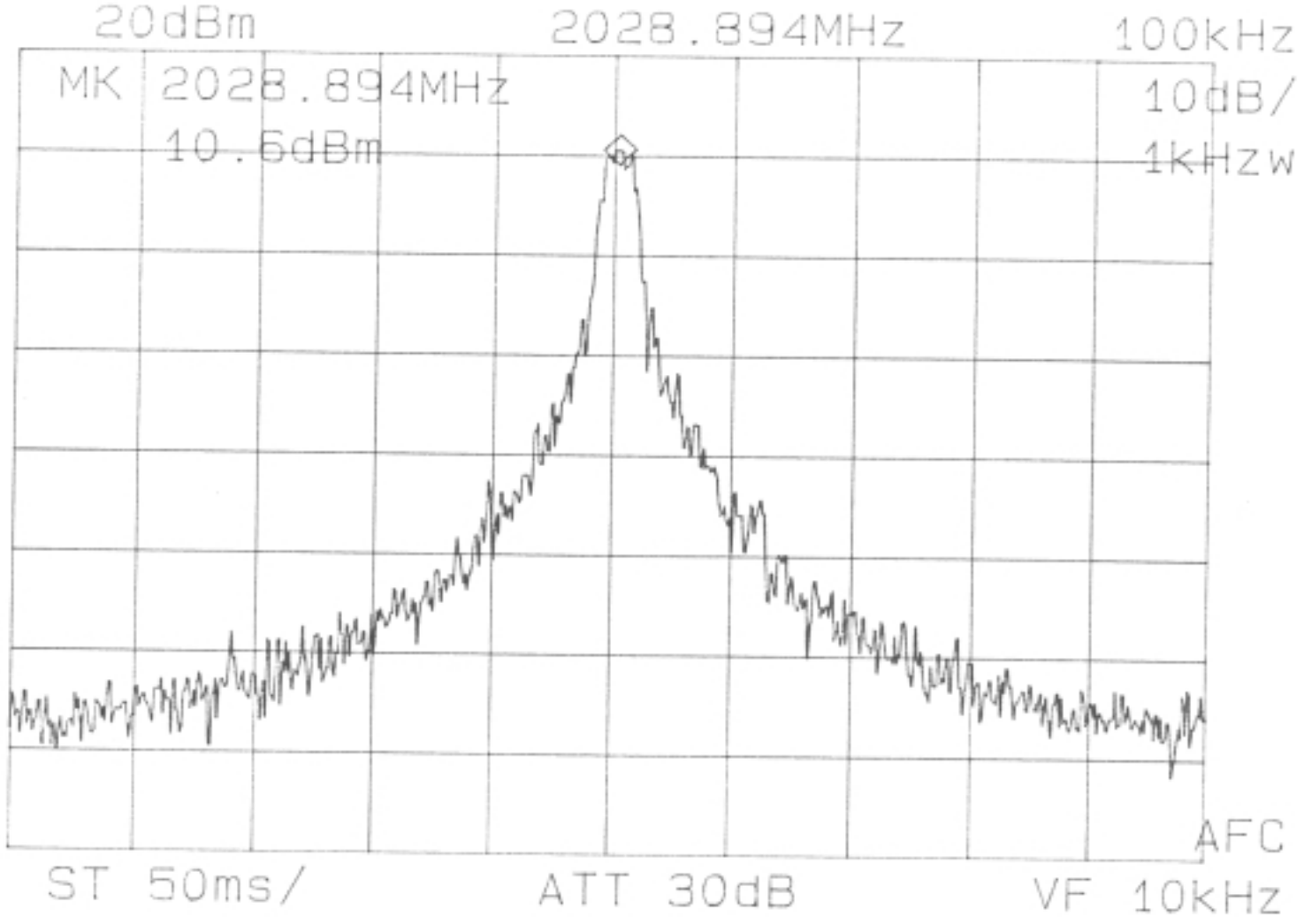
CARRIER OUTPUT LEVEL (30 dB EXT. ATTN)

UNMODULATED **.4 WATTS** **1 KHZ RES. BW**



CARRIER OUTPUT LEVEL (30 dB EXT. ATTN)

UNMODULATED **10 WATTS** **1 KHZ RES. BW**



FCC PART 2.991 - CONDUCTED SPURIOUS EMISSIONS

Power Level = 40 dBm
Frequency of Carrier = 2.028 GHz
Limit = 43 + 10 (log 10 Watts) dB = 53 dBc

TEST RESULTS

LIMIT: -53 dB FROM PEAK CARRIER (-13 dBm)

COMPONENT	FREQUENCY (MHZ)	RESULT (dB FROM PEAK)
HARMONIC	4.056	- 56
HARMONIC	6.084	- 58
HARMONIC	8.112	- 59
HARMONIC	10.140	- 63
HARMONIC	12.168	- 65
HARMONIC	14.196	- 64
HARMONIC	16.224	- 68
HARMONIC	18.252	- 66
HARMONIC	20.280	- 70

FCC PART 2.991 - CONDUCTED SPURIOUS EMISSIONS

Power Level = 26 dBm
Frequency of Carrier = 2.028 GHz
Limit = 43 + 10 (log .4 Watts) dB = 39 dBc

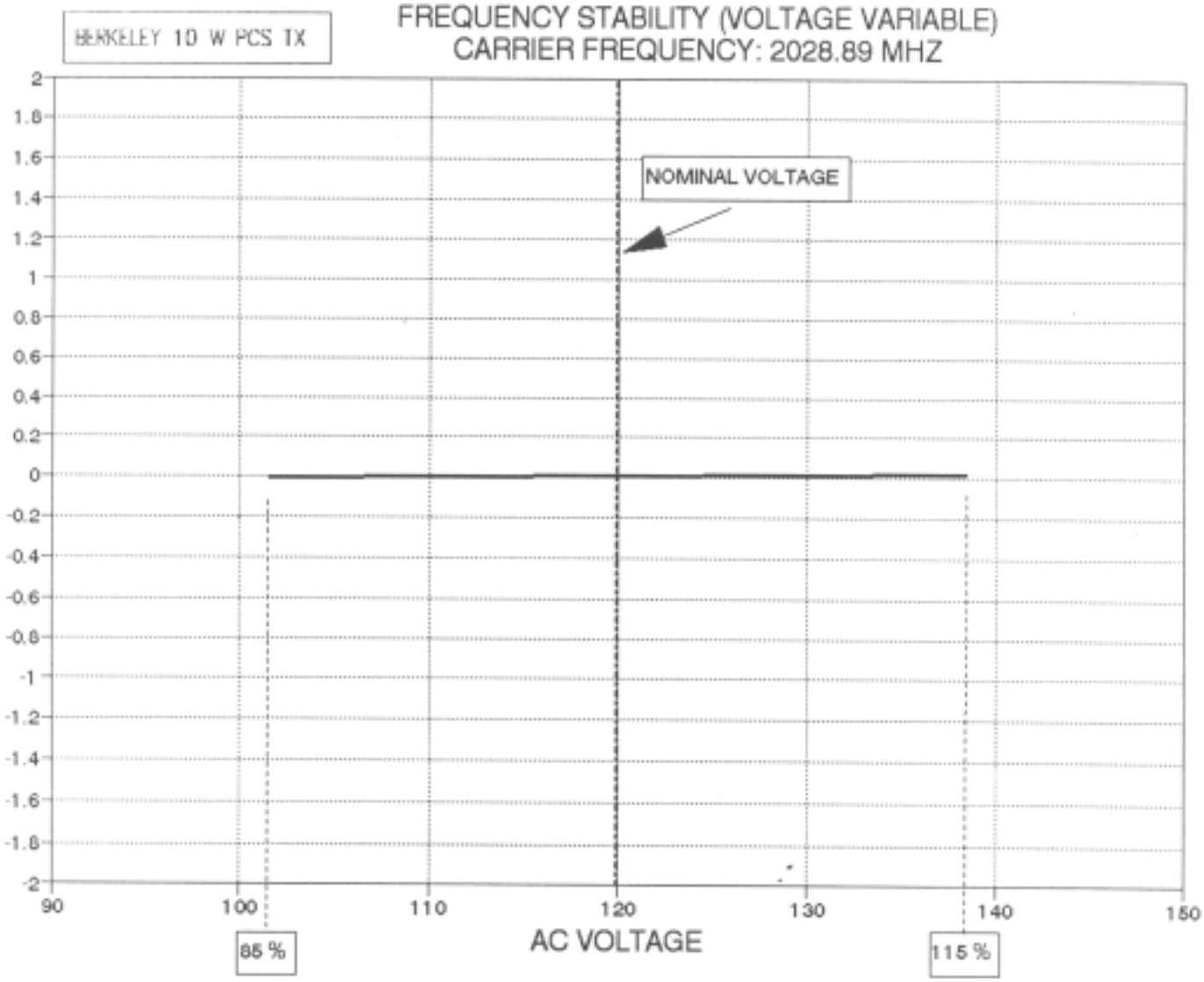
TEST RESULTS

LIMIT: -39 dB FROM PEAK CARRIER (-13 dBm)

COMPONENT	FREQUENCY (MHZ)	RESULT (dB FROM PEAK)
HARMONIC	4.056	- 55
HARMONIC	6.084	- 56
HARMONIC	8.112	- 58
HARMONIC	10.140	- 57
HARMONIC	12.168	- 60
HARMONIC	14.196	- 64
HARMONIC	16.224	- 63
HARMONIC	18.252	- 68
HARMONIC	20.280	- 69

FCC PART 2.995 - FREQUENCY STABILITY

The following charts reveal the Frequency Tolerance of the transmitter carrier frequency as a function of Temperature and Supply Voltage. The charts confirm the rated tolerance of +/- 1 kHz.


BERKELEY 10 W PCS TX
FREQUENCY STABILITY (VOLTAGE VARIABLE)
CARRIER FREQUENCY: 2028.89 MHZ
NOMINAL VOLTAGE
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
-2
90
100
110
120
130
140
150
85 %
AC VOLTAGE
115 %

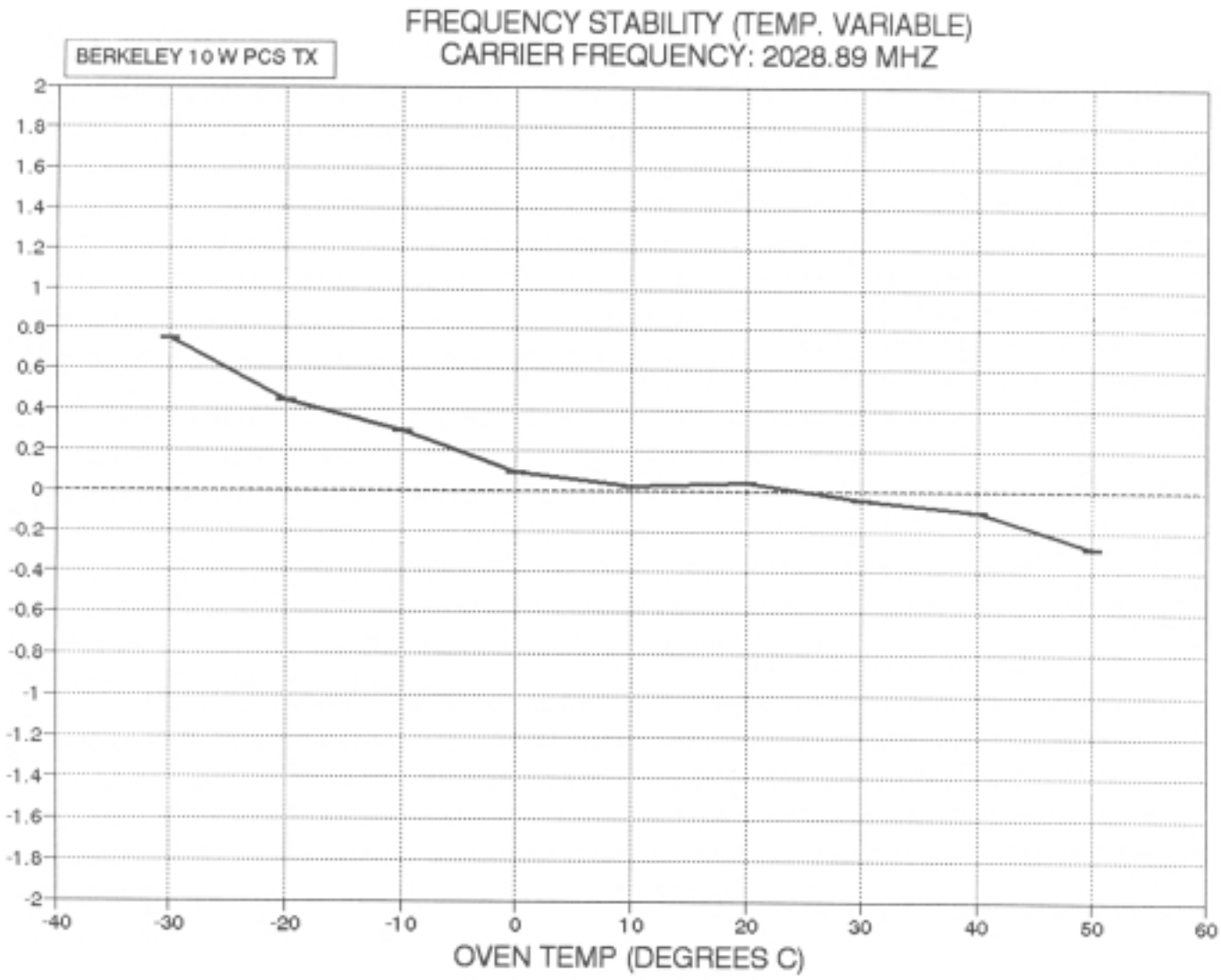

FREQUENCY STABILITY (TEMP. VARIABLE)
CARRIER FREQUENCY: 2028.89 MHZ
BERKELEY 10 W PCS TX
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
-2
-40
-30
-20
-10
0
10
20
30
40
50
60
OVEN TEMP (DEGREES C)

Table 1

Measurement Equipment Used

The following equipment is used to perform measurements:

EQUIPMENT	SERIAL NUMBER
EMCO Model 3115 Double Ridgeguide Horn Antenna	3807
EMCO Model 3110 Biconical Antenna	1619
EMCO Model 3146 Log Periodic Antenna	1222
HP 8482B Power Sensor	
Thermotron S-16 Temperature Chamber	534-84
HP 437B Power Meter	10238-F29
Bird 8306-300-N 30dB Attenuator	29198-39151-5
Advantest TR4133B Spectrum Analyzer	54432A
Decibel DB4303B 100 Watt/50 ohm RF Load	D34512-1

PCS TRANSMITTER FUNCTIONAL BLOCK DIAGRAM

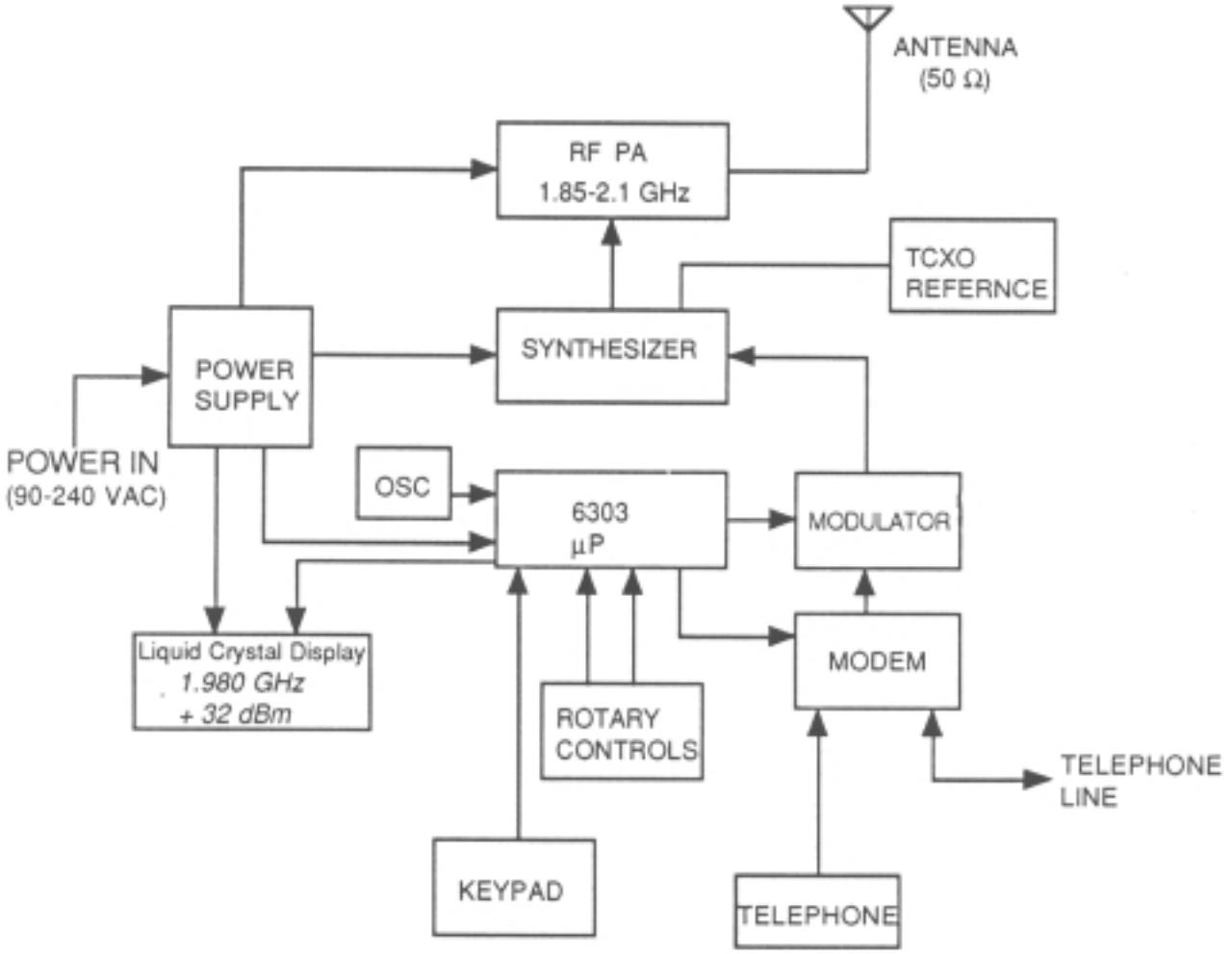


Figure 14