BANTAM INSTRUMENTS

SATELLITE UP/DOWN LINK SPECTRUM ANALYZER
MODEL 470A

OPERATING MANUAL

SATELLITE UP/DOWN LINK SPECTRUM ANALYZER

MODEL 470A

Operating Manual

DECLARATION OF CONFORMITY

CE

Manufacturer: BANTAM INSTRUMENTS, Inc.
197 South Murphy Avenue
Sunnyvale, CA 94086
USA

We hereby declare that the equipment herein conforms to the harmonized standards of the following European Commission Directives: 89/336/EEC and 72/23/EEC

Product Name: Satellite Up/Down Link Spectrum Analyzer

Model Number: 470A

Under 89/336/EEC as amended by 92/31/EEC, and 93/68/EEC

In accordance with EN 61326:1997, Emission:

EN 61326:1997 Class B radiated and conducted emissions

In accordance with EN 61326:1997, Immunity:

EN 61000-4-2:1998 Electrostatic Discharge: ±4 kV contact, ±8 kV air
EN 61000-4-3:1998 Radiated Immunity: 3 V/m
EN 61000-4-4:1995 Electrical Fast Transients / Burst: ±1 kV AC, ±0.5 kV I/O
EN 61000-4-5:1995 Surges: ±1 kV differential mode, ±2 kV common mode
EN 61000-4-6:1996 Conducted Immunity: 3V
EN 61000-4-11:1994 Supply Dips and Variations: 100%

Under 73/23/EEC as amended by 93/68/EEC

In accordance with 61010-1:1993 with amendments A1 and A2 1995, Product Safety

The product complies when used with Company supplied power supply.

Robert Bathiany

Robert Bathiany
Vice President

March 10, 2004
Date

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Chapter 3

Chapter 1
General Information

Introduction

This chapter provides basic information regarding the Model 470A Satellite Up/Down Link Spectrum Analyzer. Included are a basic description, battery and charging information, warranty, and performance specifications.

Description

The Model 470A is a handheld Spectrum Analyzer covering the frequency range of 500 kHz to 199 MHz. It is battery operated, making it fully portable and self-contained. Its small size and light weight makes it ideal for personal bench top testing by engineers and technicians and for field service applications at remote sites.

The Model 470A has an RS-232 serial interface which can be used to download measurement data to a computer. The PC Enhancement Software supplied with the Model 470A allows measurement data to be downloaded to a personal computer and to be printed to any Windows compatible printer or stored on the hard drive for later use. The computer must have a Windows[1] 95 or later operating system. The serial interface cable is included for connection between the Model 470A and a personal computer. Instructions for operating the PC Enhancement Software is contained in chapter 3.

[1]Windows is a Trademark of Microsoft Corporation

Items included with your Model 470A Personal Spectrum Analyzer

The following items are included as standard with every Model 470A Personal Spectrum Analyzer:

        Battery Charger (p/n 9000-0001)
        SMA Male to BNC Female Adapter Cable (p/n 9000-0007)
        PC Enhancement Software (p/n 9000-0006)
        Serial Interface Cable (p/n 9000-0003)
        Soft Carrying Case (p/n 9000-0004)
        Operating Manual (p/n 9900-0006)
        One Year Warranty

Options and Accessories

The following options and accessories may be ordered:

Option 001	Warranty Extension to 3 years
Option 002	Backlight for use in low illumination applications
9010-0002	Cigarette Lighter 12 VDC adapter
9011-0001	10 dB SMA Attenuator
9011-0002	20 dB SMA Attenuator
9011-0003	30 dB SMA Attenuator
9011-0004	40 dB SMA Attenuator
9050-0001	Transit Case for 400 Series Spectrum Analyzers

Option 001 must be ordered at time of purchase. If Option 002 is ordered after time of purchase, the Model 470A must be returned to the factory for installation of the backlight. The cost of factory installation of option 002 will be higher if not ordered at time of purchase. Consult you local Bantam Instruments representative for information.

Battery and Charging Information

The Model 470A is capable of greater than 2 hours of continuous operation from the internal rechargeable NiMH (nickel-metal-hydride) batteries, but internal power management software generally allows operation across an entire work day.

The Model 470A can be continuously powered from 100-240 VAC, 50/60 Hz line voltage using the supplied charger. While being powered, the internal batteries will also be charged, but at a lower rate. The 470A can also be powered or the batteries recharged from a 12V DC source such as a vehicle battery by using the optional 9010-0002 cigarette lighter adapter.

Use only factory supplied NiMH batteries. The use of other types of batteries may cause damage which will not be covered under the warranty. When replacing batteries, the entire set of four must be replaced at the same time. Never use batteries of varying ages.

Warranty

Bantam Instruments warrants its products to be free from defects in materials and workmanship for a period of 12 months. Under the provisions of this warranty, Bantam Instruments will repair or replace the product. This warranty, however, shall not apply to any damage caused by improper use or the application of voltages to the input connector which exceed the maximum specified limits. Please contact your local representative for information on service under this warranty.

There are no user-serviceable components inside of the Model 470A. Refer service to qualified service personnel. Do not remove the back cover of the instrument. To do so will void the factory warranty.

Performance Specifications

FREQUENCY	
Frequency Range:	500 kHz to 199 MHz
Frequency Resolution, Span >100 kHz:	100 kHz
Frequency Resolution, Span ≤100 kHz	10 kHz
Span:	0 to Entire Band
Span Resolution:	100 kHz
Frequency Markers:	3
Marker Resolution (Frequency):	1% of span or 10 kHz
Marker Resolution (Amplitude):	0.1 dB
Marker Readout Accuracy:	1% of span ±5 ppm
Resolution Bandwidth, 3 dB:	10 kHz, 120 kHz
Video Bandwidth:	300 Hz, 3 kHz

GENERAL	
Display Backlight (Optional)	Electro-luminescent
Operating Temperature Range:	0°C to 40°C
Storage Temperature:	-10°C to 50°C
Line Power:	6VA
DC Power (12-14 VDC):	0.4A max.
Dimensions, mm:	193H x 102W x 33D
Dimensions, inches:	7.6H x 4.0W x 1.3D
Weight:	1.2 lbs (0.55 kg)
Safely and Electromagnetic Compatibility:	CE Mark Compliance

AMPLITUDE

Measurement Range:	-35 dBm to –105 dBm
Displayed Average Noise Level at 120 kHz Resolution Bandwidth, typical:	-95 dBm, span <10 MHz -90 dBm, span >10 MHz
At 10 kHz Resolution B/W, typical:	-105 dBm, span <10 MHz -100 dBm, span >10 MHz
Maximum Safe Input Level:	+23 dBm, 50 VDC
Scale:	1, 2, 5, 10, 20 dB/div
Scale Units:	dBm, dBµV
Intermods (3rds, -35 dBm signals):	-75 dBc, typical
Harmonic Distortion (-35 dBm):	-75 dBc, typical
Amplitude Accuracy, typical:	±2.5 dB, -40 to –75 dBm
Detection Modes:	Normal, Quasi-Peak, Peak Hold, and Averaging

OTHER FEATURES

Save/Recall, Setups:	20
Save/Recall, Traces:	20
RS-232 Interface Speed:	9600, 57600 Baud
RS-232 Interface Connector:	DB-9 (Female)

Chapter 2
Operating Instructions

Introduction

This chapter covers the operating controls and interface connectors of the Model 470A Satellite Up/Down Link Spectrum Analyzer. The figure on the next page shows the Model 470A front panel and the section below identifies the function of each item.

The remaining sections of this chapter cover operation of the Model 470A such as the setting of frequencies, reference, limit lines, and scale. Markers and marker functions are also covered.
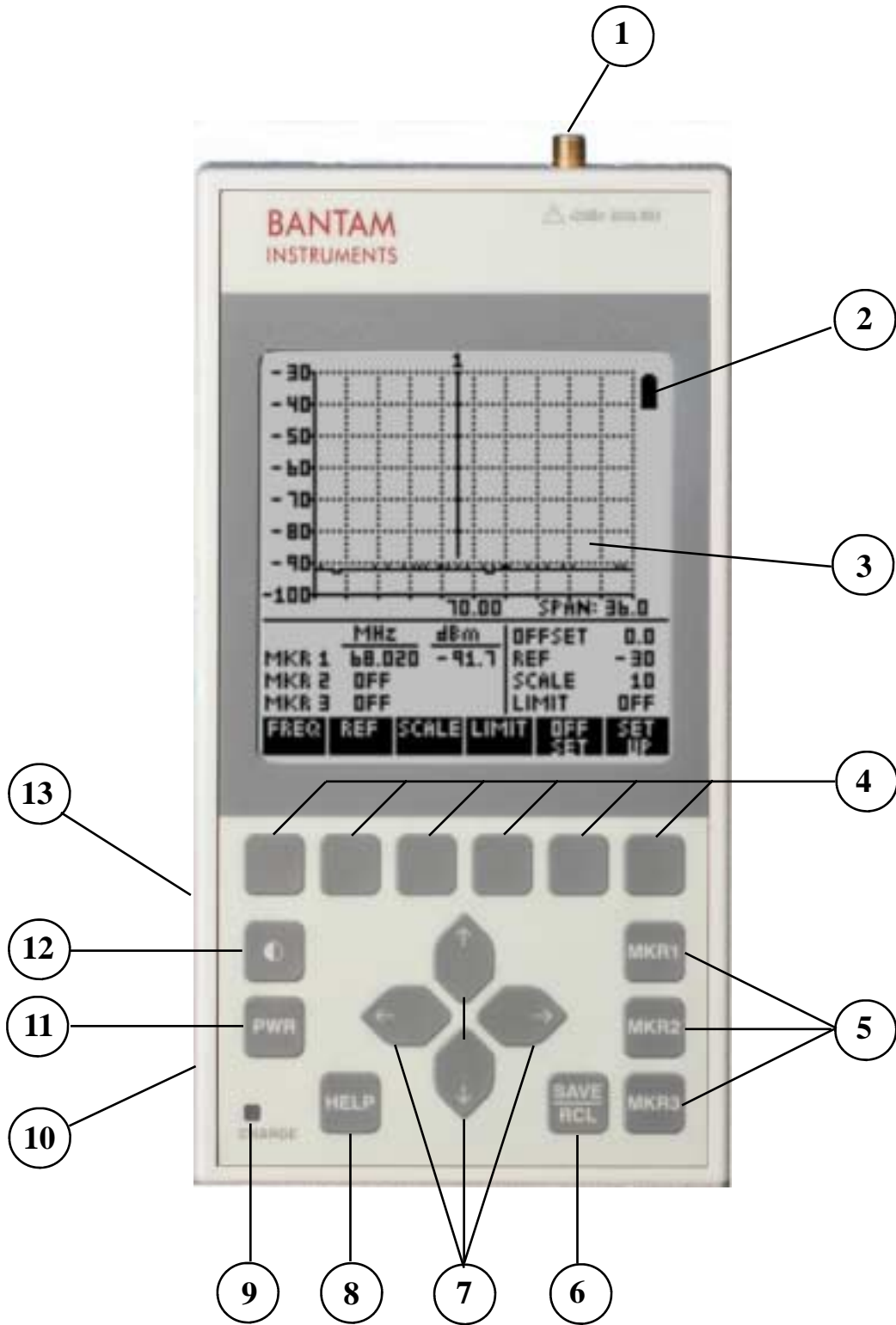
Basic Controls and Connectors:

(1)　　**RF Input Connector.** SMA female connector. Signals to be measured enter through this connector.

⚠　　*CAUTION. RF signals greater than +23 dBm (200 mW) and/or DC voltages exceeding 50 volts will cause damage to the input circuitry of the spectrum analyzer. Such damage is not covered under the warranty.*

(2)　　**Battery Icon.** Indicates battery charge in approximately 25% increments. When full discharge is indicated, approximately 4% of charge is remaining and instrument should be recharged immediately.

(3)　　**Liquid Crystal Display (LCD).** High resolution display for readout of measurement data and measurement parameters.

(4)　　**Soft Keys.** The function of these six keys is indicated directly above on the Liquid Crystal Display.

(5)　　**Marker Keys.** These three keys activate and control the three markers.

(6)　　**Save / Recall Key.** This key enables the save and recall of measurement set-ups and traces. This key also enables hard copy printout when a Personal Computer is connected to the serial interface (Number 14).

(7)　　**Cursor Keys.** These four keys up, down, left, and right, enable the selection of parameters and the increase or decrease of measurement settings.

Figure 1 – Model 470A Front Panel

Basic Controls and Connectors (Continued)

① **8**   **Help Key.** Pressing this key automatically displays a help screen relating to the operation being performed by the instrument. An index of help topics can also be accessed by pressing this key.

9   **Charge Indicator.** Indicates battery charging status when an external charger is connected. Glows yellow while the batteries are being charged and green when the batteries are fully charged. The green indication will only appear when charging with the instrument turned off. The indicator will flash and the charging will terminate if the batteries are above 55°C.

10   **External DC Power Connector.** For connection of external battery charger. The Model 470A is supplied with an external 100-240 VAC 50/60 Hz charger. An optional adapter for connection to an external 12 VDC power source is available.

11   **Power On / Off Key.** Pressing this key turns the instrument on or off.

12   **Contrast Adjustment Key.** Pressing this key brings up a screen on the LCD for the adjustment of display contrast. If display is not visible due to severe misadjustment of the LCD contrast, then holding this key down for several seconds will rapidly cycle the contrast adjustment through its range and a display should be visible. The contrast can then be adjusted for an appropriate display. This key also accesses turning on or off the optional LCD backlight.

13   **Serial Interface.** DB-9 female connector. For connection to the RS-232 serial interface of a Personal Computer.

```
--- DISPLAY CONTRAST ADJUST ---

   USE ARROW KEYS TO ADJUST
         ← OR →

  ┌─────────────────────────┐
  │ ███████████             │
  └─────────────────────────┘
  LIGHTER              DARKER



                          PRIOR
                          MENU
```
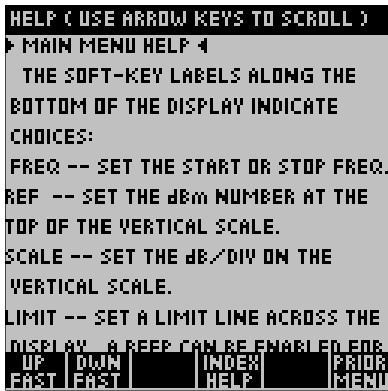
Contrast

Pressing the front panel contrast key will bring up the contrast menu shown at the left. Use the left or right front panel cursor keys to lighten or darken the display. If the display is not visible, holding down the front panel contrast key will rapidly cycle the contrast adjustment through its range. The contrast can then be adjusted for an appropriate display.

```
--- DISPLAY CONTRAST ADJUST ---

   USE ARROW KEYS TO ADJUST
         ← OR →

  ┌─────────────────────────┐
  │ ███████████             │
  └─────────────────────────┘
  LIGHTER              DARKER



  ┌PUSH TO TURN ON BACKLIGHT.
  ↓
  ON  OFF               PRIOR
                        MENU
```
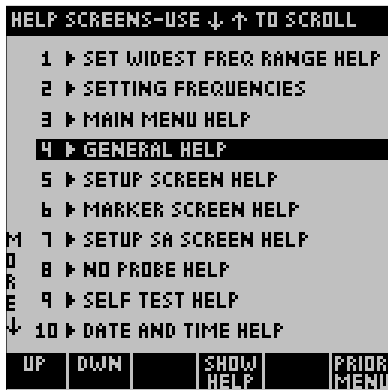
Backlight (Optional)

If Option 002 Backlight is installed, additional information will appear on the contrast menu (as shown at left) to turn the backlight on or off. If "PUSH TO TURN ON BACKLIGHT" does not appear, the backlight option is not installed in your instrument. Your 470A may be returned to the factory for backlight installation. Consult your local sales representatives for details.

```
HELP ( USE ARROW KEYS TO SCROLL )
▶ MAIN MENU HELP ◀
  THE SOFT-KEY LABELS ALONG THE
BOTTOM OF THE DISPLAY INDICATE
CHOICES:
FREQ -- SET THE START OR STOP FREQ.
REF -- SET THE dBm NUMBER AT THE
TOP OF THE VERTICAL SCALE.
SCALE -- SET THE dB/DIV ON THE
 VERTICAL SCALE.
LIMIT -- SET A LIMIT LINE ACROSS THE
DISPLAY. A BEEP CAN BE ENABLED FOR
UP   DWN        INDEX      PRIOR
FAST FAST        HELP      MENU
```

Help

Help screens are accessed by pressing the HELP key on the front panel. The help screens are context-sensitive. The help information will relate to the current measurement process underway. Pressing the soft key labeled "PRIOR MENU" will return to the measurement in progress. The HELP screens may be scrolled rapidly using the soft keys or more slowly using the "Up" and "Down" cursor keys. A typical HELP menu is shown at the left.
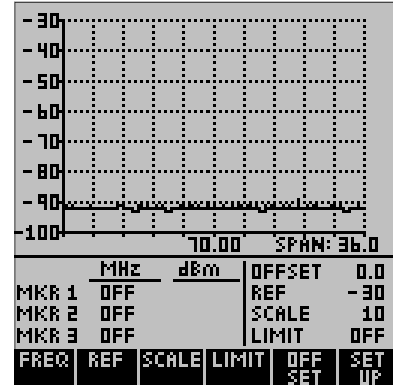
```
HELP SCREENS-USE ↓ ↑ TO SCROLL
    1 ▶ SET WIDEST FREQ RANGE HELP
    2 ▶ SETTING FREQUENCIES
    3 ▶ MAIN MENU HELP
    4 ▶ GENERAL HELP
    5 ▶ SETUP SCREEN HELP
    6 ▶ MARKER SCREEN HELP
M   7 ▶ SETUP SA SCREEN HELP
O   8 ▶ NO PROBE HELP
R
E   9 ▶ SELF TEST HELP
↓  10 ▶ DATE AND TIME HELP
 UP  DWN        SHOW       PRIOR
                HELP       MENU
```

Help Index

Pressing the soft key labeled HELP INDEX, a list of topics is displayed. The appropriate help topic can then be easily selected.

Model 470A Operating Manual   **9**
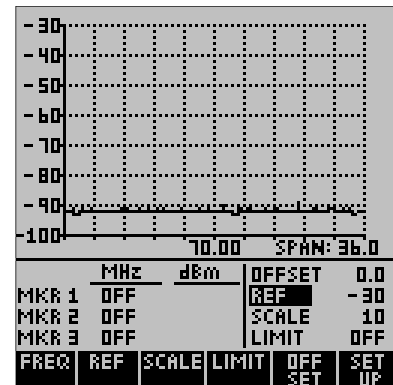
Main Menu

The Main Menu is the core menu in the operation of the Model 470A. When the instrument power is turned on, or when a stored setup or stored trace is recalled, this is the menu which is first displayed. From this menu it is straightforward to adjust measurement parameters such as Scale, Reference, Limit Line, Frequency, and to access the instrument Set-Up menus.
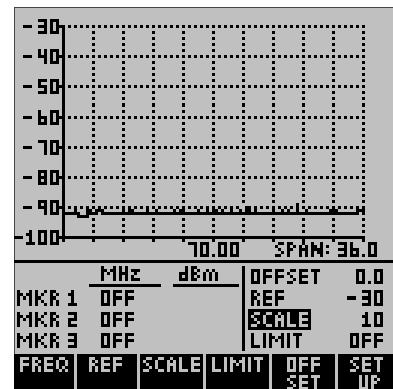
Reference Level

The Reference Level is the value associated with the top line of the graticule. In the example to the right, it is set to –30 dB which is the factory default value. To change the Reference value, press the soft key directly under "REF" at the bottom of the screen. Using the "Up" and "Down" cursor keys, the reference value can be set between +80 dB and –150 dB in 1 dB increments.
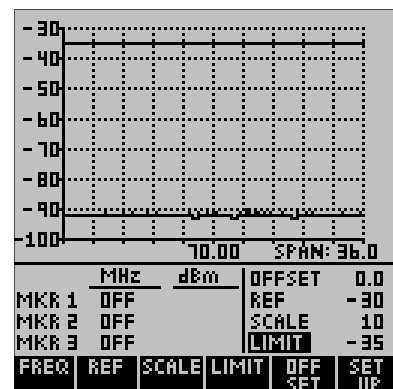
Scale

The scale is the dB per division associated with the vertical display. In the example at the right it is set to 10 dB which is the factory default value. To change the scale, press the soft key directly under "SCALE" at the bottom of the screen. Using the "Up" or "Down" cursor keys, the scale can be set to 1, 2, 5, 10, or 20 dB per division.
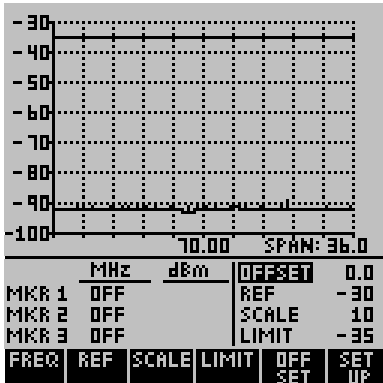
Limit Line

A Limit Line can be added as an amplitude guide for measurement data. The factory default for the Limit Line is "OFF". To activate the Limit Line, press the soft key directly below "LIMIT" and then use the "Up" and "Down" cursor keys to set the value desired. The Limit Line can be set anywhere on the graticule in 1 dB increments. In the example at the right it is set at –35 dB. To turn the Limit Line off, press the "LIMIT" soft key again.
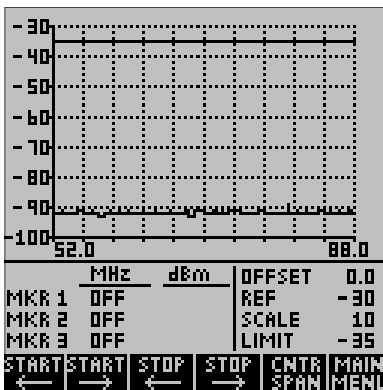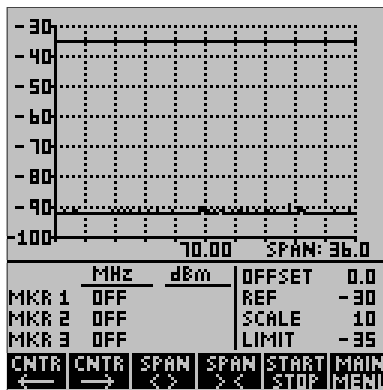
Offset

When an external amplifier or attenuator is used, it is often convenient to offset the measurement trace by the dB gain of the amplifier or dB attenuation of the attenuator. This is accomplished by pressing the OFFSET key. Positive values will move the trace upward and are used to reference the measurement to the input of the external attenuator. Negative values are used for external amplification, and move the trace downward. If no external amplifier or attenuator is used, the offset value should remain at 0. The factory preset value is 0.

Frequencies

The measurement frequency range can be adjusted by going to the Main Menu and then pressing the soft key directly under "FREQ" at the bottom of the screen. The frequency menu will come up in one of two formats, either "START STOP" or "CENTER SPAN".

In the example at left, frequency is displayed as Start and Stop Frequency. In the example just below it, frequency is displayed as Center Frequency and Span. When in the Start / Stop frequency mode, the display mode can be changed to Center / Span by pressing the soft key directly below "CNTR SPAN". When in the Center / Span mode, the display mode can be changed to Start / Stop by pressing the soft key directly below "START STOP". The factory default setting is the Start / Stop mode with the full frequency range of 1 MHz to 1024 MHz.

The START STOP frequency mode is often easier to use for wide frequency scans. The CNTR SPAN frequency mode is very convenient for narrow scans, as the scanning window can easily be moved up or down in frequency by changing the center frequency.
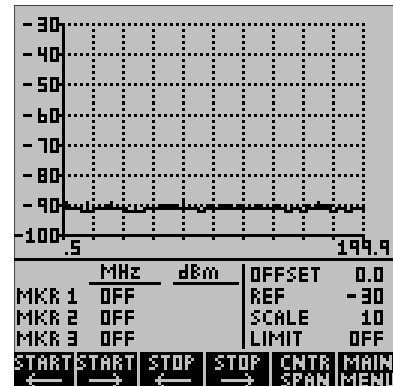
The soft keys can be used to increase or decrease the Start / Stop or Center / Span frequencies. Pressing the soft key once will make a change of 1 MHz. Holding the key down will increase the rate of frequency change.

If a large frequency change needs to be made, the cursor keys may be used. When in the Start / Stop mode, the left and right cursors control the start frequency and the up and down cursors control the stop frequency. When in the Center / Span mode, the left and right cursor keys control the center frequency and the up and down cursor keys control the span.
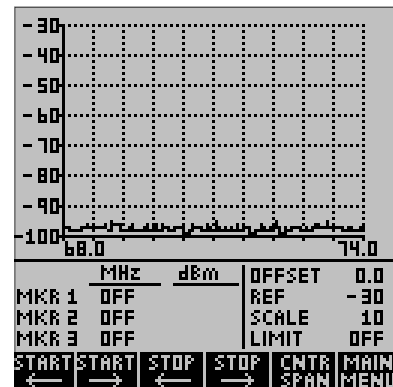
Frequency Zoom

When in the Start / Stop mode, it is possible to zoom out to the full frequency range of the Model 470A and then quickly return to the original frequency range. This is very handy for making narrow band measurements and then quickly zooming out to check surrounding frequencies.

Pressing the START (left arrow) and STOP (right arrow) soft keys simultaneously quickly changes the start and stop frequencies to the full frequency range (500 kHz to 199 MHz).

Press simultaneously to zoom out to maximum frequency range of the 401B, 1 MHz to 1024 MHz.

Pressing the START (right arrow) and STOP (left arrow) keys quickly returns to the original frequency setting.

Press simultaneously to return to original frequency range.

```
--- SETUP MENU ---

1 - SETUP SPECTRUM ANALYZER

2 - SETUP SERIAL INTERFACE TO PC

3 - SETUP PRESET FREQ RANGE



   1     2     3                    MAIN
                                    MENU
```

Set Up Menu

The Set Up menu, accessible from the Main menu, has three pages. The first page selects Spectrum Analyzer settings such as Resolution Bandwidth, Video Bandwidth, Detection Mode, Averaging, Key Click, Limit Beep, Graticule, Sleep Mode, Measurement Parameter (dBm or dBµv), Clock and Date Setting, Self Test, and Return to Factory Defaults. This page will be discussed in this section.

The second page sets up the serial interface for communication with a personal computer (PC) using the Bantam Instruments software supplied with your Model 470A Personal Spectrum Analyzer. This is covered in Chapter 4 which discusses the operation of the Personal Computer interface software.

The third page sets up the instrument for preset frequency ranges which are convenient for 70 MHz and 140 MHz IF testing.

```
--- SETUP SPECTRUM ANALYZER ---

RES. B/W:     AUTO   10KHz  120KHz
VIDEO B/W:    AUTO   3KHz   300Hz
DETECTION:    NORM   PEAK   QUASI
AVERAGING:    OFF    ON
KEY CLICK:    OFF    ON
LIMIT BEEP:   OFF    ON
GRATICULE:    OFF    HORZ   H + V
SLEEP :       5MIN   15MIN  NEVER
UNITS :       dBm    dBuV

SET  SELF  PRE-          PRIOR MAIN
DATE TEST  SET           MENU  MENU
```

Set Up Spectrum Analyzer (Set Up Menu Page 1)

In the Set Up Spectrum Analyzer menu, items shown in reverse video are the selected items. The flashing reverse video is the location of the cursor. The cursor can be moved up and down among line items by using the cursor up and down keys. The cursor can be moved left and right along the line item selections using the cursor left and right keys. When leaving this setup menu via the PRIOR MENU or MAIN MENU soft keys, the menu selections are activated.

Resolution Bandwidth

The resolution Bandwidth (RES. B/W) can be 10 kHz or 120 kHz. In the AUTO mode the instrument automatically selects the most appropriate bandwidth for the measurement.
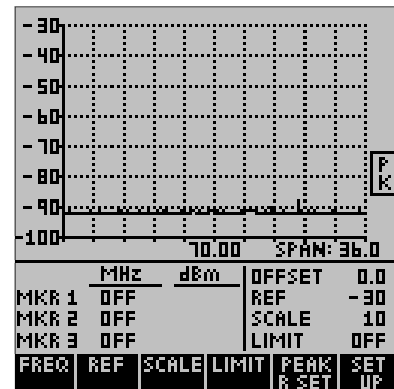
Video Bandwidth

The Video Bandwidth (VIDEO B/W) can be 3 kHz or 300 Hz. In the AUTO mode the instrument automatically selects the most appropriate bandwidth for the measurement.

Detection Mode

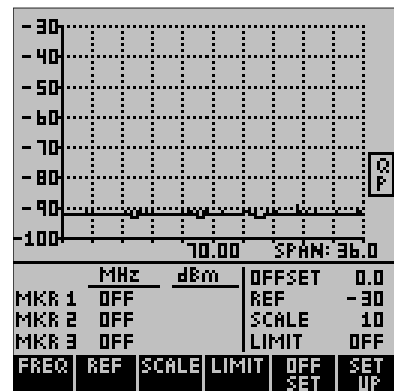Three types of detection may be selected; normal, peak, and quasi-peak.

Normal Detection displays the amplitude of a signal as measured during each measurement scan.

Peak Detection holds the highest amplitude of a signal from scan to scan. When peak detection is active, a small rectangle with the letters PK is displayed to the right of the graticule as shown to the right. To reset the peak detection memory, press the PEAK RESET soft key.
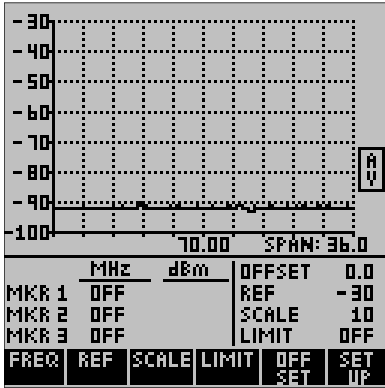
Quasi-peak is a detection mode which has a charge rate much faster than the discharge rate; therefore, the higher the repetition rate of the signal the higher the output of the quasi peak detector.

Quasi Peak detection is often used in EMC measurements as quasi-peak detectors weigh signals according to their repetition rate, which is a way of measuring their annoyance factor. Quasi-peak detection always gives a reading less than or equal to peak detection.

When in the Quasi Peak detection mode, a rectangle with QP in it is displayed to the right of the graticule.

Averaging

When averaging is on, the signal is averaged from trace to trace. This tends to bring signals up out of the noise so that they can be more easily measured. Averaging lowers the apparent noise as it is random. When averaging is on, a rectangle with AV will be displayed to the right of the graticule. Averaging can only be used when in the normal detection mode.

Key Click

When Key Click is on, an audible click is heard each time a front panel key is pressed.

Limit Beep

When limit beep is enabled, the instrument will beep after each sweep if the amplitude of the measurement data exceeds the limit line.

Graticule

The graticule may be turned off (OFF), display only horizontal lines (HORZ) or display both horizontal and vertical lines (H + V).

Sleep

To conserve battery power, the instrument can be set to go into a sleep mode if a button has not been pressed for a certain length of time. Time selections are 5 minutes (5 MIN), 15 minutes (15 MIN), or NEVER go into sleep mode. When in the sleep mode, pressing any key will return the instrument to the same measurement state it was previously in. When the charger is connected, the instrument does not go into the sleep mode.
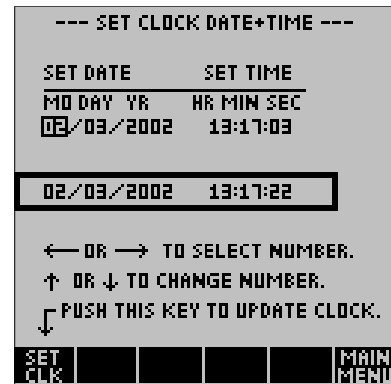
Units

Measurement display mode can be set for dBm (dB referenced to a milliwatt) or dBμv (dB referenced to a microvolt).

Setting Date and Time

To access date and time setting, press the soft key directly below "SET DATE". The screen at the right will appear. The date and time shown in the box at the center of the screen is that currently stored in the instrument. To change the date or time, use the cursor keys to change the settings. Exiting this menu will change the date to the new setting. Pressing the soft key under "SET CLK" will immediately reset the clock to the new time.

The clock is always in the 24 hour format. In other words, 3:00pm is displayed as 15:00. The data is always displayed in the month-day-year format.
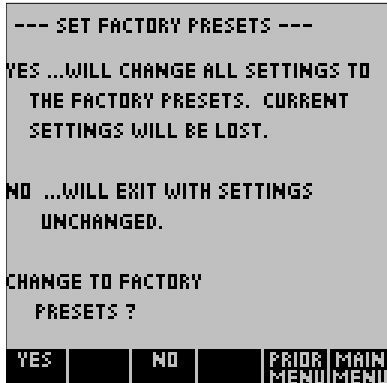
Self Test

Pressing SELF TEST will bring up the screen to the right. The instrument will conduct a self test and display the results (usually PASSED). The version of the instrument firmware is displayed along with the date, time, and internal instrument temperature. The power supply status is also indicated; either being charged from an external 12V source or powered by the internal batteries.

You will notice that this screen is also displayed for a few seconds at turn on. Each time power is activated, the instrument conducts a self test and a calibration sequence. The main menu is then displayed.
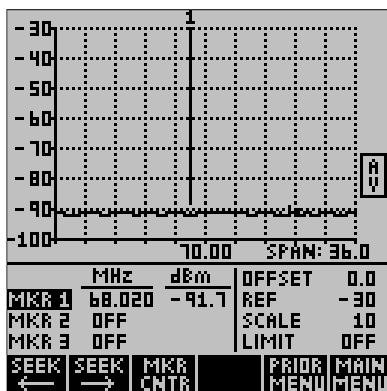
Resetting to Factory Pre-Sets

```
--- SET FACTORY PRESETS ---

YES ...WILL CHANGE ALL SETTINGS TO
    THE FACTORY PRESETS. CURRENT
    SETTINGS WILL BE LOST.

NO ...WILL EXIT WITH SETTINGS
    UNCHANGED.

CHANGE TO FACTORY
    PRESETS ?

 YES       NO          PRIOR MAIN
                       MENU  MENU
```

Pressing Pre-Set brings up the menu to the screen to the left. The factory default settings can be restored or the screen can be exited with settings unchanged. The factory defaults are as follows:

Frequency Range:	500 kHz to 199 MHz
Frequency Mode:	Center/Span
Scale:	10 dB per Division
Reference:	-30 dB
Offset:	0 dB
Limit Line:	OFF
Markers:	OFF
Resolution Bandwidth:	AUTO
Video Bandwidth:	AUTO
Detection:	NORMAL
Averaging:	OFF
Key Click:	ON
Limit Beep:	OFF
Sleep:	5 MIN
Units:	dBm

Markers

```
-30 |··········|1|··········|
-40 |··········| |··········|
-50 |··········| |··········|
-60 |··········| |··········|
-70 |··········| |··········| A
-80 |··········| |··········| V
-90 |··········| |··········|
-100|··········| |··········|
         70.00    SPAN: 36.0

        MHz    dBm   OFFSET    0.0
 MKR 1 68.020 -91.7  REF       -30
 MKR 2  OFF          SCALE      10
 MKR 3  OFF          LIMIT     OFF
 SEEK  SEEK   MKR          PRIOR MAIN
  <-    ->    CNTR         MENU  MENU
```

The Model 470A has three frequency markers. These markers can be accessed by pressing the front panel keys labeled MKR1, MKR2, or MKR3. A screen similar to the one at the left will be displayed. The active marker which was the last front panel key pressed is shown in reverse video (dark). It may be moved by pressing the left or right cursor keys. To turn a marker off, press the corresponding front panel marker key.

Two marker functions are built into the Model 470A. Pressing the soft key under "SEEK" will move the marker left or right to the highest amplitude signal in that direction.
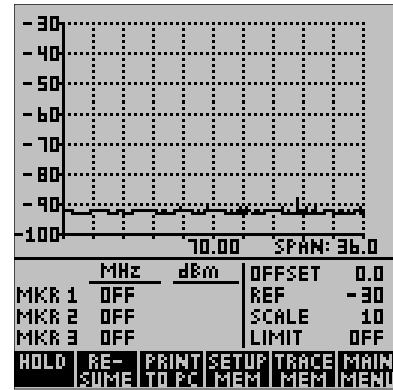
Pressing the soft key under "MKR CNTR" will change the frequency range so that the marker is at the center of the screen. If necessary, the frequency range will be narrowed to make this possible.

Save / Recall

Pressing the SAVE / RCL key on the front panel changes
the soft key labels to those shown at the right.

Hold / Resume

Pressing the "HOLD" soft key stops the trace update on
the screen. This is indicated by an "X" appearing under
"HOLD". To resume the trace update, press the soft key
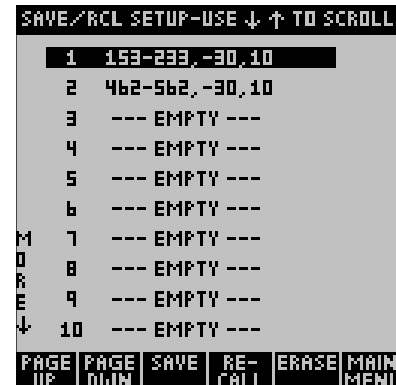under "RESUME".

Print to PC

Using the PC Enhancement Software supplied with the
Model 470A, it is possible to make a hard copy printout of
measurement data each time this button is pressed. See
Chapter 4 for information on setting up this feature.

Setup Memory

Setup Memory stores the basic measurement parameters
such as frequency span, reference value, scale, etc., so that
the 470A can make the exact same measurement when
setup is recalled. Setup Memory is accessed by pressing
the soft key labeled "SETUP MEM". The Model 470A
has memory to store 20 measurement setups. Each setup
in memory is identified by the measurement frequency
range, reference dB value, and scale in dB per division.
The soft keys labeled "PAGE UP" and "PAGE DOWN"
switch between the first ten setups and the last ten. The
cursor up / down keys can be used to select a specific
setup.

Once a setup memory location has been selected, pressing
the "SAVE" soft key will store the current setup in this lo-
cation. Pressing "RECALL" will load the setup from that
location into the instrument, and pressing "ERASE" will
erase the contents of the location.

Trace Memory
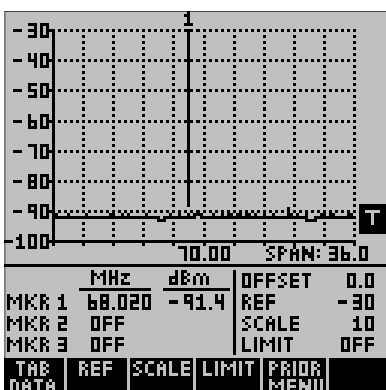
```
SAVE/RCL TRACE-USE ↓ ↑ TO SCROLL
   1  2/3/2002,09:38:49      T
   2  2/3/2002,09:40:23      T
   3  --- NO TRACE ---       T
   4  --- NO TRACE ---       T
   5  --- NO TRACE ---       T
   6  --- NO TRACE ---       T
M  7  --- NO TRACE ---       T
O
R  8  --- NO TRACE ---       T
E
   9  --- NO TRACE ---       T
↓ 10  --- NO TRACE ---       T
PAGE PAGE SAVE  RE-  ERASE MAIN
 UP  DWN       CALL       MENU
```

Trace Memory stores just the trace, or measurement data currently being measured. Trace Memory is accessed by pressing the soft key labeled "TRACE MEM". There is memory sufficient to store 20 traces. Each trace memory is identified by the date and time it was stored. The soft keys labeled "PAGE UP" and "PAGE DOWN" switch between the first ten setups and the last ten. The cursor up / down keys can be used to select a specific setup.

Once a specific setup has been selected, pressing the "SAVE" soft key will store the current trace in this memory. Pressing "RECALL" will load the trace in memory into the 470A, and pressing "ERASE" will erase the trace from the memory location.

```
-30        1
-40
-50
-60
-70
-80
-90                         T
-100      70.00   SPAN:36.0
        MHz   dBm  OFFSET   0.0
MKR 1 68.020 -91.4 REF     -30
MKR 2  OFF        SCALE     10
MKR 3  OFF        LIMIT    OFF
TAB   REF  SCALE LIMIT PRIOR
DATA                   MENU
```

When a trace is recalled, it is marked with a reverse video "T" as shown on the left. This is to show that the displayed trace is from memory; it is not current measurement data. The reference line value and scale of a stored trace can be changed; however the frequency span cannot.

```
   --- TRACE TABULAR DATA ---

  T  2/3/2002, 09:40:23
RES. B/W:   AUTO
VIDEO B/W:  AUTO
DETECTION:  NORM
AVERAGING:  OFF
INPUT  :    DIRECT




                      PRIOR
                      MENU
```

Pressing TAB DATA will show tabular data about the saved measurement. Information such as Resolution Bandwidth, Video Bandwidth, whether Averaging was used, etc. can be determined.

To return to a live measurement press the soft key labeled PRIOR MENU.

Chapter 3
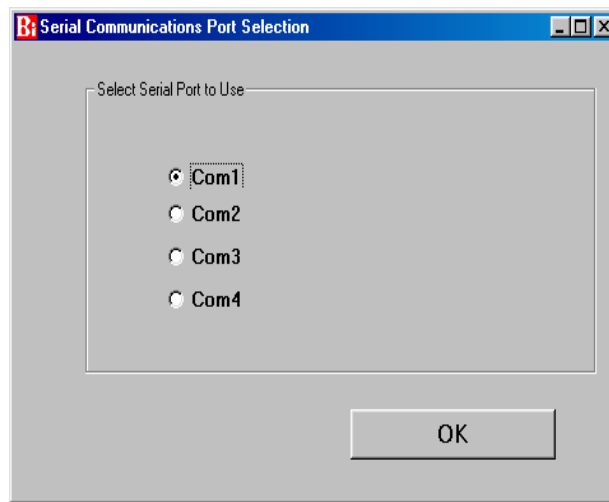# Using the PC Enhancement Software

Introduction

This chapter covers the installation and use of the PC Enhancement Software. This software, supplied with the Model 470A Spectrum Analyzer, allows measurement data to be downloaded to any PC operating under Windows 95 or later. Measurement data can be stored on disk within the PC or printed using any Windows compatible printer. A unique feature of this software allows data to be printed with the touch of a button on the 470A front panel without using the PC keyboard.

Installing the PC Enhancement Program

Insert the CD ROM into the computer. After several seconds the program should begin automatically installing. If this does not happen, click START located on the lower left hand corner of the Windows desktop. Select RUN from the pop up menu and then type X:SETUP.EXE, where "X" is the drive identifier for the CD ROM drive on your computer.
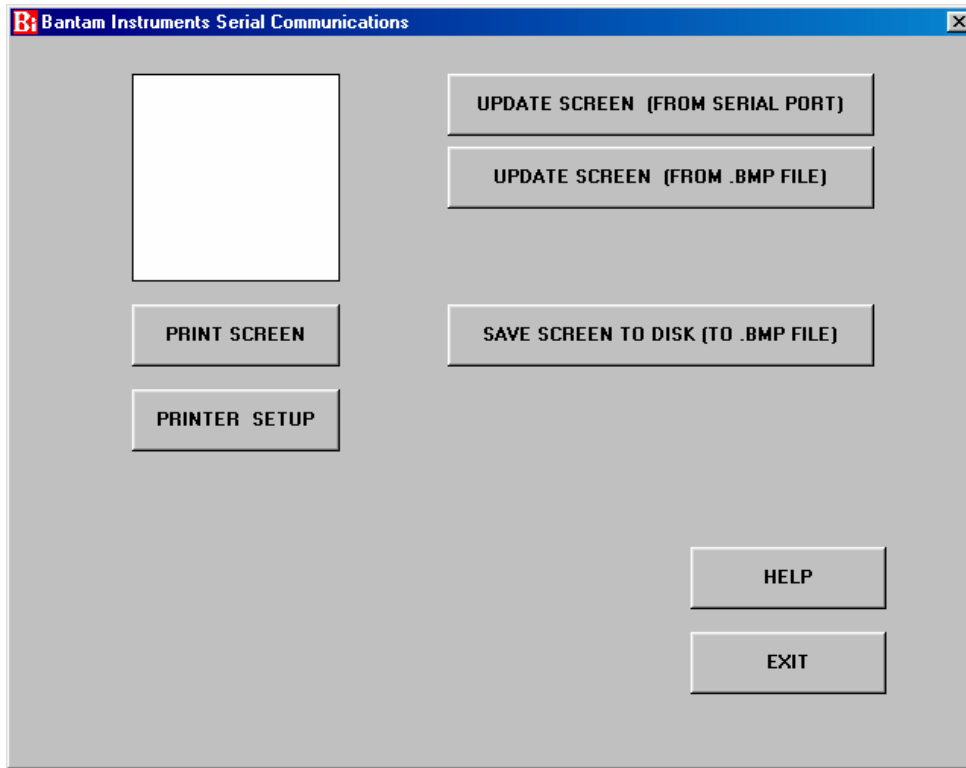
Starting the PC Enhancement Program

Connect the Model 470A Spectrum Analyzer to one of the PC RS-232 serial ports using the supplied serial interface cable. Double click on the program icon to start the program. The first screen, shown below, will ask you to indicate the RS-232 COM port you are using. Select the appropriate COM port and then press OK.

Downloading Measurement Data from the 470A

After selecting the COM port the following display will appear.

The white area in the upper left hand corner is called the "Screen". Data can be up-loaded from the 470A by clicking on the button labeled UPDATE SCREEN (FROM SE-RIAL PORT). Clicking this button will upload whatever is present on the 470A LCD display to the Screen. The upload can take as long as five seconds depending upon the speed of the PC being used, so click just once and wait a few seconds.

If the 470A screen fails to upload to the PC, check that the serial cable is connected to both the 470A and the PC. Also check that the correct COM port was selected when the program was started. Also go to the 470A SETUP menu from the 470A Main Menu. Select soft key labeled "2" and ensure that the baud rate is set for "57600" and that the serial address is set to "1".
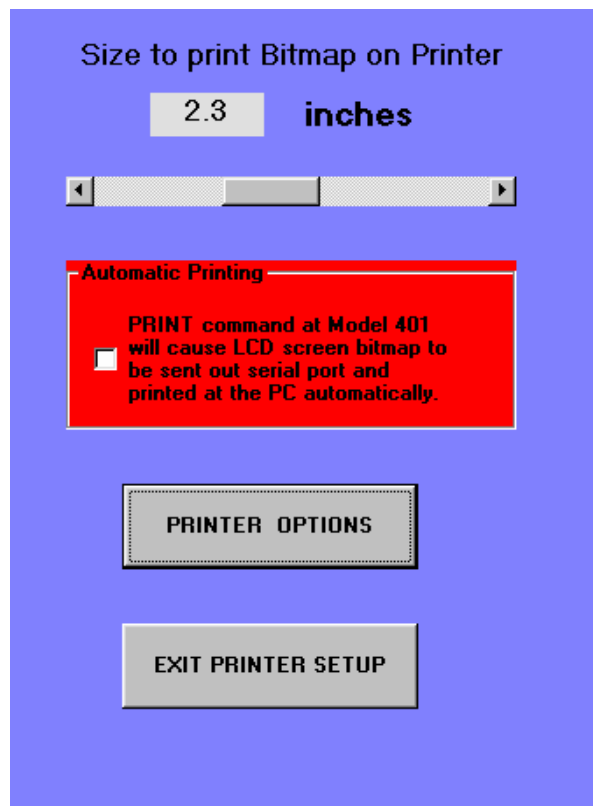
Saving the Downloaded Data to Disk

The downloaded data from the 470A can be saved to Disk by clicking on the button labeled "SAVE SCREEN TO DISK (TO .BMP FILE). The format used is .BMP bitmap which is compatible with most word processing, spreadsheet, presentation, and publishing software. Upon clicking on the button, you will have a choice of where to save the data and what name to place on it.

To view saved data, click on the UPDATE SCREEN (FROM .BMP FILE) and select the data to be viewed. The data will then be displayed on the program Screen

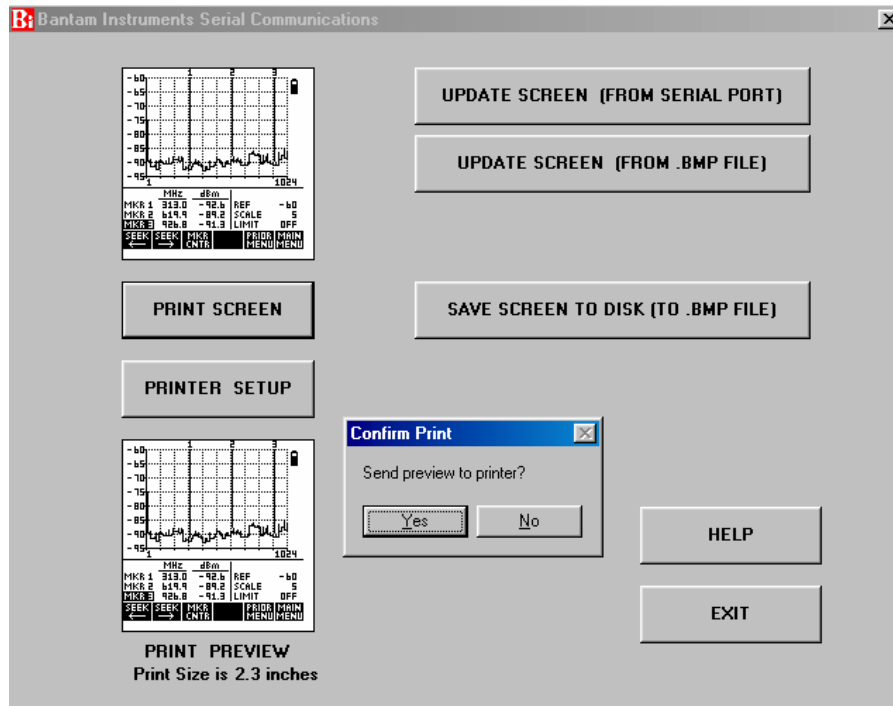**Printing Downloaded Data**

The screen can be printed at any time by clicking on PRINT SCREEN. Before doing so, click PRINTER SETUP and the screen shown below will appear.

At the top of this window, the size of the printout can be set from a minimum of 2 inches square to a maximum of 4 inches square. The default is 2.3 inches which corresponds to a 1:1 copy of the 470A screen.
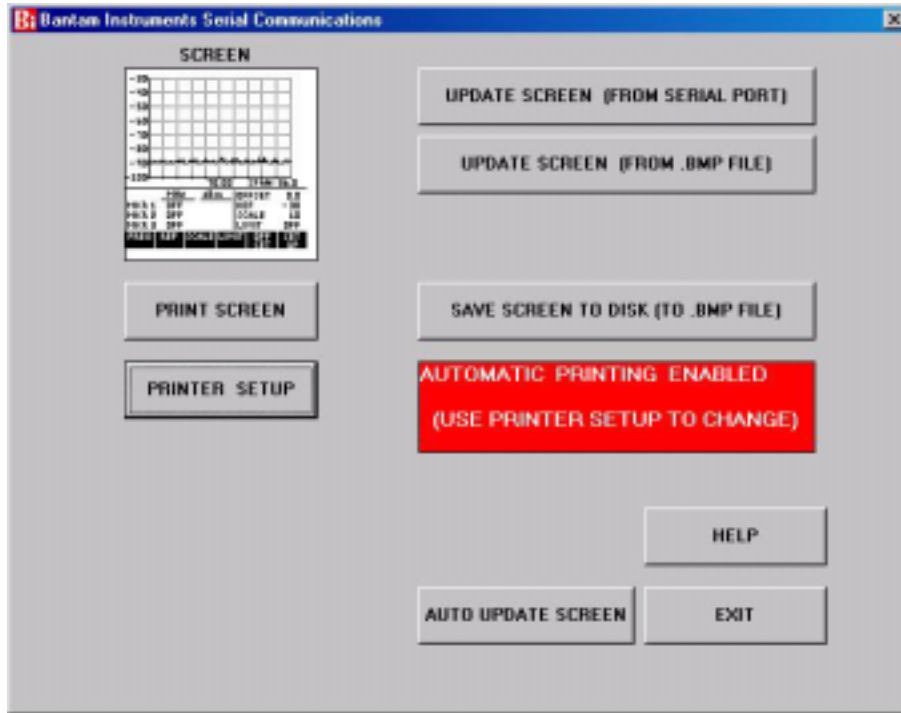
The PRINTER OPTIONS key allows selection of the printer, printer resolution, and other standard Windows printer options. Clicking on EXIT PRINTER SETUP returns to the PC Enhancement Software main window.

If the Screen is to be printed, click on the PRINT SCREEN BUTTON. A duplicate Screen will appear at the bottom left of the main display and the print size will be shown. If this is correct, press OK and the Screen will be printed.
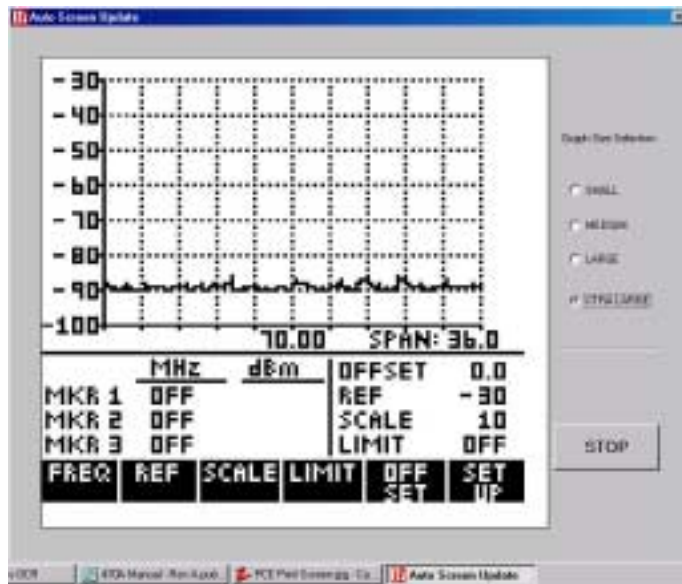

Automatic Printing from the 470A Keypad

Enabling the red area labeled "Automatic Printing" allows a printout to be made every time the PRINT TO PC soft key on the 470A is pressed. The PRINT TO PC soft key appears when the 425A front panel SAVE/RCL key is pressed. When "Automatic Printing" is selected, the main window will appear on the PC aas shown on the following illustration.

Automatic Update of the Screen Image

Often it is desired for the PC to continuously update the screen image from the 470A. This is especially useful when the PC is being used to monitor measurements being made on the 470A a distance away. To activate this mode, press the AUTO UPDATE SCREEN button. The image will now be continuously updated.

On slower PCs using older versions of Windows, it is possible for the computer input buffers to occasionally overload. When this happens the update process will hesitate and the computer will emit an audible tone. As a first remedy, close any programs which are operating and not being currently used. If this does not cure the problem, simultaneously press the CTR, ALT, and DEL keys. This will activate the Windows Task Manager. Close programs here if they will not interfere with the operation of your PC.

In addition, some users may want to use a USB to RS-232 serial converter. These are inexpensive and usually have a memory to buffer bursts of incoming signal data which can overload a PC.