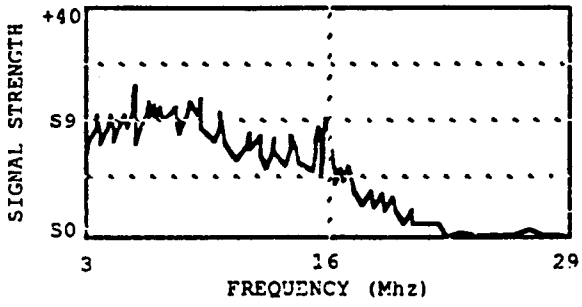
signal/one®

"BANDVIEW" HF SPECTRUM ANALYSIS PROGRAM SOFTWARE MANUAL



"This manual describes the use of the BANDVIEW program which produces near-real-time High Frequency Spectrum Analysis"

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SECTION 1.0
GENERAL

1.1 PROGRAM FUNCTIONS AND USE

This manual covers the set-up and operation of Signal-One's BANDVIEW program, which controls the MILSPEC 1030 transceiver and displays the signal strength associated with the selected frequency band. The program allows the user to view the relative signal levels present at the frequency intervals selected. Specific general coverage bands are pre-programmed into the BANDVIEW software and can be used for most maximum usable frequency (MUF) determinations. In some instances, it may be desirable to select the end-points of a specific frequency band and have the program analyze that frequency range. This can be accomplished using the "select your own band" option from the setup menu.

The primary intended use of this program is to aid in determining the MUF which is then used in conjunction with a list of operational frequencies to select which frequency would produce the highest signal strength at the destination. A secondary use of this program is to scan, selected, narrow frequency ranges (10 - 20 Khz) and display the characteristics of a given signal and/or adjacent signals. The information, concerning high frequency (HF) radio signal propagation, that is required to use this capability is given below.

1.2 HF RADIO SIGNAL PROPAGATION

In the HF frequency range, three to thirty megahertz, the major mode of propagation of radio signals is via reflection of electromagnetic waves from ionized regions of the earth's atmosphere. These ionized regions are caused, mainly, by the Sun's emissions. Due to the daily rotation of the Earth, the atmosphere above and around a given location is exposed to the Sun's radiation generally during the location's daylight hours. Seasonal variations and solar cycle effects modify the total period in a given day during which the atmosphere is sufficiently ionized to support the reflection of signals back to Earth. In addition, solar storms cause changes in the ionosphere that can

change the reflective characteristics of the ionosphere in a random manner. At any given point in time, there is a maximum usable frequency that forms the general cut-off point which limits communications when using frequencies that are higher than the MUF. Many organizations have tried to analyze the ionospheric state, using numerical methods. These attempts have resulted in computer codes that can, under optimum conditions, predict the maximum usable frequency. These methods, of course, cannot guess when solar storms and other atmosphere events will happen and because of this, they are only partially effective when used to determine the MUF. Actual measurement of the signal and noise level associated with a range of frequencies is a more accurate method of determining the MUF. The BANDVIEW program provides for the measurement and display of signals and noise associated with a user selected range of frequencies which can then be used to make judgements concerning the MUF.

1.3 REQUIREMENTS

Certain minimum equipment requirements must be available if this program is to be used efficiently. The following items are needed.

transceiver -- Signal-One model: MILSPEC 1030C

computer -- IBM PC,XT, or AT computer or compatible such as: the Zenith 150 or 248; the all COMPAQ computer models; and others

computer options -- Two serial communications ports
One parallel printer port
At least 256 kilobytes of memory
Two floppy disk drives
monochrome text type monitors are supported
requires CGA graphics for plots

SECTION 2.0
PRELIMINARY SETUP

2.1 BACKUP COPIES OF SOFTWARE

It is always important to initially make copies of all software. The Signal-One software is not copy-protected, in that the user can make as many copies as is required to properly run the station. The programs may be installed on a hard disk system if desired. The BANDVIEW program is not keyed to a specific transceiver as is the SOFTPAQ 4 Signal-One software. It is recommended that the distribution disk not be used for operation of the program, instead, format two other disks and make copies of the program using either the disk operating systems (DOS) DISKCOPY or COPY commands (see DOS manual for proper use of these commands). After making the backup copies of the program, place the original disk in a safe location. This program is supplied for use only where a Signal-One MILSPEC 1030C transceiver is in place or is on order. It is not legal to make copies of this program for use at other stations that have not purchased a MILSPEC 1030C, without written permission of the Signal-One Corporation.

The user should load the GRAPHICS program supplied with DOS prior to running the BANDVIEW program, if a printed copy of the plots are required. the GRAPHICS program is loaded by typing GRAPHICS and pressing the RETURN key while at the DOS level. It should be noted that the GRAPHICS program is designed to operate with EPSON type printers and other types of printers may or may not work. This feature should be verified with knowledgable personnel if problems occur.

SECTION 3.0

GETTING STARTED

3.1 EQUIPMENT SETUP

Proper set-up and wiring of the equipment is required prior to using the 1030RTTY program. The program will not run correctly, unless it receives the proper signals from the communications ports. See figure 3-1 for hook-up layout. The following directions should be followed when initially wiring the system.

3.1.1 Wiring

No special wiring is required to run the band scanning program. All of the functions are implemented in software. Normal connections between the MILSPEC 1030C, antenna, and the computer are all that is required. To hook up the system, make the following connections between the units. Cables for the connections identified, are available packed in the original cartons containing the MILSPEC 1030C.

1. Position the MILSPEC 1030C, make the 110 volt AC connection
2. Position the Computer and printer, if used, supply AC power
3. Connect external speaker to MILSPEC 1030C if desired
4. Connect microphone to MILSPEC 1030C
5. Connect RS-232 cable between the computer's comm port #1 and the MILSPEC 1030C's Control port.
6. Connect proper antenna to 1030C
7. Connect external RF output amplifier (if needed).

3.1.2 Equipment Check-out

Check out the MILSPEC 1030C according to the directions in the 1030C Operating and Technical Manual. Leave the below listed switches in the following positions.

mode -- USB

RX/TX channel -- A

frequency -- operational frequency

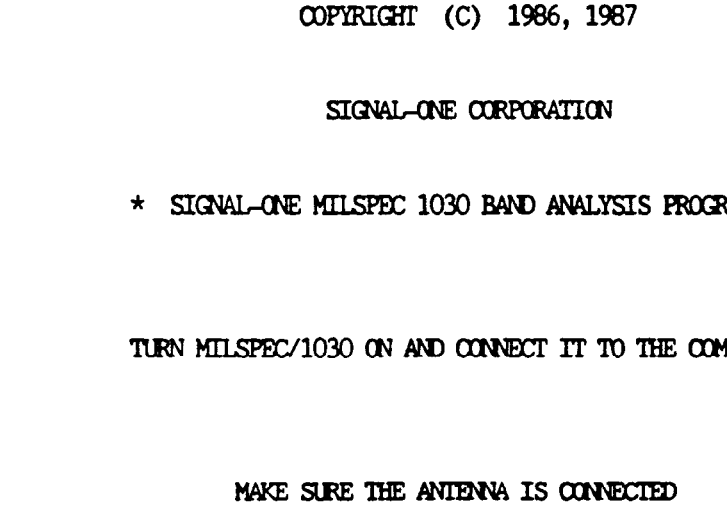
3.2 INITIAL OPERATION

This program is a stand-alone program that requires no coordination or help from other communications sites.

3.2.1 Program Loading

After the computer is turned on and boot-up is accomplished according to the disk operating system (DOS) manual, load the band scanning program by typing "BANDVIEW" and pressing the RETURN KEY.

The BANDVIEW program will produce the screen display shown below. At this point any key may be pressed to intiallize the MILSPEC 1030C and the program variables.



Start-up screen for BANDVIEW program

Figure 3-1

SECTION 4.0
BAND SELECTION AND EVALUATION

4.1 BAND SELECTION FROM MENU

After starting the program and pressing any key to initialize communications between the computer and the MILSPEC 1030C, the computer will automatically generate the screen display which is shown in figure 4-1. The proper use of this screen will allow the user to easily select a range of frequencies and display the results of the resulting band scanning process on the computer's screen. As an example of the process, if the user where to select option "E" from the menu, the computer will automatically command the MILSPEC 1030C to scan the 3 to 29 Mhz range, using approximately 3000 specific frequency increments. The number of steps has been programmed to produce a detailed display of the frequency range selected. The results would then be displayed on the screen similar to the example shown in figure 4-2. The results can then be used to determine what frequency should be used to communicate with other stations. Section 4.4 gives information regarding the proper use of the data displayed after the band is scanned.

4.2 SPECIFYING YOUR OWN BAND

When the operator desires a display of the noise and signal levels associated with bands other than those pre-programmed into the BANDVIEW program, the "J" option may be selected from the menu shown in figure 4-1. Pressing the "J" key will produce a computer request for the user to enter; a start frequency, an end frequency, and a specific frequency interval to use in the scanning action. As an example, we will select the following data to be used.

Start frequency - .4 Mhz
End frequency - 2.0 Mhz
Frequency step size - 1 Khz

These numbers are entered at the prompt, the program will ask you to verify the numbers and give you an option of changing any that are wrong. After changing, if required, the user presses the RETURN key and the program will process the information and eventually display a plot

similar to figure 4-3. It should be noted that a similar plot could be produced by simply pressing the "A" option from the menu.

SELECT PRESET BAND OR YOUR OWN FREQUENCY PARAMETERS

A)	.5	TO	2.0	Mhz
B)	2.0	TO	10.0	Mhz
C)	10.0	TO	20.0	Mhz
D)	20.0	TO	29.0	Mhz
E)	3.0	TO	29.0	Mhz
F)	11.0	TO	13.0	Mhz
G)	13.0	TO	15.0	Mhz
H)	15.0	TO	17.0	Mhz
I)	17.0	TO	19.0	Mhz
J)	SELECT YOUR OWN BAND			
K)	(END), RETURN TO SYSTEM			

MILSPEC 1030 BANDVIEW Frequency Selection Menu

Figure 4-1

4.3 SINGLE AND MULTIPLE SCANS

After a given set parameters are entered and the scanning process has been completed, additional scans and overlayed plots can be generated by pressing the correct key. These key functions are described at the bottom of the display, figure 4-2. The functions performed by the keys are as follows:

One scan - Pressing the "O" key will instruct the program to make one additional scan of the band and overlay the results on the screen.

Multiple scans - Pressing "C" key will activate the continuous scan feature. Successive scans will be plotted on the same screen. Use this feature to display actions that are changing with time, such as individual signals. This feature is turned off by pressing any of the other keys.

Menu - Pressing the "M" key will return you to the frequency selection menu shown in figure 4-1.

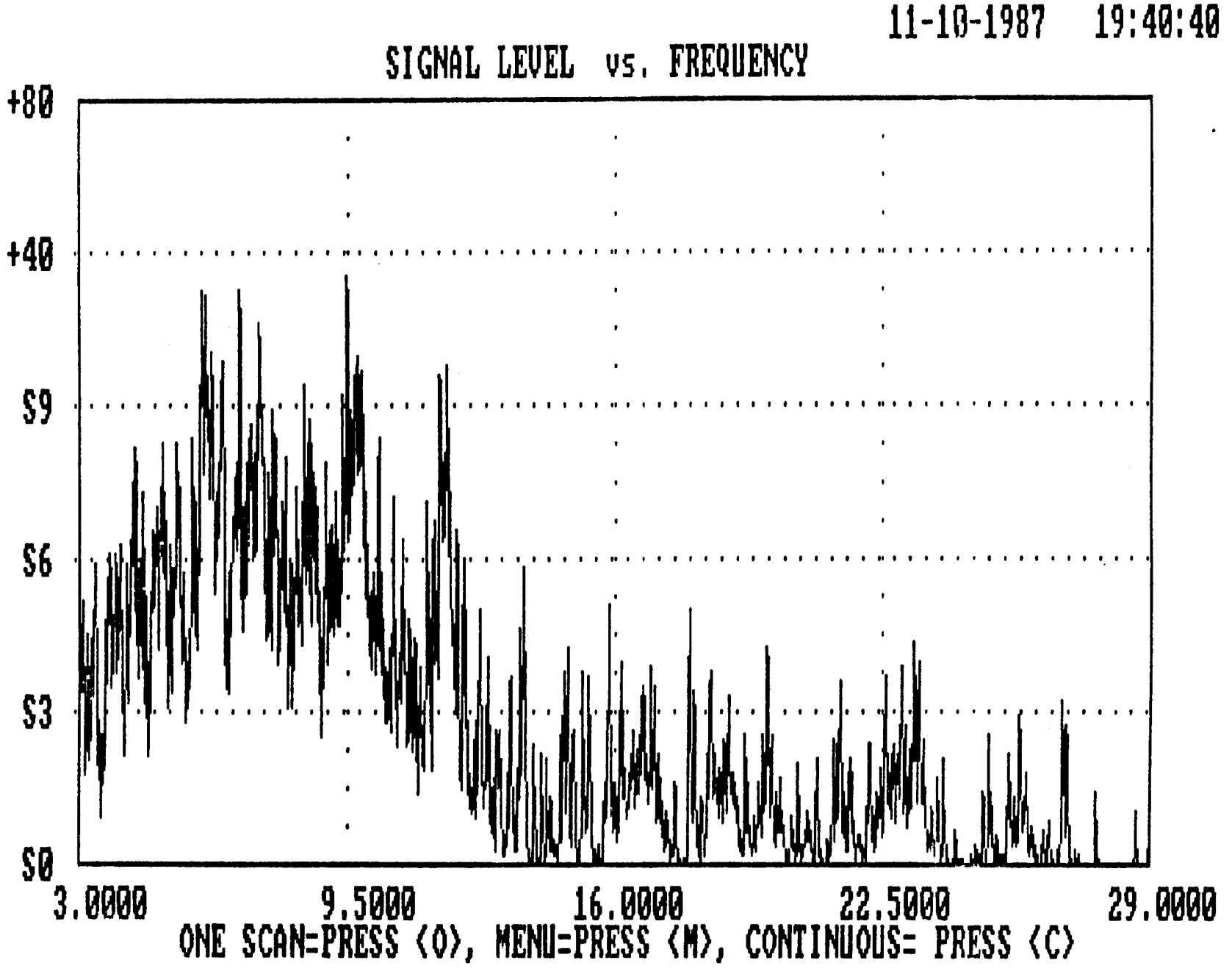

11-10-1987 19:40:40
SIGNAL LEVEL vs. FREQUENCY
+80
+40
S9
S6
S3
S0
3.0000
9.5000
16.0000
22.5000
29.0000
ONE SCAN=PRESS (O), MENU=PRESS (M), CONTINUOUS= PRESS (C)

Figure 4-2

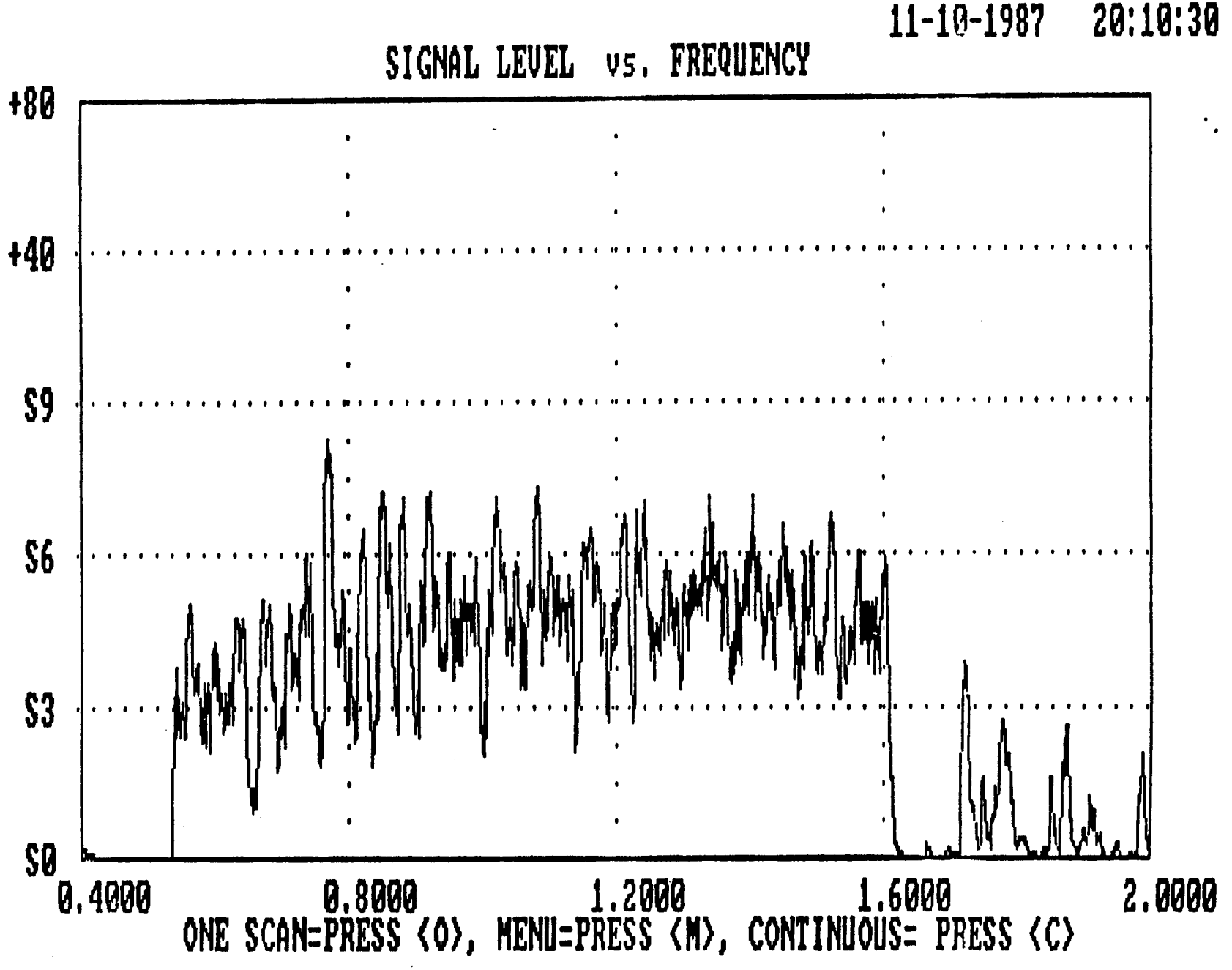

11-10-1987 20:10:30
SIGNAL LEVEL vs. FREQUENCY
+80
+40
S9
S6
S3
S0
0.4000
0.8000
1.2000
1.6000
2.0000
ONE SCAN=PRESS (O), MENU=PRESS (M), CONTINUOUS= PRESS (C)

Figure 4-3

4.4 EVALUATION OF RESULTS OF SCANS

The display shown in figure 4-1 has a great deal of information included within it. The peak signal lines that extend higher than the "S9" level are very strong stations that are resident at the shown frequency. For example at the frequency of approximately 9.5 Mhz, there is a very strong signal. The overall noise level of the band can be seen by averaging the signal levels over the range. Notice that the average signal level drops rapidly beyond 9 - 10 Mhz, reaching near "S0" at approximately 14 - 15 Mhz. From the information shown in figure 4-2, the MUF would appear to be around 14 - 15 Mhz. The addition signals shown beyond that range show random noise from local sources or very large signals from commercial broadcast stations. If the operator were using the information in figure 4-2 to determine the MUF and a potentially good operating frequency. The selection of the operating frequency would be at a point near 10 Mhz. The user should select a frequency that is lower than the point where the noise gets very low, near "S0", but not to low, since at lower frequencies, the noise conditions get worse. The data should in figure 4-3 shows the AM broadcast band. The information is presented for information only, but is interesting in the fact that the cut-off of the AM broadcast bands near 0.5 Mhz and 1.6 Mhz are clearly defined. This same type of display can be made for any desired band.

SECTION 5.0
PROGRAM UPDATES

5.1 VERSIONS AND POLICY

This is the first version of BANDVIEW, and undoubtedly there will be areas that will need improvement. Improvements will be made and distributed free-of-charge to purchasers of the original program. The time table and version update periods will be a function of the number of modifications made and the operational impact of the modifications. User identified problems or enhancements are solicited. Please contact Signal-One with problem reports or suggestions.