APPLICATION NOTES

FOR THE

ifr

FM / AM-1500

COMMUNICATIONS SERVICE MONITOR

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APPLICATION NOTE

HOW TO USE THIS BOOK

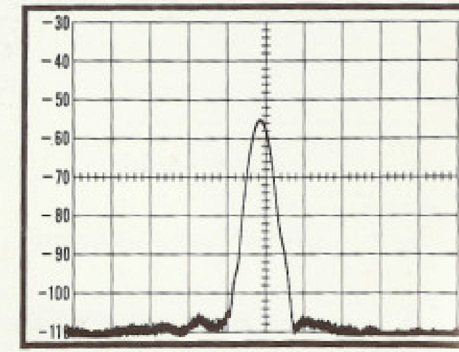
Application ***TITLE*** *box*

This Application Note book contains actual field applications of the IFR FM/AM-1500 Communications Service Monitor.

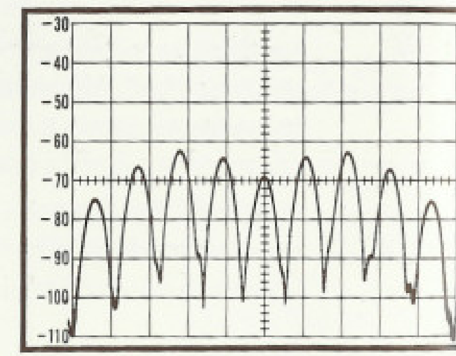
Overview... *highlights of application*

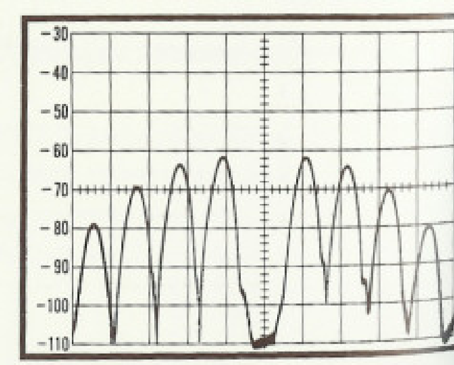
DETAILS

Comments



CRT IMAGES & WAVEFORMS

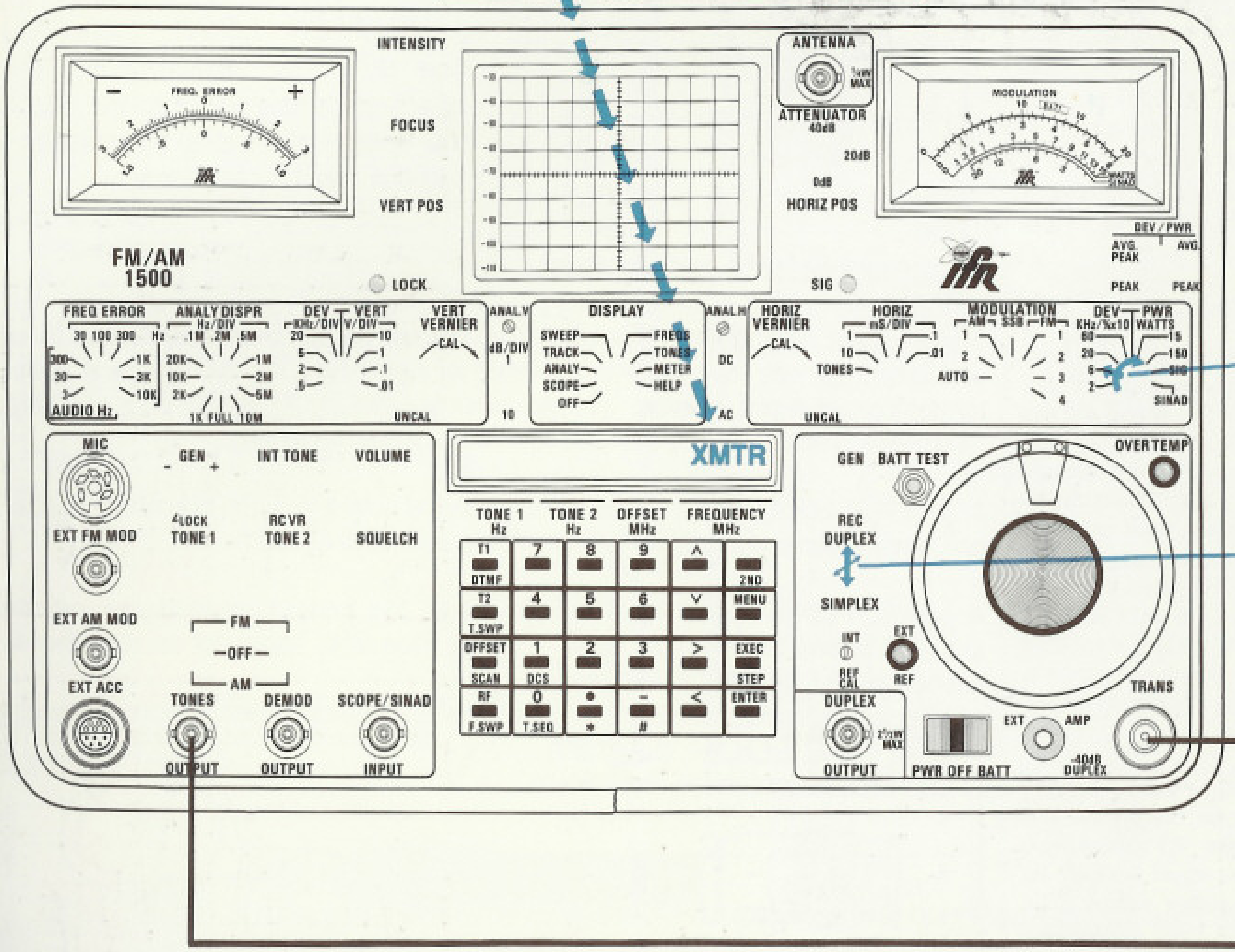


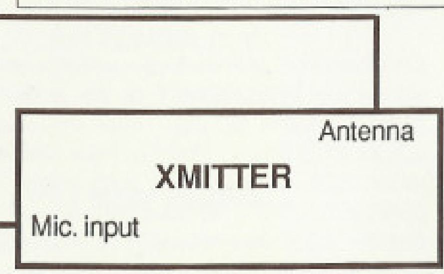


DETAILED SETUP

IFR FM/AM-1500

XMTR or RCVR in FREQUENCY window indicates that you select proper frequency for the equipment under test.





HOW TO USE THIS BOOK

This facing page shows connection information and the position of *pertinent* controls.

Those *controls, readouts* or *indicators* shown in BLUE affect the operation in this particular application.

SYMBOL EXPLANATION

Denotes a control requiring *adjustment* during the application.

Denotes a switch requiring a *change of position* during the application.

APPLICATION NOTE

Check local oscillators & xtals without opening radio case

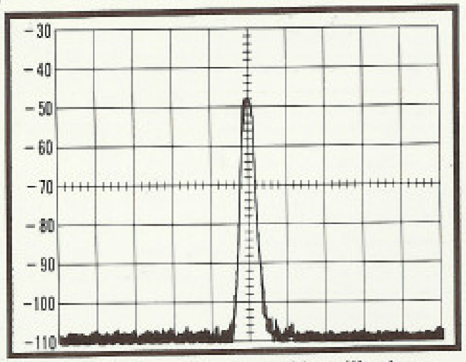
CONCEPT

There is nothing fancy or complicated about an inductive pickup. The concept is to connect the high sensitivity spectrum analyzer (2 µv) to an antenna that only picks up a small percentage of signal, obviously you don't want to look at all of the signals that are present in your shop. A 2 turn pickup loop works well from about 100 kHz through VHF. With the spectrum analyzer set to one of the wider dispersion settings, you can quickly determine the operation of the local oscillators.

EXAMPLE

Suppose that a hand-held VHF radio operating at 150 MHz comes across your bench. You know from experience that it probably has a first IF on or near 10.7 MHz. If you set the analyzer center **FREQUENCY** at 150.0000 MHz and the **ANALY**zer **DISP**e**R**sion to **5 M**Hz per horizontal division, the analyzer will scan from 125 to 175 MHz. Most radios radiate enough to pick up the high frequency local oscillator easily with the ***SNIFFER LOOP*** anywhere close to the radio. The Hi Freq L.O. should show up about two divisions to the left or right of the center frequency of 150 MHz. Exact frequency of any signal you can see on the analyzer is easily measured by jogging the **FREQUENCY** until the unknown signal is within 10 KHz, then use the error meter to get an exact reading.

Checking the Lo Freq local oscillator would be just as easy by setting the **FREQUENCY** of the analyzer on 10.7 MHz and **ANALY DISPR** to **.2M.** Now the analyzer will sweep from 9.7 to 11.7 MHz. The Lo Freq oscillator would typically be about 2.25 divisions (455 kHz) above or below center. The ***SNIFFER LOOP*** is less sensitive at the lower frequencies and the Lo Freq oscillator coil is usually shielded better than HF coils so you may have to hunt around the case a little to find the signal.



Local oscillator picked up with sniffer loop

A ***SNIFFER LOOP*** lets you use the high sensitivity of the spectrum analyzer to show you if the local oscillators are running without opening the case.

If you haven't used a ***SNIFFER LOOP*** we suggest you build yourself **two** of them and keep them with your 1500. One is used for *SNIFFING*, the second one is useful for non-contact signal injection. You may want to COLOR CODE both ends with vinyl tape to keep track of which one is injecting and which one is receiving.

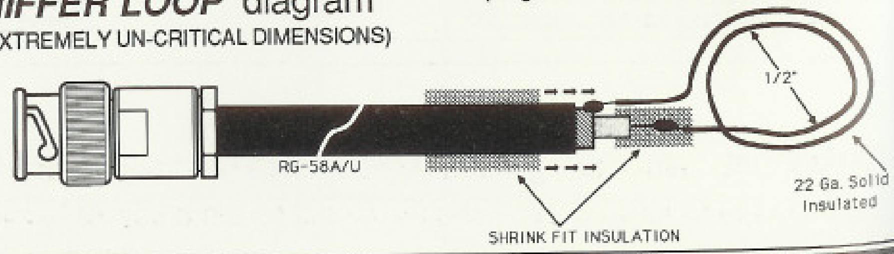
A ***SNIFFER LOOP*** is such a useful tool when attached to your spectrum analyzer and tracking generator that you'll wonder how you've done without it.

A ***SNIFFER LOOP*** is nothing more than one or two turns of insulated wire on one end of a convenient length of coax. Install a male BNC connector on the other to connect to the 1500's **ANTENNA** input.

SNIFFER LOOP diagram

(EXTREMELY UN-CRITICAL DIMENSIONS)

(Single turn, 1/4" dia. loop best above VHF)

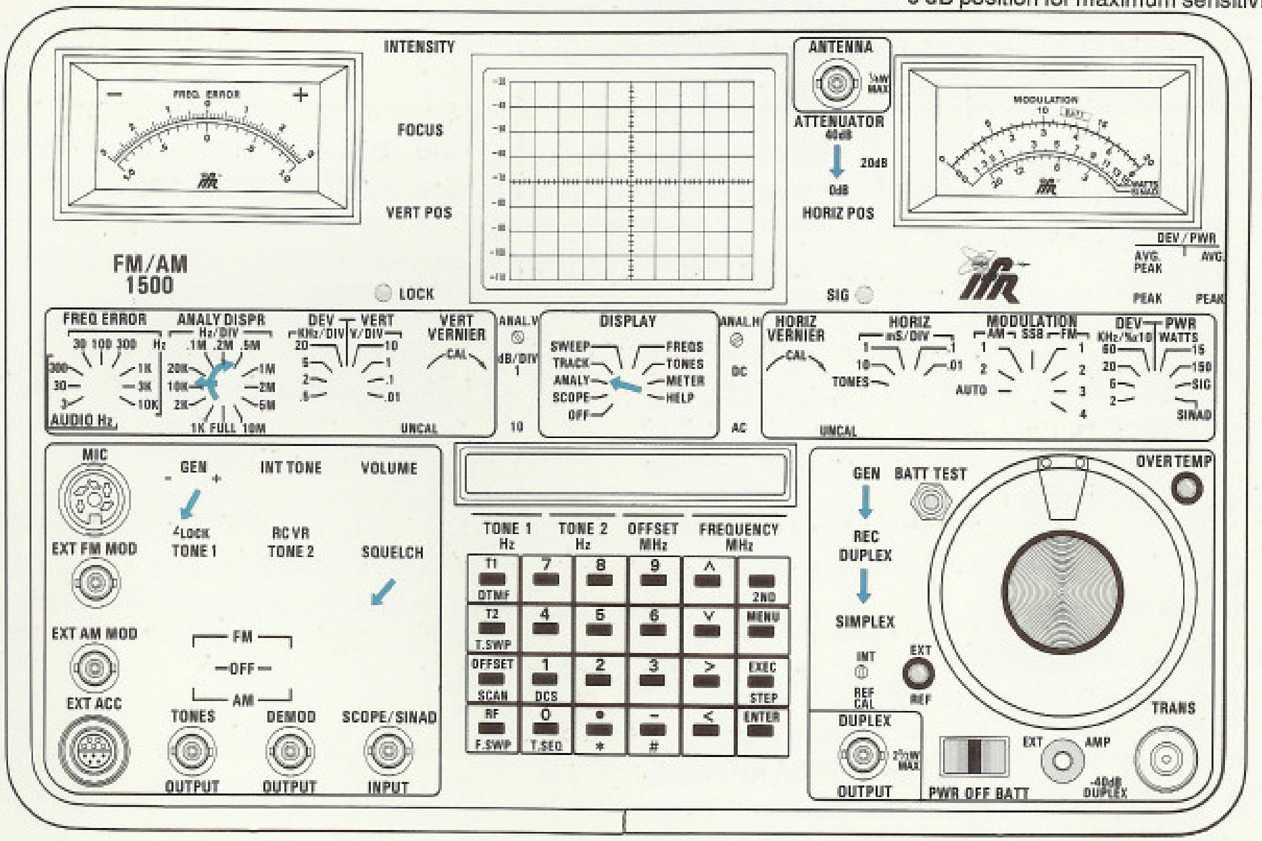


IFR FM/AM-1500

Check local oscillators & xtals without opening radio case

Connect *SNIFFER LOOP* to **ANTENNA** port

ATTENUATOR switch must be in 0 dB position for maximum sensitivity.



SNIFFER LOOP use

Couple loop to the radiating coil to get at least a -80dBm response on the analyzer screen. -80dBm will quiet the FM/AM-1500's receiver section sufficiently to get a good **FREQ ERROR** reading once you have centered the signal near the center of the screen at an **ANALY DISPR** setting of *less* than **10K.**

REMEMBER.. you are dealing with **2** receivers in the 1500, the spectrum analyzer and the monitor receiver. Both use the same front end and connect to the outside world via the **ANTENNA** port.

CAUTION: When using the ***SNIFFER LOOP*** on transmitters, bring the loop towards the radio ***after keying.*** Don't couple closely *until* you see the signal on the analyzer to avoid overloading or possible front end burn out. Keep the signal on the analyzer screen below the top (**-30dBm**) to prevent spurious generation due to overloading.

Measuring audio frequency response with tone sweep

APPLICATION NOTE

The 1500's Tone sweep menu can simplify audio frequency response testing by stepping through the 300-3000 Hz range quickly in octave steps so that receiver de-emphasis or transmitter pre-emphasis response may be checked.

If we set the audio output at 300 Hz to fill the 8 vertical divisions of the scope, then each octave increase in frequency should be half as many divisions if the receiver audio output meets the standard 6dB per octave de-emphasis curve.

PROCEDURE

Set **DISPLAY** to **TONES** Key **ENTER**, **MENU**, **Λ** , **Λ** , this should bring up the **TONE SWEEP MENU** on the CRT.

Key **ENTER**, **4**, **>**, the cursor will now flash under **START FREQ.** Set the frequency to **300.**

> will move the cursor to **STOP FREQ.** Set it at **3000.**

>, moves the cursor on to **INCR**emental **STEP.** Key the **Λ** until it reads **X.**

In the next position enter the factor **2.0**, this indicates that at each step the frequency will be doubled (an octave).

Set the **INCR**emental **RATE** to **5000 msec.**

To start the **TONE SWEEP** running, use the following sequence.

ENTER, EXECUTE, 2ND, T.SWP, 4, • (loop), **ENTER.**

TONE generator **1** will begin automatically stepping every 5 seconds through the following frequencies: 300, 600, 1200, 2400, 3000 Hz. The loop (•) repeats the function. Neat, but not real handy unless you have a plotter for the output. Even with a plotter you would still have to take the 6dB per octave decrease into account.
Now, *How do I stop the darn thing?*

2nd, **STEP** will halt the cycle and leave the tone on.

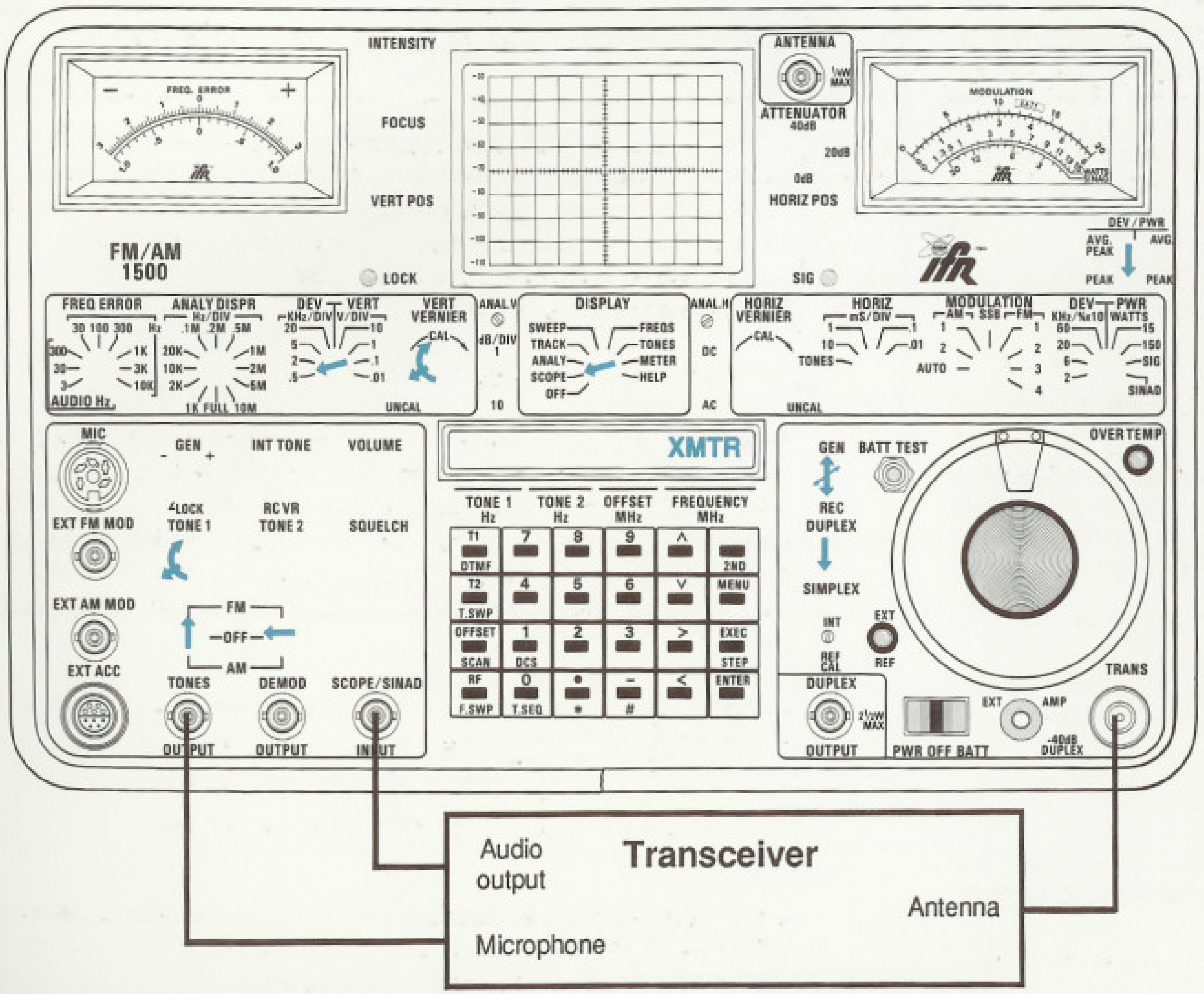
Now, ^ will step the frequency up an octave at a time.(300 to 2400) If you step to 300 Hz and use the **VERT VERNIER** to fill the scope with the 300 Hz sine wave, each stroke of the ^ key will double the frequency which should cut the audio amplitude in half if it fits the de-emphasis curve. The top step to 3000 Hz gives you a final check at the top of the audio passband to check for excessive roll off even though it isn't an octave step.

300 Hz = 8 div.
600 Hz = 4 div.
1200 Hz = 2 div.
2400 Hz = 1 div.
3000 Hz = 0.8 div.

Peak to peak levels required to conform to 6dB per octave de-emphasis curve

Once programmed, this function will remain in the **TONE SWEEP MENU** as **ITEM #04** for future use. (We selected item 4 so it won't be changed as easily when you call up the menu)

Measuring audio frequency response with tone sweep



RECEIVER RESPONSE

The setup shown is for measuring receiver audio response as described on the facing page.

TRANSMITTER RESPONSE

Transmitter audio response may be measured by modulating the transmitter with **TONES OUTPUT** and measuring the deviation on the scope in the **.5 KHz/DIV** position.

Set the modulation level of the transmitter with the **TONE 1** level control to produce 8 divisions of deflection on CRT at 2400 Hz.

Each octave step down in frequency should produce half the amplitude of audio if the pre-emphasis circuit is operating properly.