

# One-Chip Facsimile

*We all talk about the weather; now you can see it on your Atari. You'll be amazed at how simple it is.*

**H**ave you ever been tuning the shortwave bands and encountered the distinctive "screech screech" sound of a facsimile signal and wondered what type of information was being transmitted? Very interesting weather charts and satellite photographs are transmitted by various services continuously. These charts will allow you to answer pertinent questions such as: Will it snow on Kamchatka today?, Is the Gulf Stream changing its path?, or Should I take my umbrella to work tomorrow?

If you happen to have an Atari computer system available, using the circuit and computer program described here you will be able to receive and display these facsimile signals. The received charts are displayed on the computer's monitor or TV screen and are roughly

two displays wide and three displays long. A joystick is used to scroll the screen around the chart.

The components of this system are: a good-quality communications receiver with SSB capability, a simple tone-detector circuit, an Atari 800 computer system, and the computer program, VISIFAX.

## Capabilities

This system will properly display facsimile signals sent at a rate of 120 or 60 lines per minute (LPM). These rates (particularly 120 LPM) are used by most commonly heard stations.

The computer samples each received line a nominal 480 times and can display 512 lines horizontally. While this resolution can give good results, it is less than 50% of the resolution transmitted. Also, gray tones are not

used. Thus this system is more suitable for high-contrast, large-format weather charts than for satellite pictures and similar charts with much fine detail.

Figs. 2 through 4 are samples of charts that I have received at my location and are representative of the system's capabilities.

## Receiver Requirements

The receiver that you use should be a stable, good-quality general-coverage receiver with SSB capability. If your receiver provides acceptable ease of tuning and frequency stability for SSB voice signals, it should be usable for facsimile reception. I have used a Yaesu FRG-7 and a Sony ICF6500W with good results.

## The Tone Detector

The tone detector is a simple circuit that connects be-

tween the receiver audio output and joystick port 2 of the computer. The detector converts the facsimile tones to TTL pulses that the computer can use. The circuit is shown in Fig. 1.

The circuit is based on the XR2211 integrated circuit used as a tone detector. R1 and C1 determine the detector's frequency, and R2 is used to adjust for the sharpest detail as a chart is being received. The LED serves as a simple but effective tuning indicator. The circuit requires only 5 volts of power, which is taken from the computer.

The parts may all be obtained from local outlets. The construction methods used are not critical. I eventually added a few components to allow me to use the same basic circuit for CW reception.

## The Computer System

The Atari 800 computer and the VISIFAX program are the heart of the system and control all aspects of reading and displaying facsimile charts. The program is written entirely in assembly language and is not shown here because of its length (about 30 pages). It is a complex program that uses several of the Atari's sophisticated capabilities to do the job at hand. The computer is required to have 48K of RAM because of the size of

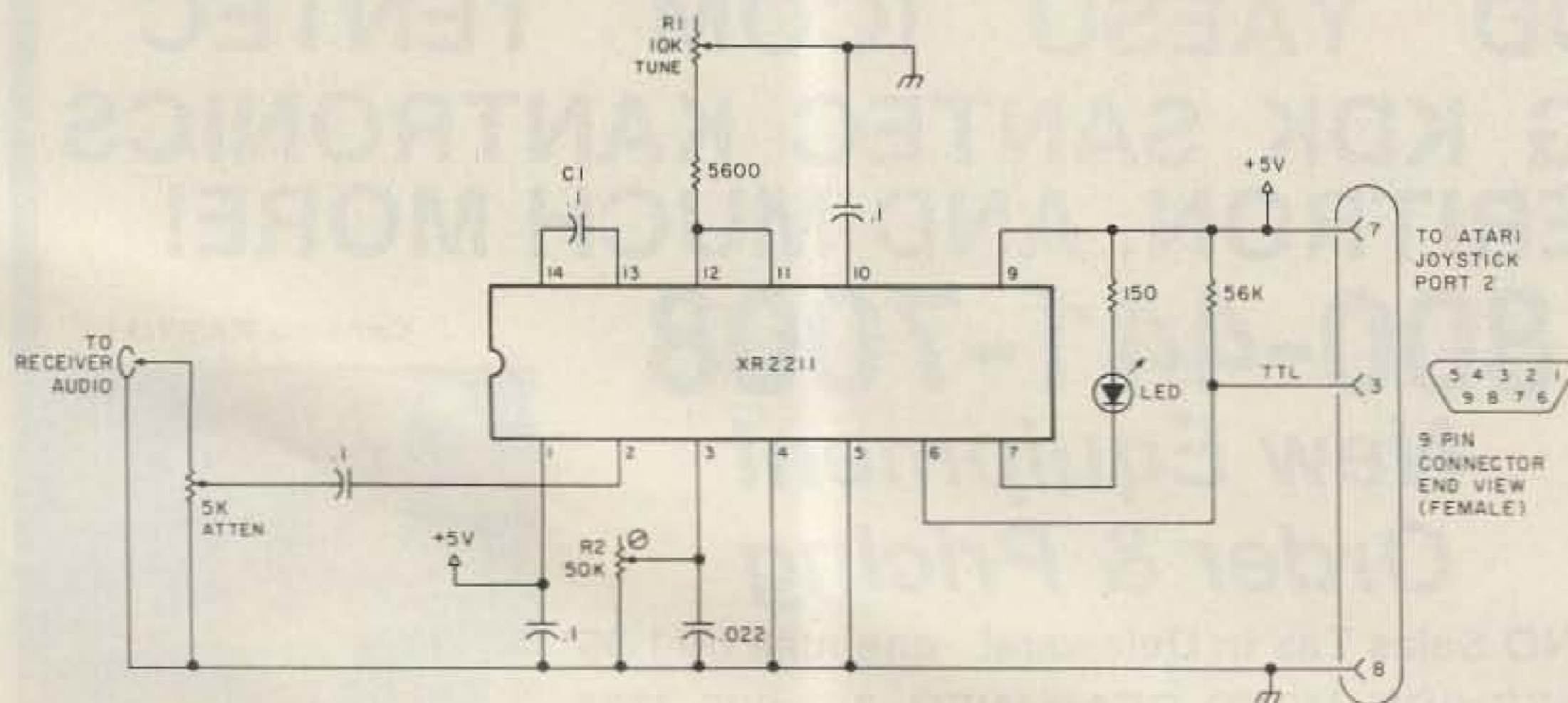


Fig. 1. Tone-detector schematic.



Fig. 2. GOES satellite picture as copied on 8080 kHz. Major cloud cover areas and fronts are readily observed.

the chart. A disk is required only to load in the program. An optional printer may be used to produce a hard copy of the received chart and was used to produce the charts that accompany this article.

#### VISIFAX At Work

VISIFAX begins by initializing for operation, which includes setting up the Atari's hardware timer #4 to interrupt to sample line data and plot it 480 times per line or 960 times per second.

Next, the program will check the joystick plugged into port one of the computer to see if the displayed chart is to be scrolled on the screen. The scrolling effect is accomplished by manipulating the computer's display list.

Finally, the program checks to see if a keyboard key has been pressed. If so, its corresponding command is performed.

The computer screen includes two lines of text at the bottom. These two lines display the available commands and certain status information. To invoke a particular command, only its first letter must be pressed. Any command may be used at any time. The commands are:

**RESET:** An R will start the process of displaying a chart. The chart is displayed as received from left to right

and from the bottom to the top (so most charts are viewed normally... without your having to stand on your head!). Pressing the R again will reset the displayed chart to the left of the screen without altering the synchronization.

**SYNC:** An S will have the effect of displaying subsequent received lines down the display about one-half inch. This command should be used as required to properly center the received chart. Most stations precede charts with a short period of synchronizing lines that may be used for centering.

**LINE-SKIP:** An L will increment the number of received lines to skip between displayed lines. This feature will allow compressing of the received chart horizontally, fitting more of it onto the computer's screen. I find that a LINE-SKIP count of 1 is used most often.

**MODE:** An M will step through the three possible modes of operation. The present mode is shown on the screen's bottom line. Mode "one" indicates that the chart will be received and the process will complete when the right-most line is displayed. Mode "cont" allows the continuous display of charts, with one overlapping the last. Mode "wait" halts the display of any more received lines but does maintain syn-

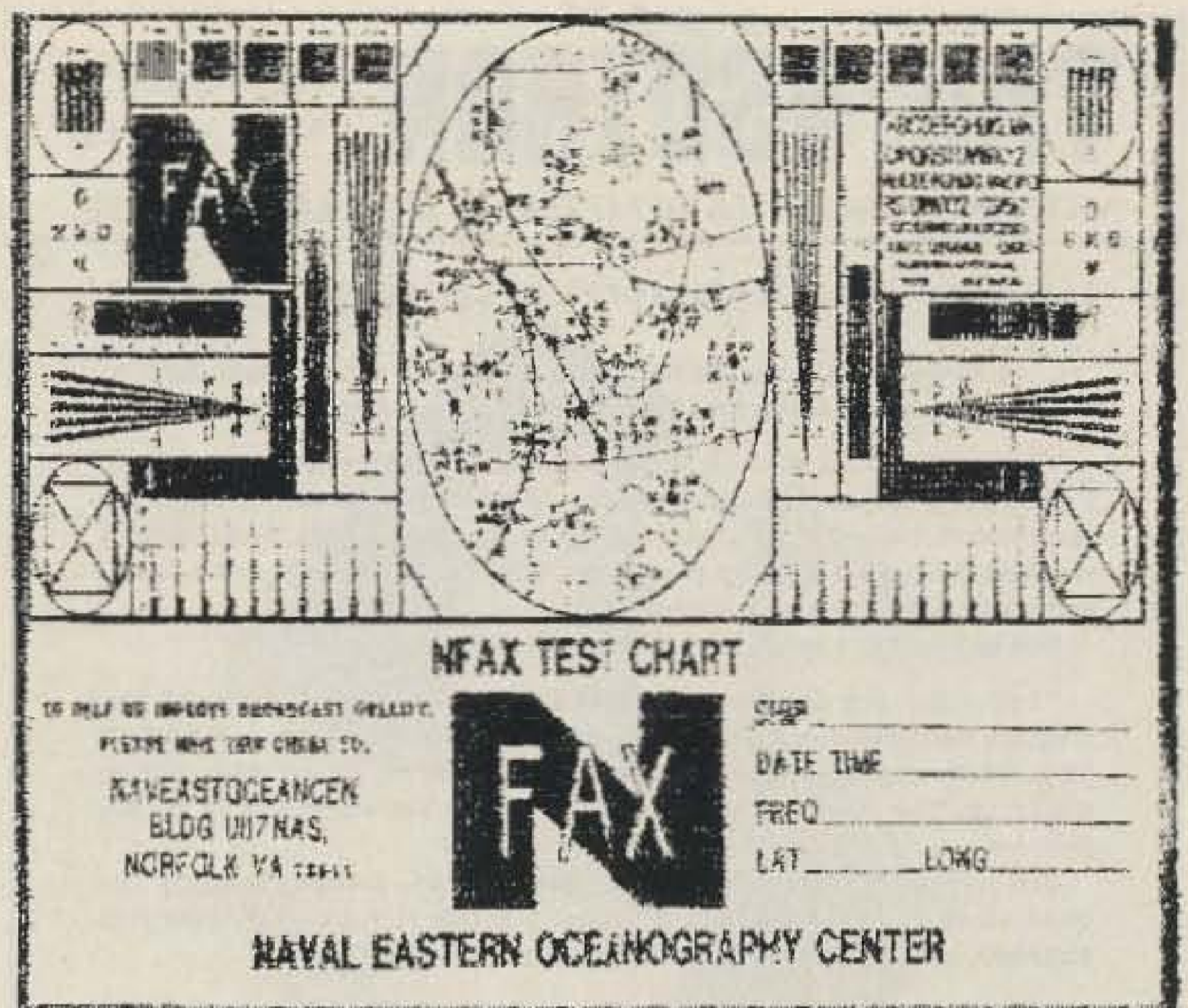


Fig. 3. Test chart copied from NAM on 8080 kHz. A good example of the resolution capabilities of this system.

chronization. This feature may be useful to eliminate unwanted sections of a known chart.

**PRINT:** A P may be used to print a copy of the present chart on a Gemini 10X printer. The eight-by-eight-inch chart will require about three minutes to print. To abort the printing process, enter another P.

**LPM:** A 1 or 2 may be entered to select the desired received LPM rate. A 1 will select one line per second (60 LPM), while a 2 will select two lines per second (120 LPM).

Finally, the right portion of the bottom line of the screen indicates the present number of rows (or pixels per received line) and the amount of time between samples, both shown as hexadecimal numbers. The <, >, +, or - keys may be used to increment or decrement these values. This may be required to fine tune your computer to synchronize with the received chart.

#### How To Use the System

Before starting up your computer, make sure all cartridges are removed. If you have an 800XL computer, hold down the OPTION button while powering on to make sure that Basic is out

of the way. 800XL owners will also have to load in the TRANSLATOR disk before loading in VISIFAX. After booting, use Atari DOS option L to load and start your copy of VISIFAX.

Fire up your receiver and then connect its audio output to the tone detector's input and the tone detector's output to joystick port 2 on the computer. Tune in a strong facsimile signal until its characteristic "screech screech" sound is of a medium pitch. Then adjust the detector's TUNE control until the tuning LED blinks in time with the audio.

Press R on the keyboard to start displaying the chart. Use the S and R keys as required to properly position the chart vertically on the display. Fine tune to get the sharpest picture.

Except when printing a chart, the joystick may be used at all times to scroll the received chart around the display.

#### Where To Tune

By far the best facsimile signals at my location are from the Naval Eastern Oceanography Center (NAM) on 3357, 8080, 10,865, 16,410, and 20,225 kHz. Weather charts and satellite photographs of all types are

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broadcast nearly continuously.

Canadian station CFH out of Halifax, Nova Scotia, on 4217, 6330, 10,536, and 13,520 kHz also puts out good facsimile signals. CFH usually broadcasts one or two charts for the first 15 to 30 minutes of each hour.

I have also heard and printed charts from a number of other stations. Try 7640, 7670, 9400, 10,400, 12,125, 14,435, 14,500, 14,610, and 14,737 kHz.

#### Where To From Here

Several improvements to VISIFAX jump to mind. A nice feature would be saving and restoring charts from disk. Sometimes a chart is received without proper synchronization, resulting in a chart that is split horizontally, vertically, or both. An option could be provided that would allow manipulating a received chart to straighten out the chart. A more sophisticated tone de-

detector and program changes could result in improved charts. There is a lot of room for experimentation and improvements. I would enjoy hearing from anyone who has made any of these, or other, modifications.

The Atari Editor/Assembler cartridge was used to develop VISIFAX. The source-code file should be compatible (with a few minor modifications) with any 6502 assembler you might happen to have.

#### Where To Get the Program

For a fee of \$5.00 to cover my expenses, I will send you an Atari DOS 2.0S formatted diskette (containing the VISIFAX program in source, object, and listing forms), the tone-detector schematic, and other various notes. I cannot accept any CODs or credit cards. The package is available from me at the address given at the beginning of this article. ■

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