

Collecting Pocket and Hand-Held Televisions

Presented to

Mid-Atlantic Antique Radio Club

RadioActivity 2025

By

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VHF	UHF
13	83
	80
11	70
9	60
7	50
	40
	30
4	
2	14

Collecting Pocket and Hand-Held Televisions

- Manufacturer's drive towards portability:
Reducing the size of CRT televisions.

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- Development of LCD TVs.

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CRT televisions: Initial attempts at portability.



1959 - World's first truly portable TV.

World's First Transistor Portable TV

Philco Safari plays anywhere without plugging in...even in bright sunlight!

You've never seen TV like Safari! Weighing a scant 15½ pounds, less than 17" tall, Safari is the world's first TV you can take wherever you go, including places electricity can't go... on picnics, to the beach, on boats, in trains, truly everywhere!

Safari plays on its own built-in rechargeable battery, and the recharger is built in, too! (Or save the battery, operate Safari on AC house current!) And wait till you see the picture... it's like looking at a theatre screen! Exclusive Philco design lets you enjoy perfect viewing even in the brightest sunlight.

Safari is the world's first transistor TV mass-produced for sale today! Reserve yours now at your Philco dealer's. **\$250**

Rechargeable battery. \$6.95 extra.

SPECIFICATIONS: 21-transistor chassis, 4 IF stages, 3-transistor high-gain tuner, 12 diodes, 2 rectifiers, easy-to-service Ferns-Circuit chassis design, Pivot-Tenna, "jack" for optional ear speaker. Natural or black genuine leather with saddle stitching, durable styrene top. Dimensions: 8½" wide, 16½" high, 5½" deep. Not available in U.H.F. PHILCO IS A REGISTERED TRADEMARK OF PHILCO CORPORATION, PITTSBURGH, PA.

★ On September 12, Philco brings you the exciting New America Pageant — "Live" from Atlantic City. Watch your local paper for time and channel!



NEW! SWIVEL-SCREEN CONSOLE TV PRICED FROM \$199.95

Decorator TV fits so many rooms perfectly. Comes in 5 fashionable colors — gold, charcoal brown, vermilion, beige, mahogany finish. Handsome stand has gleaming brass legs and a useful decorator shelf. The complete unit measures just 12" deep. The picture tube swivels a full circle. Sinsto (left) has automatic clock controls.* Turns on your favorite programs, turns itself off at night.

*PHILCO PATENT PENDING.

PHILCO

QUALITY FIRST!

Some interesting sets on the way to miniaturization:



Sony Micro TV 4 204UW (1964)
From Visions4 Magazine
(visions4netjournal.com/vintage-
micro-tv-color-tv/)



Panasonic TR-001, 1.5" screen (1970).
From Visions4 Magazine, Page 2.
(visions4netjournal.com/page-two/)



Sears Binoc TV 57 5039 (1980).
Similar to Sanyo TPM 2570.



Panasonic CT 101A, 1.5" color CRT (1984).
From Visions4 Magazine, Page 2a.
(visions4netjournal.com/page-twoa/)



Emerson boom box TV
XLC-555 (1985)



Zykkor 23 transistor TV, 2-inch screen,
with AM, FM, & SW radio (1987)

The Sony revolution:



The Skinny Sony.

Sony® has just put television on a crash diet with the invention of the new Watchman™ TV. It's a mere 1/4" thin.

Other "small" TVs would love to have a body like that, but their picture tubes are just too chubby.

On the other hand, Sony's new flat display picture tube is as flat as a pancake (literally), making Watchman extremely easy to hold when you're watching it. And extremely easy to slip into your pocket when you're not.

Watch what you want, wherever you want to watch it, because Watchman is the first really

personal TV. With a sharp 2" (measured diagonally) black-and-white picture that you'll have all to yourself.

Now, you can catch the 6 o'clock news on the bus home. Or tune in the ball game on a bank line, because with its personal ear-phone, you can enjoy your favorite show in the privacy of a crowd.

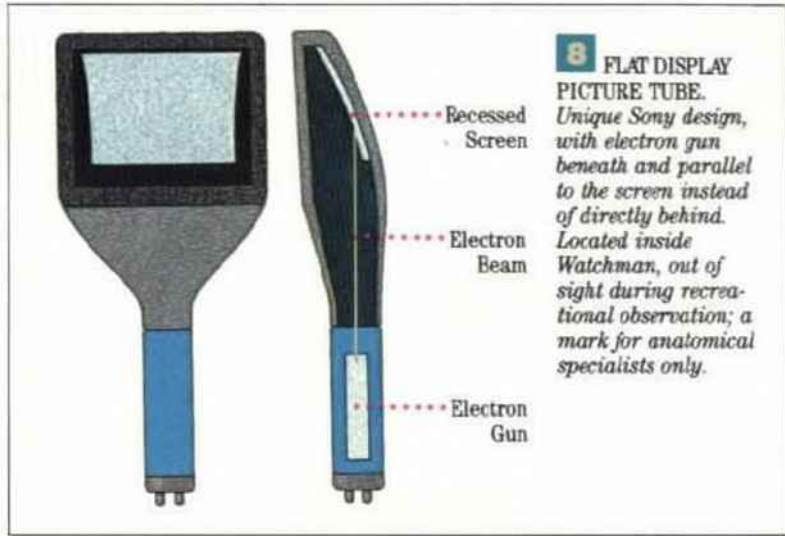
So why load yourself down with a television that's overweight when you can travel with one that watches its figure.

INTRODUCING SONY WATCHMAN PERSONAL TV.

SONY
THE ONE AND ONLY



Simulated Picture



**The next big
breakthrough in
mini-CRT TVs –
the Sony Watchman
pocket TVs.**



A couple of other interesting mini-CRT TV models:



Sinclair MTV-1 (1977)



Sinclair FTV-1 (TV80) (1983)

Sinclair TVs from: Franks Hand Held TV pages, Part 2 –
The Tubes (www.guenthoer.de/e-tube.htm).

The Next Revolution:

Liquid Crystal Display (LCD) Televisions

What is a liquid crystal??

- A liquid crystal is (usually) an organic compound that has:
 - the mechanical properties of a liquid,
 - a molecular arrangement resembling that of solid crystals.
- Considered a fourth state of matter – with properties of both liquid and solid phase.



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What is a liquid crystal display?

A liquid-crystal display (LCD) is a flat panel display that uses the light-modulating properties of liquid crystals combined with polarizers to display information. Liquid crystals do not emit light themselves but instead use a backlight or reflector to produce images.



A Brief Time-Line of Liquid Crystal Displays



1888

- First recorded observation of the liquid crystal effect by Austrian botanist Friedrich Reinitzer.

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- Reinitzer forwards his observations to Otto Lehmann, a German physicist and crystallographer.
- Coins the term *fliessende krystalle* (flowing crystals).

A Brief Time-Line of Liquid Crystal Displays

1951

David Sarnoff kicks off research for a thin TV that can hang on a wall – “Magnalux.”



A Brief Time-Line of Liquid Crystal Displays

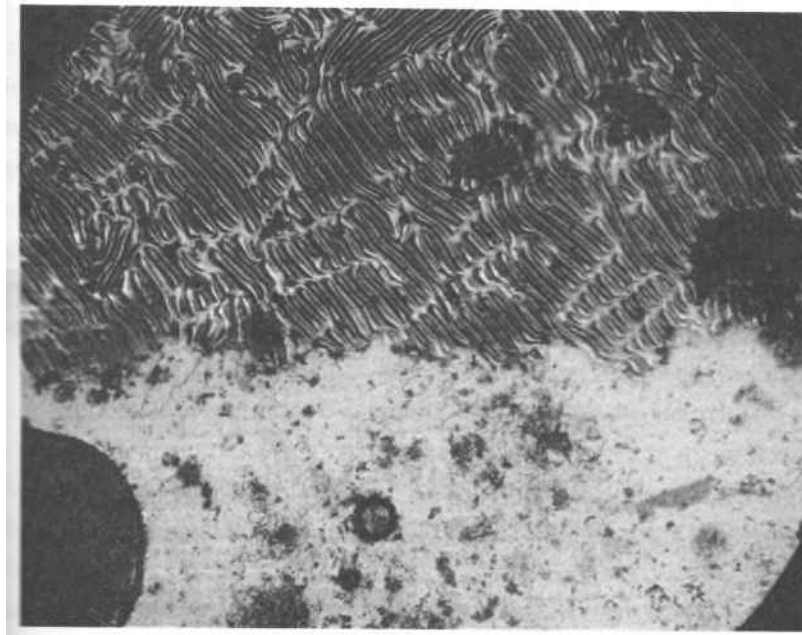
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Research into using liquid crystals to modulate light begins at RCA.



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Liquid crystal displays, using the dynamic scattering method (DSM), demonstrated to the public at a press conference.

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RCA sells their LCD operation to Timex.

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1986

RCA is sold to GE in a corporate buyout.

A Brief Time-Line of Liquid Crystal Displays



Sharp Corporation's Isamu Washizuka with the company's 14-inch prototype color LCD TV.

1988

Sharp announces a prototype 14-inch color LCD TV.



A Brief Time-Line of Liquid Crystal Displays



Sharp model 9E-HC1 full color LCD TV.

1991

Sharp markets the world's first commercial wall mount flat panel LCD TV .

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“Carrots are the ancestors of flat screen TVs”

The Next Revolution - Liquid Crystal Display (LCD) Televisions



Seiko T-001 TV Watch (1982). World's first device with LCD TV screen; 1 ¼ inch .
(e-bay; and www.seiko-design.com/140th/en/topic/51.html)



Casio TV-10 (1983).
World's first self-contained LCD TV. (Visions4 magazine – Page TwoA).



Epson ET-10/Seiko T102 (1984).
World's first color LCD TVs.

Types of LCD TVs



Direct-view LCD. Casio TV-900.



Indirect-view LCD. Casio TV-300. (1986). Snap-on backlight panel was an optional extra.



Hybrid light source. Epson ET-10 LCD TV (1984). Reflective panel can be pivoted into or out of position.

The Dawn and Sunset of analog hand-held LCD TVs

Advances in LCD Technology



Casio TV-10 (1983). 2.7 in. Black & White, passive twisted nematic (TN) screen. 20,480 pixels. Manual Tuning.



Casio EV-4500 (2003) 4 in. color LCD TV. Thin film transistor (TFT) active matrix screen. 122,920 pixels. Digital tuning.

Collecting mini-TV sets:

Determining Viability: What to look for

Bad things to see on a screen -



Collecting mini-TV sets: Determining Viability: What to look for

Good things to see on a screen -



Casio TV EV-200B with auto tuning. The green (UHF) scan line suggests a working set.



Casio TV-400 LCD TV with auto tuning. The snowy screen and visible channel indicator tab suggest a working set.



Citizen TV-06TA B&W LCD TV indirect view set. Manual tuning. The mirror shows the screen has a full raster with snow throughout the screen.



Watchman FD-20A CRT-TV showing full screen of Snow.

Collecting mini-TV sets: Can they be fixed?



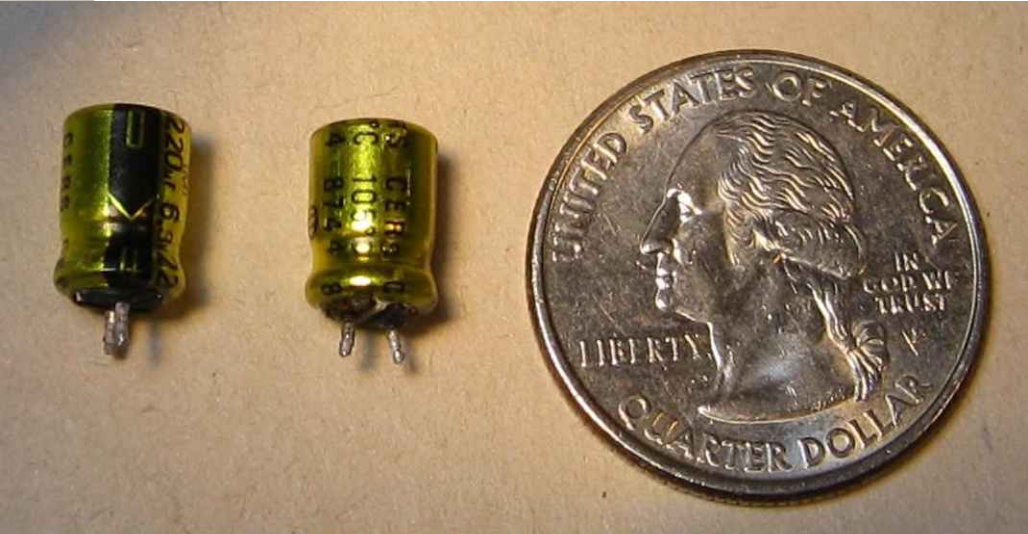
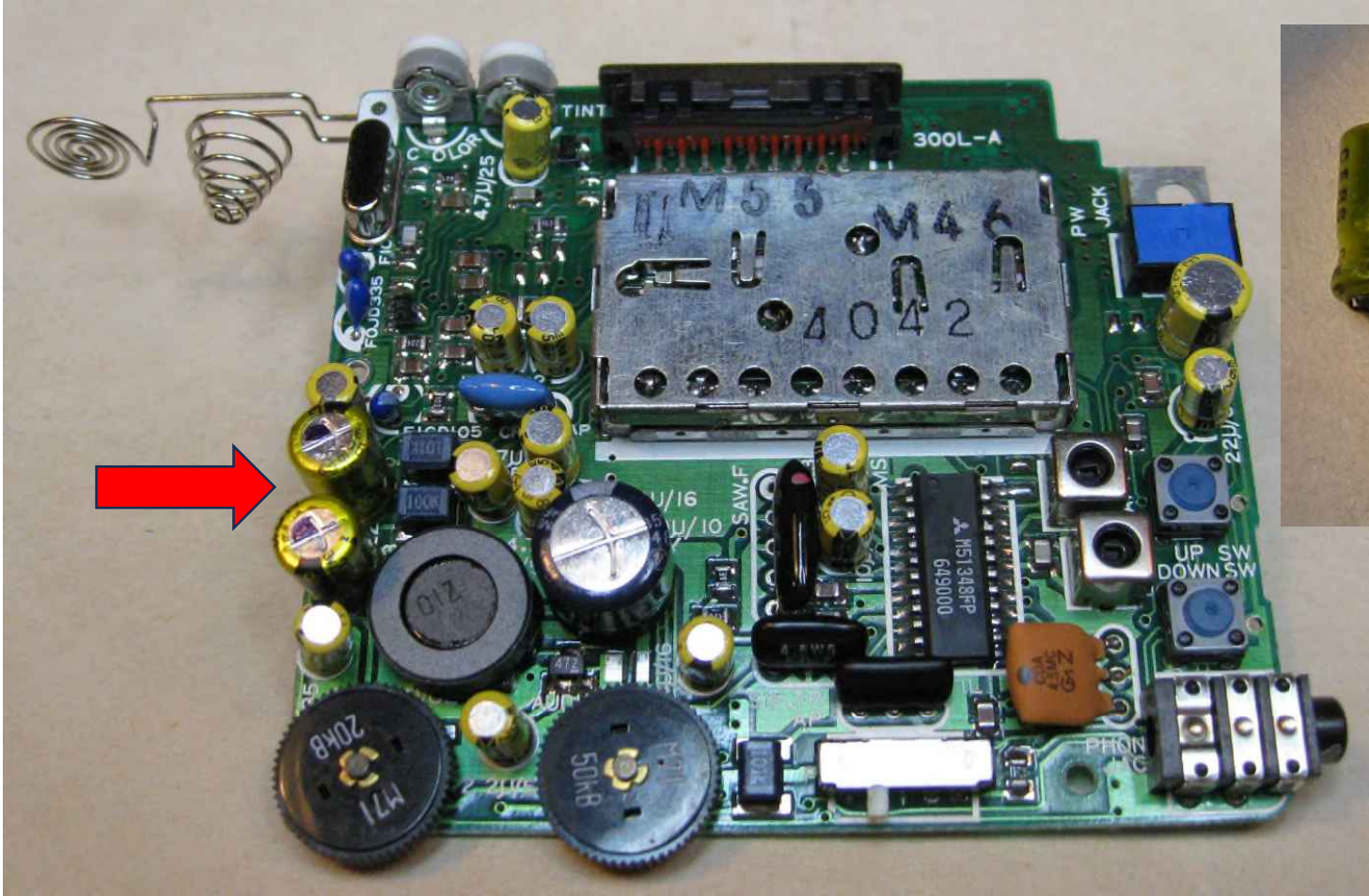
Circuit board for the Sony FDL-370 color LCD TV. There are 37 electrolytic capacitors on the board, both Surface Mount Devices (SMDs) and through board caps. Here, the LCD panel and cradle have been removed for clarity.



Left - surface mount devices (SMD) electrolytic caps.

Right – through-board radial electrolytic cap.

Collecting mini-TV sets: Can they be fixed?



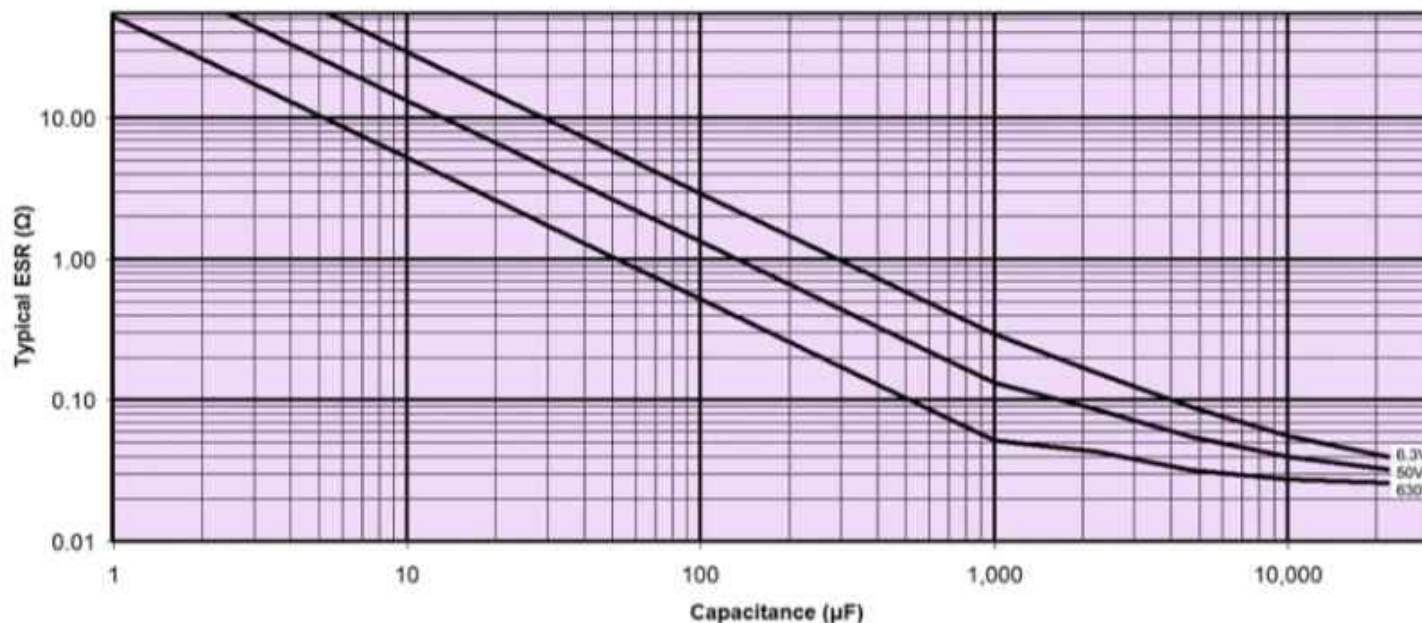
Guts of a Casio mini-TV. Note the two greenish-golden ELNA capacitors on the left – which are virtually always bad.

Equivalent Series Resistance (ESR) meter



	6.3V	10V	16V	25V	35V	50V	63V	100V	160V	250V	400V	630V
4.7µF	62.0Ω	54.0Ω	45.0Ω	40.0Ω	34.0Ω	28.0Ω	25.0Ω	23.0Ω	19.0Ω	16.0Ω	13.0Ω	11.0Ω
10µF	29.0Ω	25.0Ω	21.0Ω	19.0Ω	16.0Ω	13.0Ω	12.0Ω	11.0Ω	8.7Ω	7.4Ω	6.2Ω	5.2Ω
22µF	13.0Ω	11.0Ω	9.6Ω	8.4Ω	7.2Ω	6.0Ω	5.4Ω	4.8Ω	4.0Ω	3.4Ω	2.8Ω	2.4Ω
47µF	6.2Ω	5.4Ω	4.5Ω	4.0Ω	3.4Ω	2.8Ω	2.5Ω	2.3Ω	1.9Ω	1.6Ω	1.3Ω	1.1Ω
100µF	2.9Ω	2.5Ω	2.1Ω	1.9Ω	1.6Ω	1.3Ω	1.2Ω	1.1Ω	0.87Ω	0.74Ω	0.62Ω	0.52Ω
220µF	1.3Ω	1.1Ω	0.97Ω	0.84Ω	0.72Ω	0.60Ω	0.54Ω	0.48Ω	0.40Ω	0.34Ω	0.28Ω	0.24Ω
470µF	0.62Ω	0.54Ω	0.45Ω	0.40Ω	0.34Ω	0.28Ω	0.25Ω	0.23Ω	0.19Ω	0.16Ω	0.13Ω	0.11Ω
1000µF	0.29Ω	0.25Ω	0.21Ω	0.19Ω	0.16Ω	0.13Ω	0.12Ω	0.11Ω	0.087Ω	0.074Ω	0.062Ω	0.052Ω
2200µF	0.16Ω	0.14Ω	0.12Ω	0.11Ω	0.10Ω	0.09Ω	0.08Ω	0.07Ω	0.06Ω	0.06Ω	0.05Ω	0.04Ω
4700µF	0.09Ω	0.08Ω	0.07Ω	0.07Ω	0.06Ω	0.05Ω	0.05Ω	0.05Ω	0.04Ω	0.04Ω	0.04Ω	0.03Ω
10000µF	0.06Ω	0.05Ω	0.05Ω	0.05Ω	0.04Ω	0.04Ω	0.04Ω	0.04Ω	0.03Ω	0.03Ω	0.03Ω	0.03Ω
22000µF	0.04Ω	0.04Ω	0.04Ω	0.04Ω	0.03Ω	0.03Ω	0.03Ω	0.03Ω	0.03Ω	0.03Ω	0.03Ω	0.03Ω

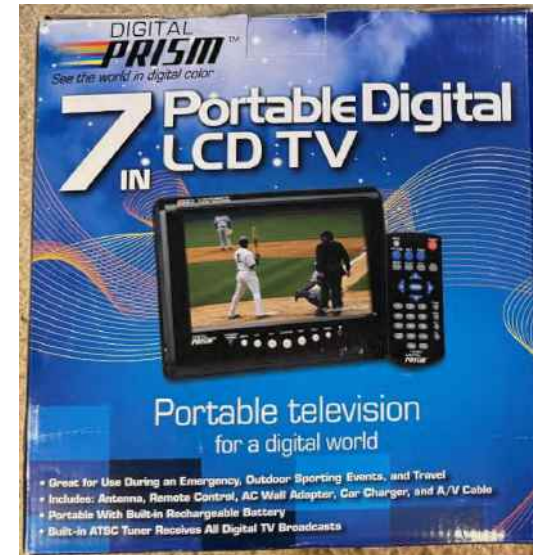
Remember, lower ESR is better. Many good capacitors will have ESR lower than shown above, that is good. ©
 Values in this table are calculated from published dissipation factors for Panasonic® FR-Series capacitors from 4.7µF to 4700µF with voltage ratings of 6.3VDC to 100VDC. Other values extrapolated by curve-fitting.



Digital LCD Televisions



Digital Prism ATSC-301 3.5" LCD TV

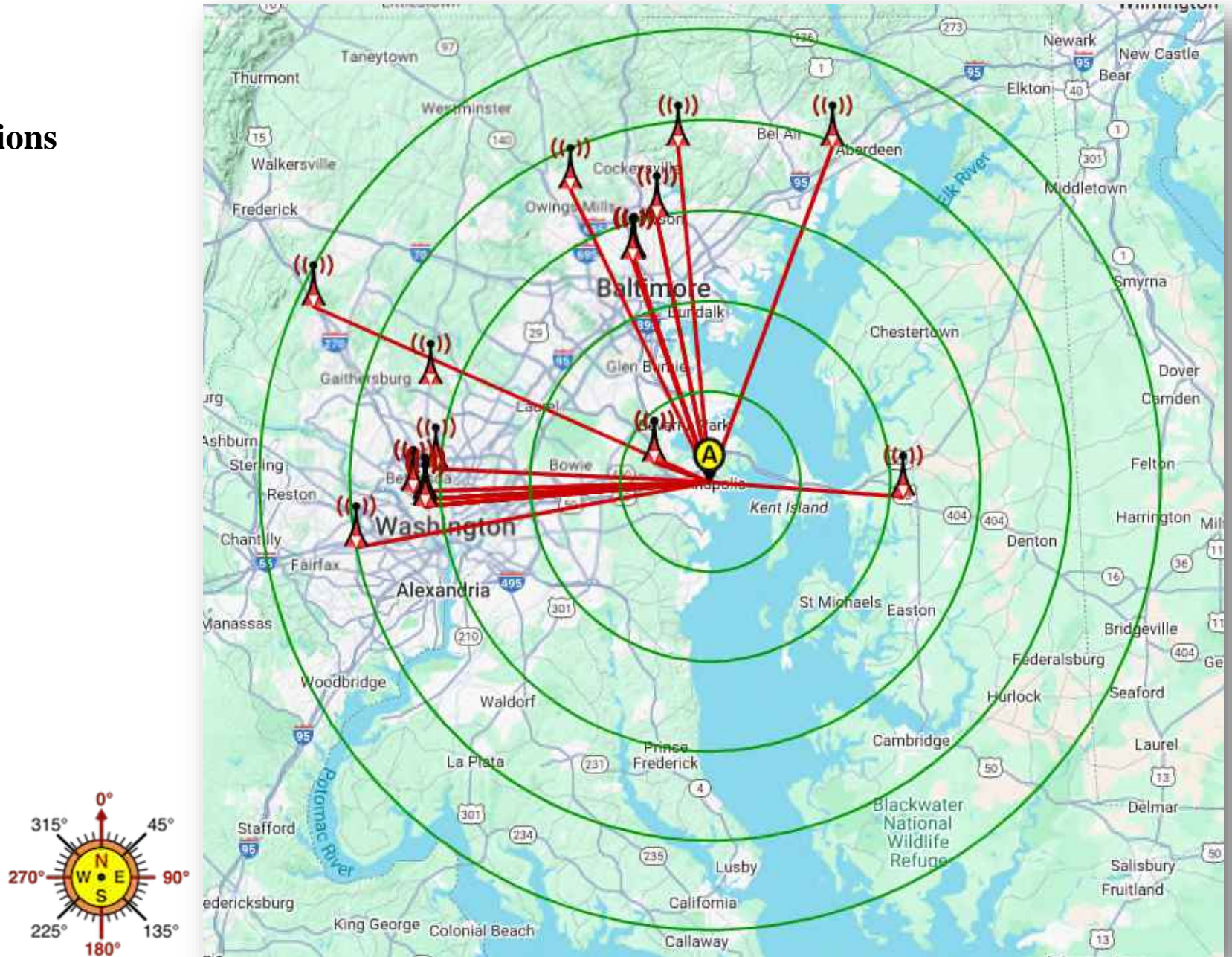


Digital Prism ATSC-710 7" LCD TV

Digital Over-The-Air TV stations

Each ring is 10 miles from center point.

Stations located mostly to the North and West of Byzantium.



Collecting mini-TVs:

The Chase –

- **E-bay**
- **Facebook/Craigslist**
- **MAARC**
- **Hamfests**
- **Second hand stores**

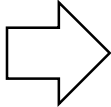
Why collect mini-tvs?

- Interesting & Fun
- Inexpensive (usually)
- Don't take up much shelf space

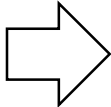


Summary

CRT televisions -

- Large screen  Small screen

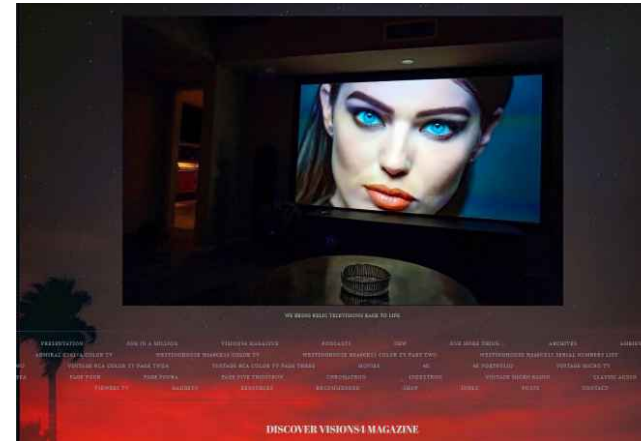
LCD televisions -

- Brief history of development
- Small screen  Large screen
- Repair – what to look out for
- Using analog LCD TVs in a digital age

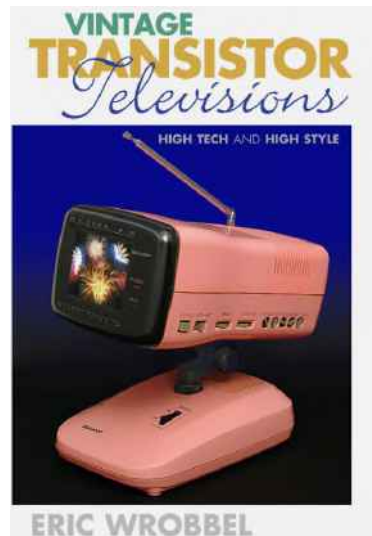
Resources



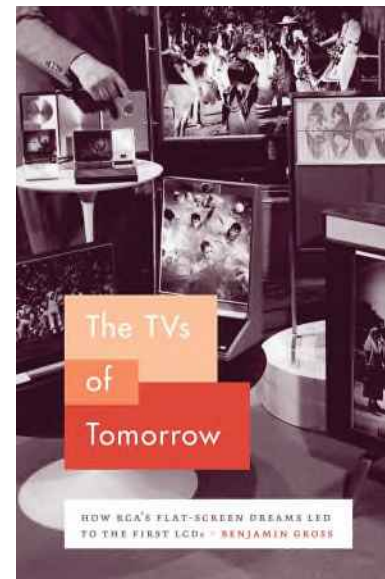
Frank's Handheld-TV Pages
Frank Günthör, (english.guenthoer.de)



Visions4 Magazine (visions4netjournal.com)



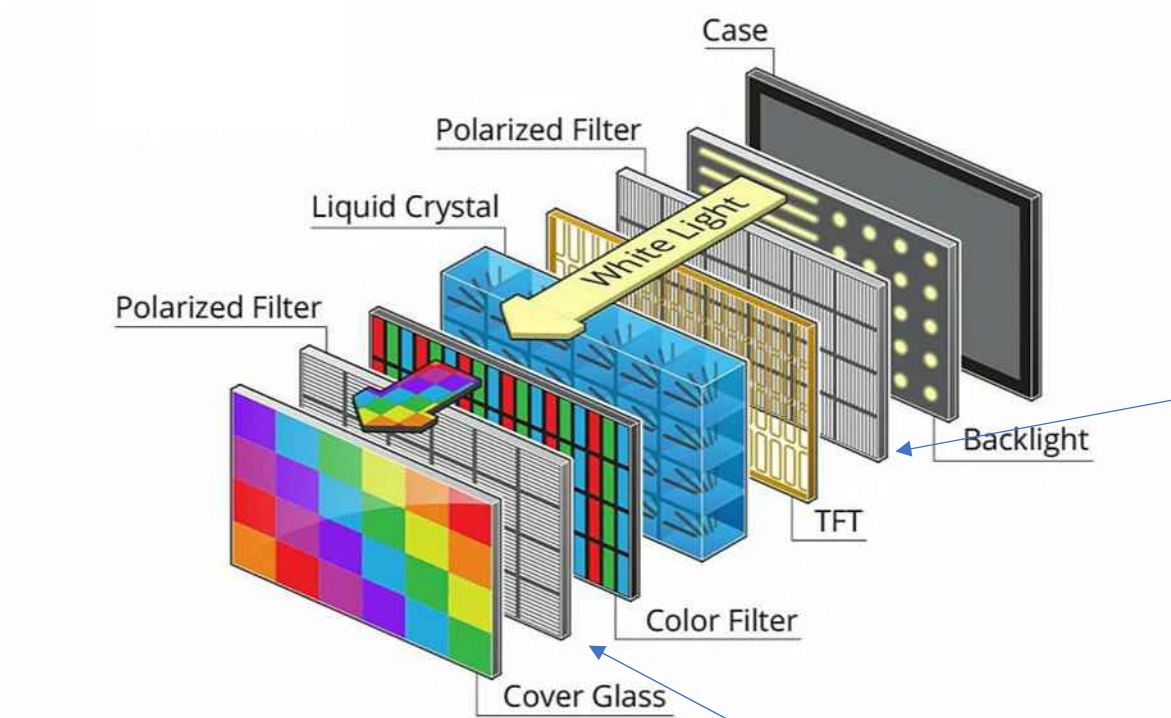
Vintage Transistor Televisions:
Booklet by Eric Wrobbel, 2006.



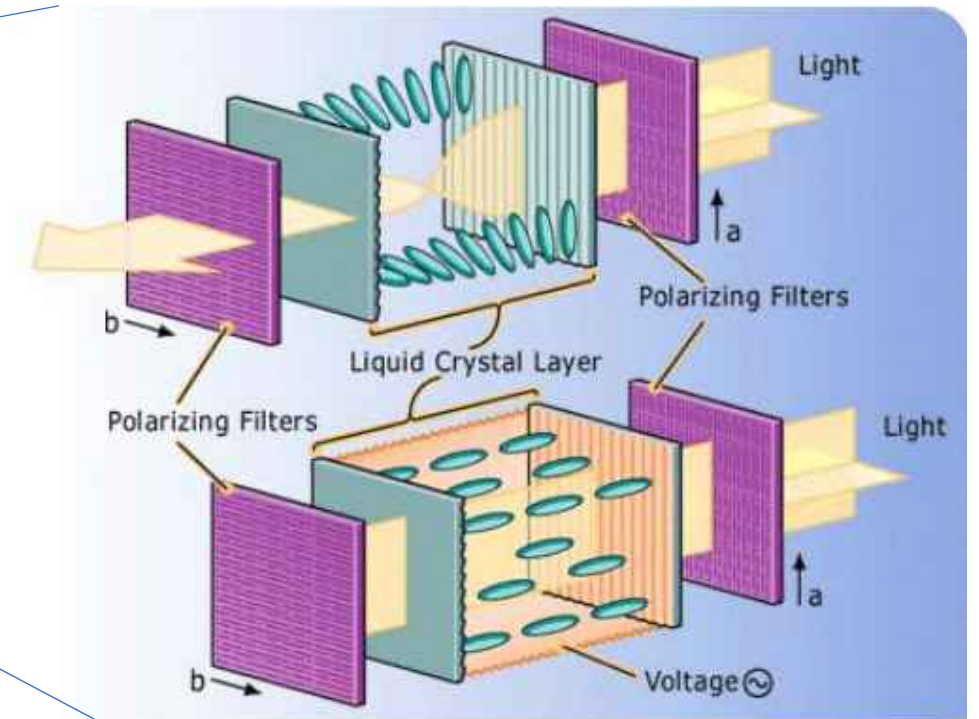
The TVs of Tomorrow
By Benjamin Cross, 2018.

QUESTIONS??

Structure of a Twisted Nematic (TN) Liquid Crystal Display



A light switch controlled by an electric field. Pixel size depends on screen resolution and size of screen. Can be avg 0.297 mm (~300 microns)



Some notable Sony CRT Watchman models



Sony FD-210 b&w CRT (1982). First Watchman sold in US.



Left: Sony FD-40A b&w CRT (1985). Right: Analogous Zenith model BTO44S. Largest-screen Watchman at 4 inches diag.



Sony FD-280 b&w CRT (1993). Last Watchman to use a CRT.

Some interesting Sony LCD televisions



Sony FDL-310 color LCD. First color Watchman (1989).



Sony FDL-380 color LCD with AM/FM stereo radio. With a 3-inch speaker, the best sounding Watchman (1993).

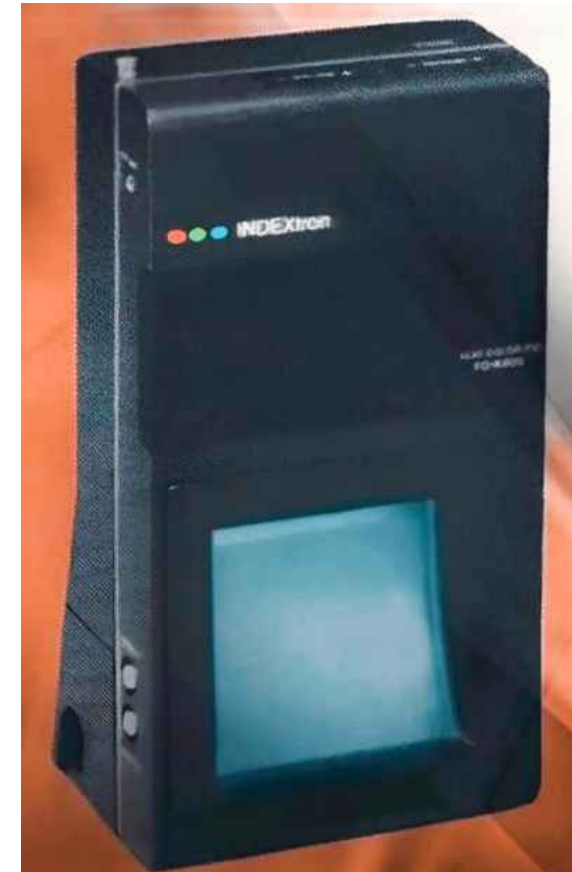


Sony FDL-PT222 color LCD (~2001). The last Sony Watchman TV.

Holy Grails



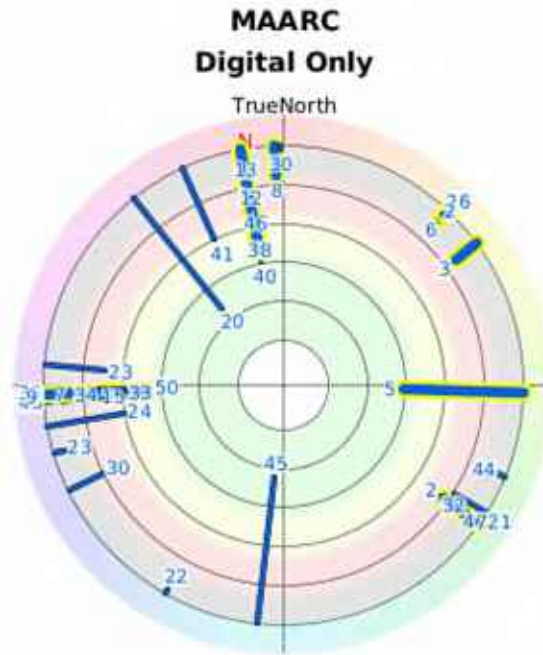
Sanyo 30CTV1 Index-1 flat CRT color TV (1985)
(World's first and only?)



Sony prototype, flat color Watchman (1986).
Never produced??

Digital Over-The-Air stations

Center of plot is 2747 Riva Rd.
Longer bars = stronger signals.



Search Criteria

Address: exact
Annapolis, MD
Postal code 21401

db datecode
202202220057

www.tvfool.com

Callsign	Real	(Virt)	Netwk	NM(dB)	Signal Pwr(dBm)	Path	Dist miles	True Azimuth	(Magn)
W45DN-D	45			55.2	-35.6	LOS	4.1	186°	(197°)
WQAW-LP	20			52.8	-38.1	LOS	3.7	321°	(332°)
WMDE	5			41.2	-49.6	LOS	25.5	92°	(103°)
WNUV-DT	40	(54.1)	CW	38.1	-52.8	2Edge	25.8	350°	(1°)
WMAR-TV	38	(2.1)	ABC	37.6	-53.3	2Edge	25.7	350°	(1°)
WBFF	46	(45.1)	Fox	36.2	-54.6	2Edge	25.8	350°	(1°)
WDCW	50	(50.1)	CW	34.9	-56.0	1Edge	24.8	269°	(280°)
WHUT-TV	33	(32.1)	PBS	34.7	-56.2	1Edge	27.7	268°	(279°)
WFDC-DT	15	(14.1)	Uni	34.1	-56.7	1Edge	27.8	266°	(277°)
WPXW-DT	34	(66.1)	ION	34.1	-56.7	1Edge	27.7	268°	(279°)
WBAL-TV	12		NBC	33.6	-57.2	2Edge	25.7	350°	(1°)
WJLA-TV	7	(7.1)	ABC	33.5	-57.4	1Edge	27.7	268°	(279°)
WJZ-TV	13	(13.1)	CBS	33.1	-57.8	2Edge	25.7	350°	(1°)
WUSA	9		CBS	32.9	-57.9	1Edge	27.7	268°	(279°)
WTTG	36	(5.1)	Fox	32.0	-58.8	1Edge	27.9	268°	(279°)
WRC-DT	48	(4.1)	NBC	32.0	-58.9	1Edge	27.8	266°	(277°)
WDCA	35	(20.1)	MyN	29.1	-61.7	1Edge	27.9	268°	(279°)
WETA-TV	27		PBS	24.2	-66.6	1Edge	27.7	268°	(279°)
WUTB	41	(24.1)	MyN	20.4	-70.4	1Edge	24.4	335°	(346°)
WNVG-DT	24	(30.1)	Ind	20.0	-70.9	2Edge	36.0	260°	(271°)
WVTD-LD	14			13.0	-77.8	1Edge	27.8	266°	(277°)
WRZB-LD	32			11.7	-79.2	1Edge	27.8	266°	(277°)
WDDN-LD	23			10.8	-80.1	1Edge	26.5	275°	(286°)
WIAV-CD	44			9.6	-81.3	1Edge	27.8	266°	(277°)
WZDC-CD	25			3.2	-87.6	2Edge	27.8	266°	(277°)
WNDC-LP	2	(11.1)		2.8	-88.1	2Edge	55.2	125°	(136°)
WMDO-CD	22			0.8	-90.0	2Edge	27.8	266°	(277°)
WGDV-LD	32			0.5	-90.4	1Edge	55.2	125°	(136°)
WVVT-DT	30	(30.1)	Ind	0.0	-90.8	2Edge	52.6	244°	(255°)
WMDT-DT	47	(47.1)	ABC	-0.2	-91.0	1Edge	55.2	125°	(136°)
WBOC-DT	21	(16.1)	CBS	-0.9	-91.7	2Edge	59.2	122°	(133°)
WVPX-TV	12		ION	-1	-92.2	2Edge	27.7	268°	(279°)
WGAL	8	(8.1)	NBC	-5	-96.1	2Edge	73.6	358°	(9°)
WEVD-LP	3	(27.1)		-6	-97.6	2Edge	55.9	54°	(65°)
WDWA-LD	23			-14.4	-105.3	2Edge	43.0	253°	(264°)
WPVI-TV	6	(6.1)	ABC	-14.6	-105.4	Tropo	102.4	43°	(54°)
WDPB-DT	44	(64.1)	PBS	-15.8	-106.7	2Edge	55.9	112°	(124°)
KJWP	2	(2.1)		-17.0	-107.8	2Edge	102.6	43°	(54°)
KYW-TV	26	(3.1)	CBS	-17.6	-108.4	Tropo	102.4	43°	(54°)
WRIC-DT	22	(8.1)	ABC	-17.6	-108.5	Tropo	115.1	210°	(221°)
WPHL-DT	17	(17.1)	MyN	-18.1	-108.9	Tropo	102.5	43°	(54°)
WGCB-DT	30	(49.1)	Ind	-18.6	-109.5	Tropo	64.6	359°	(10°)
WACP	4			-20.6	-111.5	Tropo	106.4	60°	(71°)
WWSI	49		TEL	-20.8	-111.6	Tropo	106.4	60°	(71°)
WVIR-DT	32	(29.1)	NBC	-20.9	-111.7	Tropo	124.1	237°	(248°)
WTVR-TV	23		CBS	-20.9	-111.8	Tropo	115.1	210°	(221°)
WTVZ-DT	33	(33.1)	MyN	-21.0	-111.8	Tropo	149.0	179°	(190°)
WHRO-DT	16	(15.1)	PBS	-21.0	-111.9	Tropo	149.0	179°	(190°)
WVPX-DT	12	(60.1)	ION	-21.0	-111.9	2Edge	87.2	293°	(304°)
WXBU	23	(15.1)		-21.1	-111.9	Tropo	89.4	3°	(14°)
WAVY-DT	31	(10.1)	NBC	-21.1	-111.9	Tropo	148.1	179°	(190°)

