



Fly-Over Report

Mar-
Tech

**Time Warner
ELYRIA, OH
September 10, 2008**

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Summary

System: Time Warner: ELYRIA, OH

Test Date: September 10, 2008

A fly-over test for the system was performed to evaluate the system on the basis of signal leakage in the aeronautical band (108-140 MHz) as required by the F.C.C. (frequencies outside range will receive correction factor, see *Procedure* step 2a), and to determine the location and levels of any non-complying leaks (leaks in excess of 10 uV/m at 1500 feet). A description of the procedure, probability graph, a list of relative high readings, and a plotted map showing the system boundary, flight pattern and locations of relative high readings are included. Listed below are the results.

1. Generator level input into calibration antenna	6.55 millivolts
2. Receiver adjustment to force a 10 uV/m reading	0 dB
3. Measure signal level of peak video carrier in aeronautical band at test point, and set generator level one dB higher.	
4. Number of sample points	2,200 points
5. Number of points > 10 uV/m	5 points
6. Minimum leakage	1.31 uV/m
7. Maximum leakage	11.47 uV/m
8. Average field intensity	2.58 uV/m
9. Percentage of points < 10 uV/m	99.77 %

F.C.C. requirements status: PASSED

Procedure

1. Determine system boundaries and correlate to Topo map using either a 7.5' or a 1:100,000 scale print.
2. Determine proper channel and time for testing, using a modulated carrier between 108 and 140 MHz.

Date: September 10, 2008
Time: 2:40 AM
Frequency: 138.2500 MHz

2a. Apply Correction factor:

Frequencies above 140: (Data Sample) + 20 * log(f/140)
Frequencies below 108: (Data Sample) + 20 * log(f/108)

3. Calibration of Receiver

Establish signal generator input levels which will be used to calibrate AOR receiver. If calibration graph is not provided with the report, the calibration was performed at 3 feet above the ground. If calibration graph is provided with the report, the calibration was performed at 1,500 feet above ground level.

10 uV/m field (at 3 or 1,500 feet & 138.2500 MHz)

Convert uV/m to dBmV:

$$\begin{aligned} \text{dBmV} &= 20 * \log(E) - 20 * \log(20.7 * f) \\ &\quad (\text{where } E = 10 \text{ uV/m and } f = \text{frequency in MHz}) \\ &= 20 - 20 * \log(20.7 * 138.2500) \\ &= -49.1327 \text{ dBmV} \end{aligned}$$

$$\begin{aligned} \text{dBuV} &= -49.1327 + 60 \text{ (dBuV = dBmV + 60)} \\ &\quad (\text{we increase this amount by a factor of 20 dB to increase our sensitivity}) \\ \text{dB} &= 20 * \log(x/10) \text{ where } x=100 \text{ uV/m or expected reading in receiver is } 100 \text{ uV/m} \end{aligned}$$

$$\text{dBuV} = 10.8673 + 20 \text{ dB}$$

Determine Free Space Loss:

$$\begin{aligned} \text{FSL} &= -37.87 + 20 * \log(f) + 20 * \log(d) \\ f &= \text{frequency in MHz and } d = \text{distance feet} \\ &= -37.87 + 20 * \log(138.2500) + 9.54 \\ &= 14.4833 \text{ dB} \end{aligned}$$

Determine Signal Level Input:

$$\begin{aligned} 100 \text{ uV/m} &= (\text{free space and cable loss}) \\ &\quad - (\text{dipole and reflector gain}) \\ &\quad - (\text{impedance mismatch: } 50 \text{ ohm to } 75 \text{ ohm}) \\ &\quad + (22 \text{ dB gain amp} + \text{input}) \end{aligned}$$

Cable and Filter Loss (from antenna to receiver) = 4 dB

$$\begin{aligned} \text{Dipole gain} &= 0 \text{ dB at } 138.2500 \text{ MHz} \\ &\quad (\text{reflector gain} = 2 \text{ dB; impedance gain} = 1 \text{ dB}) \end{aligned}$$

$$\begin{aligned} \text{Free space loss} &= 14.4833 \text{ dB} \\ \text{dBuV} &= 22 \text{ dB} - 4 \text{ dB} - 14.4833 + 3 \text{ dB} + X \text{ (where } X = \text{generator input)} \\ 30.8673 &= (21 - 14.4833) + X \end{aligned}$$

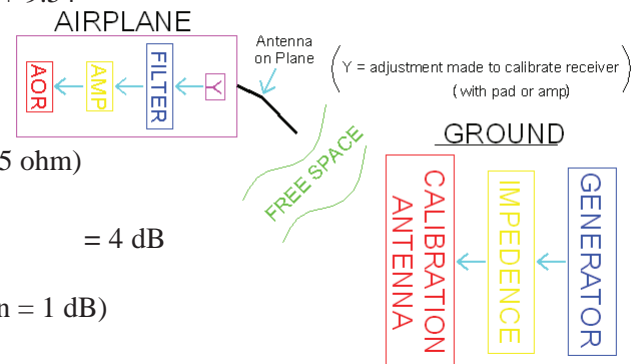
$$X = 30.8673 - (21 - 14.4833)$$

$$X = 24.3506 - 108.75 \text{ (the signal generator level to create an } 100 \text{ uV/m leak at receiver)}$$

$$X = -84.3994 \text{ dBm (dBm = dBuV - 108.75)}$$

Convert to millivolts:

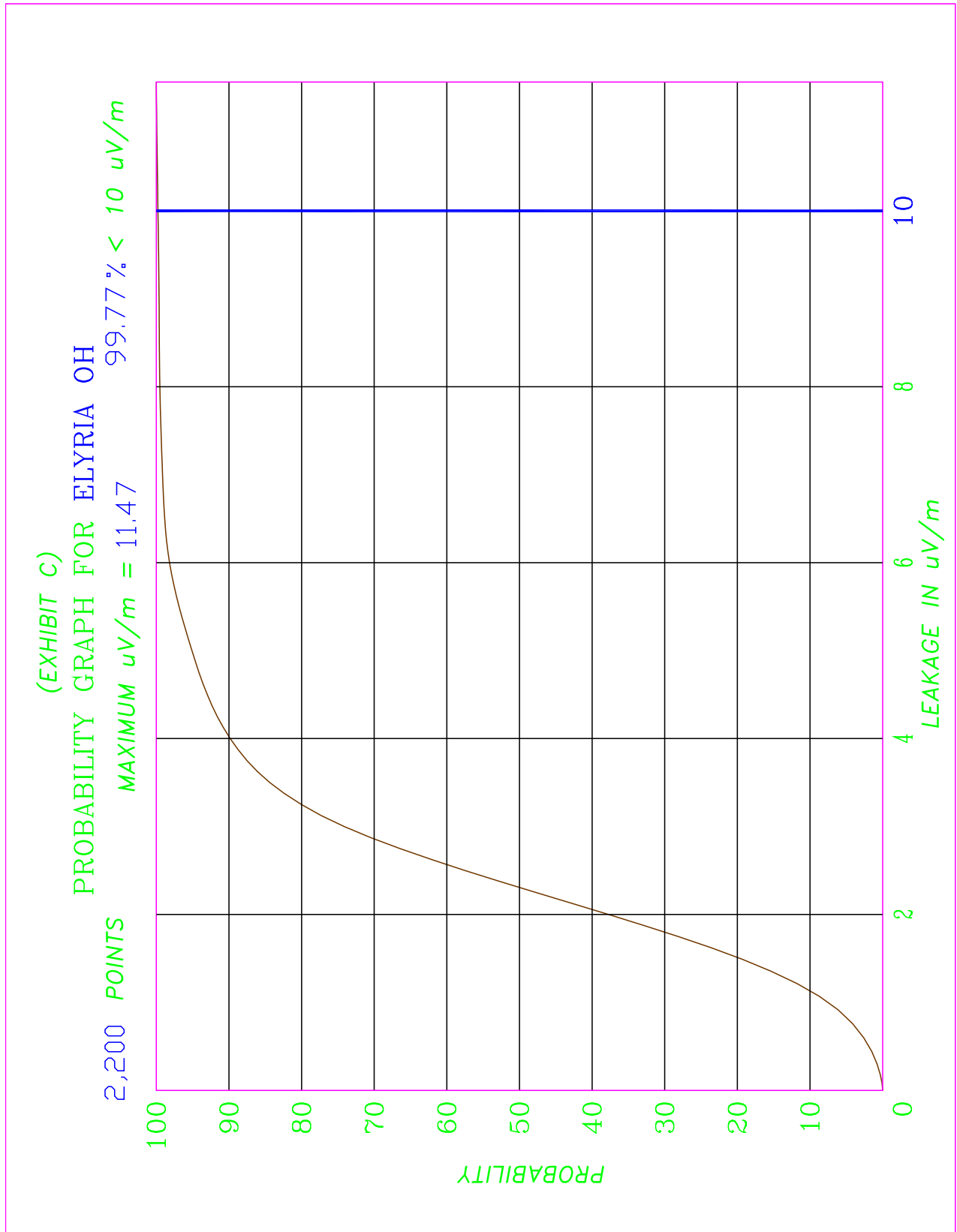
$$\begin{aligned} \text{mV} &= 10 (\text{dBuV}/20) \\ &= 32.9253 \text{ uV} \end{aligned}$$



Procedure

4. Test signal level input of generator with signal level meter to insure accuracy.
5. **If using video carrier:**
Flyover performed using channel **D** video carrier.
If using modulated carrier:
Insert generator to combining network at **138.2500** MHz.
Measure signal level of channel **D** video carrier at headend trunk output test point with signal level meter.
Set generator output one dB above measured channel **D** video carrier level.
6. Perform system fly-over at 1500 feet in a grid pattern (all plant covered within 1/2 mile of pattern) at 120mph, combining GPS and signal level readings simultaneously with our software into an on-board computer (see *Test Configuration*).
7. Using system boundary polygon, filter all data points outside of system using custom software.
8. Develop a frequency distribution graph (see Probability Graph) and a listing of all relative high readings.
9. Plot all leak levels on digitized map showing the exact locations of all relative high readings along with the flight pattern .
10. An Enhanced test is a test performed with a test level inserted 2 dB or higher than adjacent video carrier levels. To generate the FCC standard report, all test data is reduced utilizing the following formula:
$$\text{dB} = 20 * \log(x / 10).$$

Probability Graph



Relative High Readings

Center Point and Radius of System

 Latitude = 41 23 45
 Longitude = -82 4 22
 Radius = 19.1164 Kilometer(s)

Relative high readings for ELYRIA OH

Reference	uV/m	Longitude	Latitude
-----	----	D M S	D M S
		-----	-----
47701	10	-82 05 38 -82.0940	41 20 41 41.3340
48068	6	-82 07 30 -82.1250	41 21 41 41.3530
48388	7	-82 05 42 -82.0950	41 22 41 41.3680
48509	7	-82 12 39 -82.2110	41 22 41 41.3680
48742	10	-82 07 26 -82.1240	41 23 41 41.3840
48818	11	-82 03 14 -82.0540	41 22 41 41.3820
49317	6	-82 13 15 -82.2210	41 24 41 41.4140
49464	6	-82 05 24 -82.0900	41 24 41 41.4140

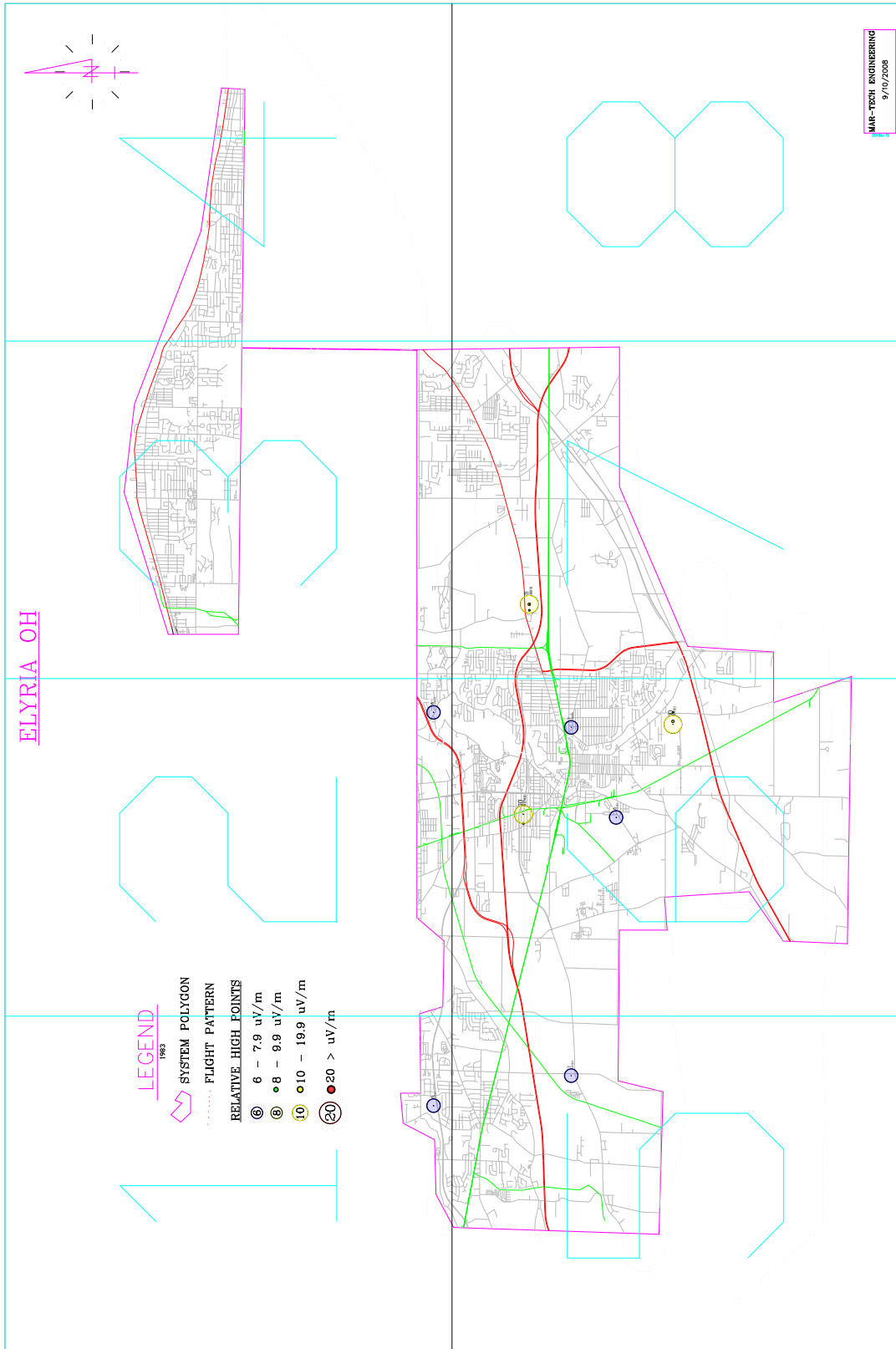
List of Equipment (Partial)

Equipment	Calibration
Aircraft Partenavia P69B Cessna 210 Cessna T210 Beechcraft B76	N/A N/A N/A N/A
Apollo 2001 GPS NMS	N/A
Leakage Detection Meters Wavetek CLM - 1000 AOR AR - 1	Yearly Yearly
Signal Level Meters Wavetek SAM - 1550 Wavetek SAM - 2000	Yearly Yearly
Frequency Synthesized Generators HP 8467 - A Wavetek - Model 2407 Wavetek - Model 3000-200	Yearly Yearly Yearly
Interfacing Combining Equipment Band Pass Filter 20 dB Pre-Amp 28-13 DC Voltage Converter	N/A N/A N/A
Lindsay Airborne Dipole Antenna	N/A
Lindsay Calibration Dipole Antenna	N/A
Laptop Computers	N/A
Mar-Tech Custom Software For Collecting And Interpreting Data And Filtering Points Outside The Polygon (System Boundary)	N/A

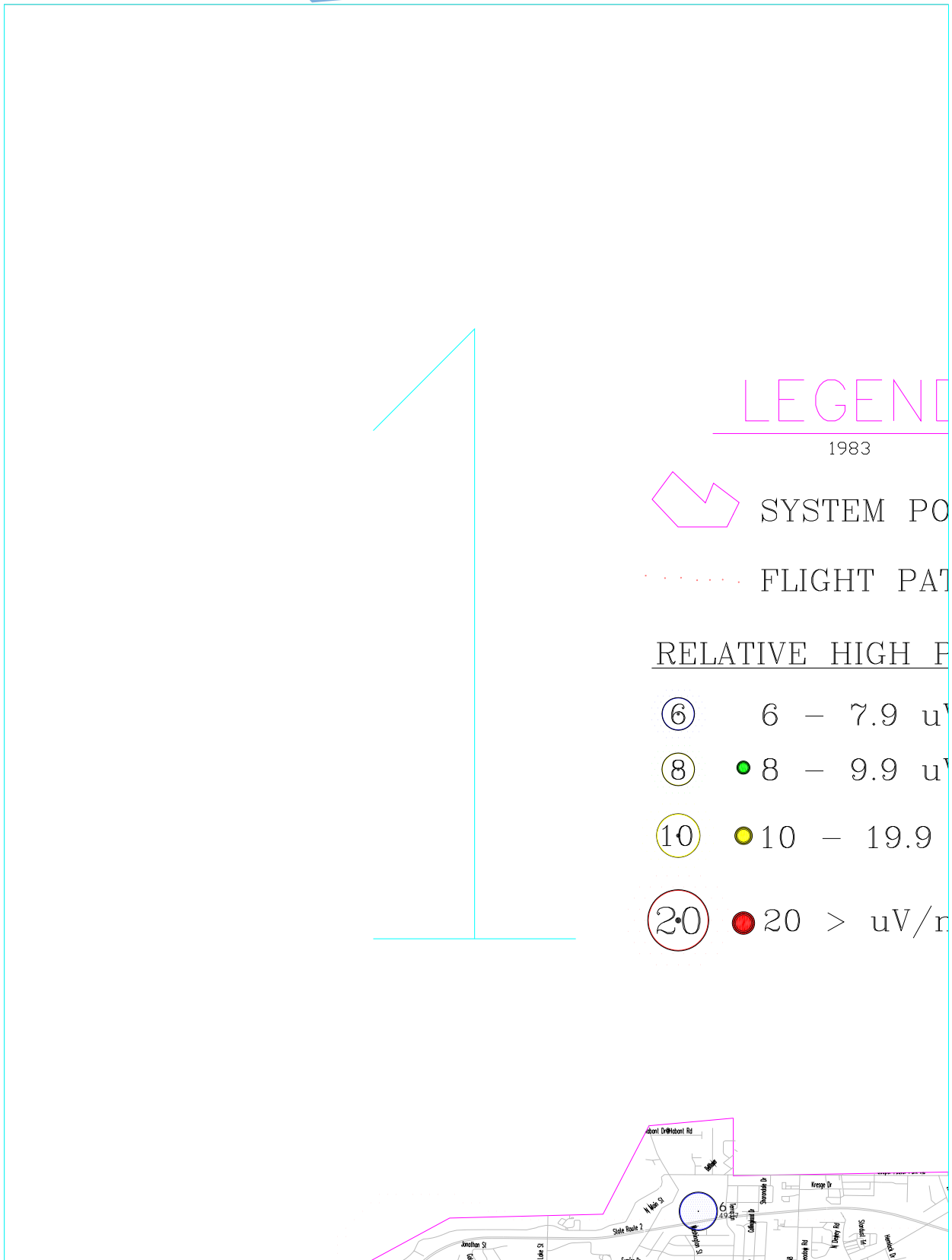
Test Configuration



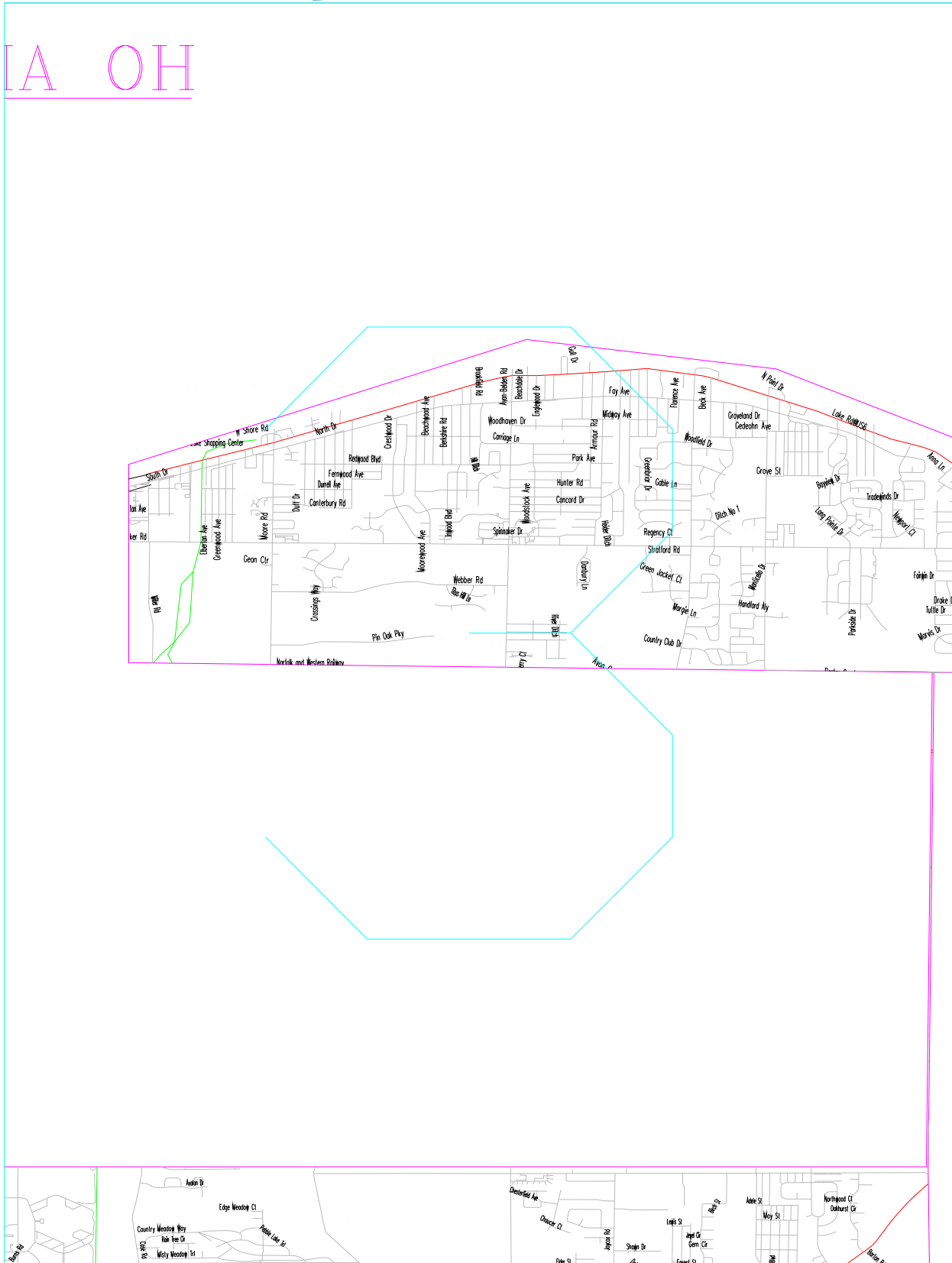
Map



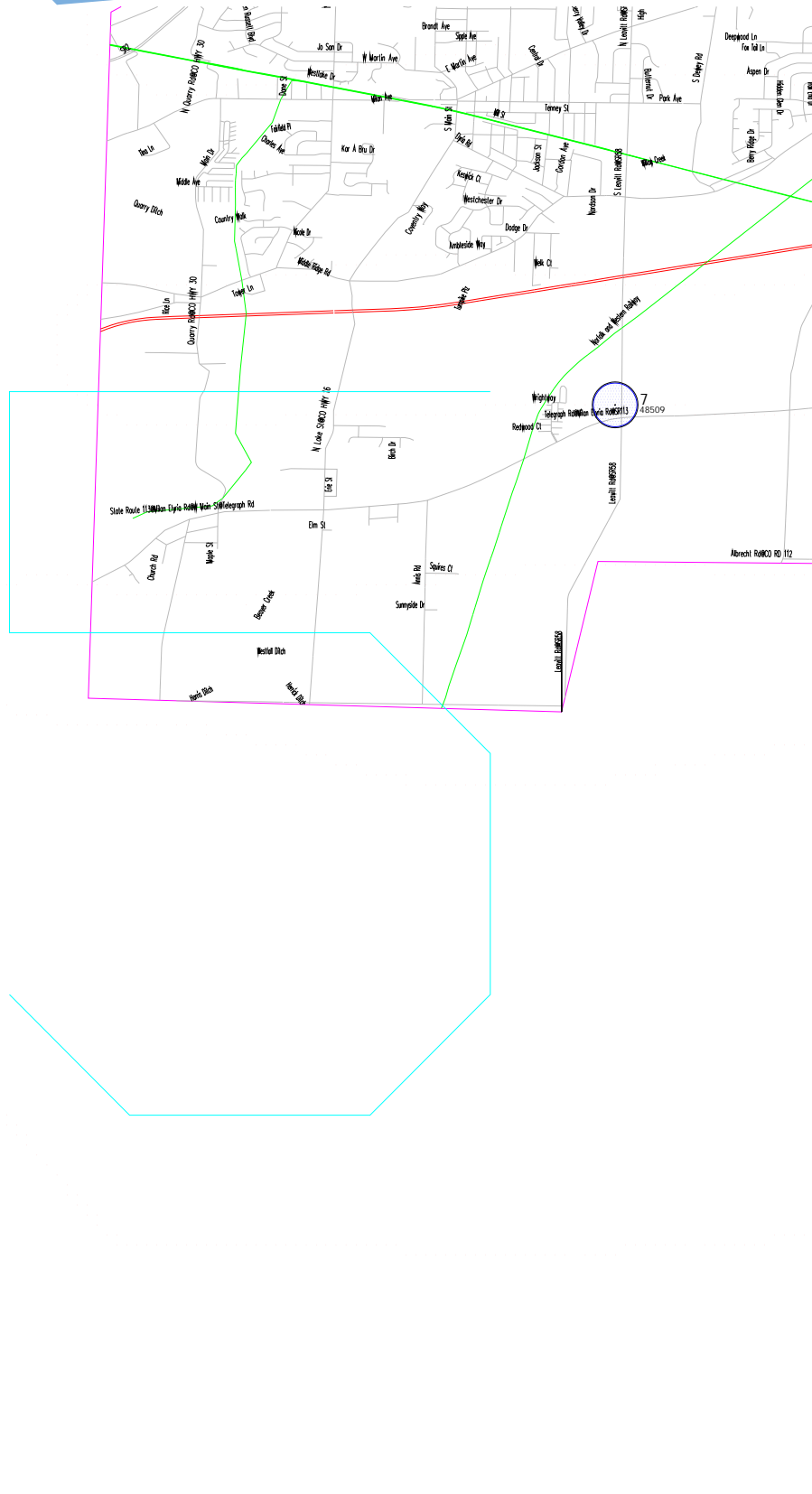
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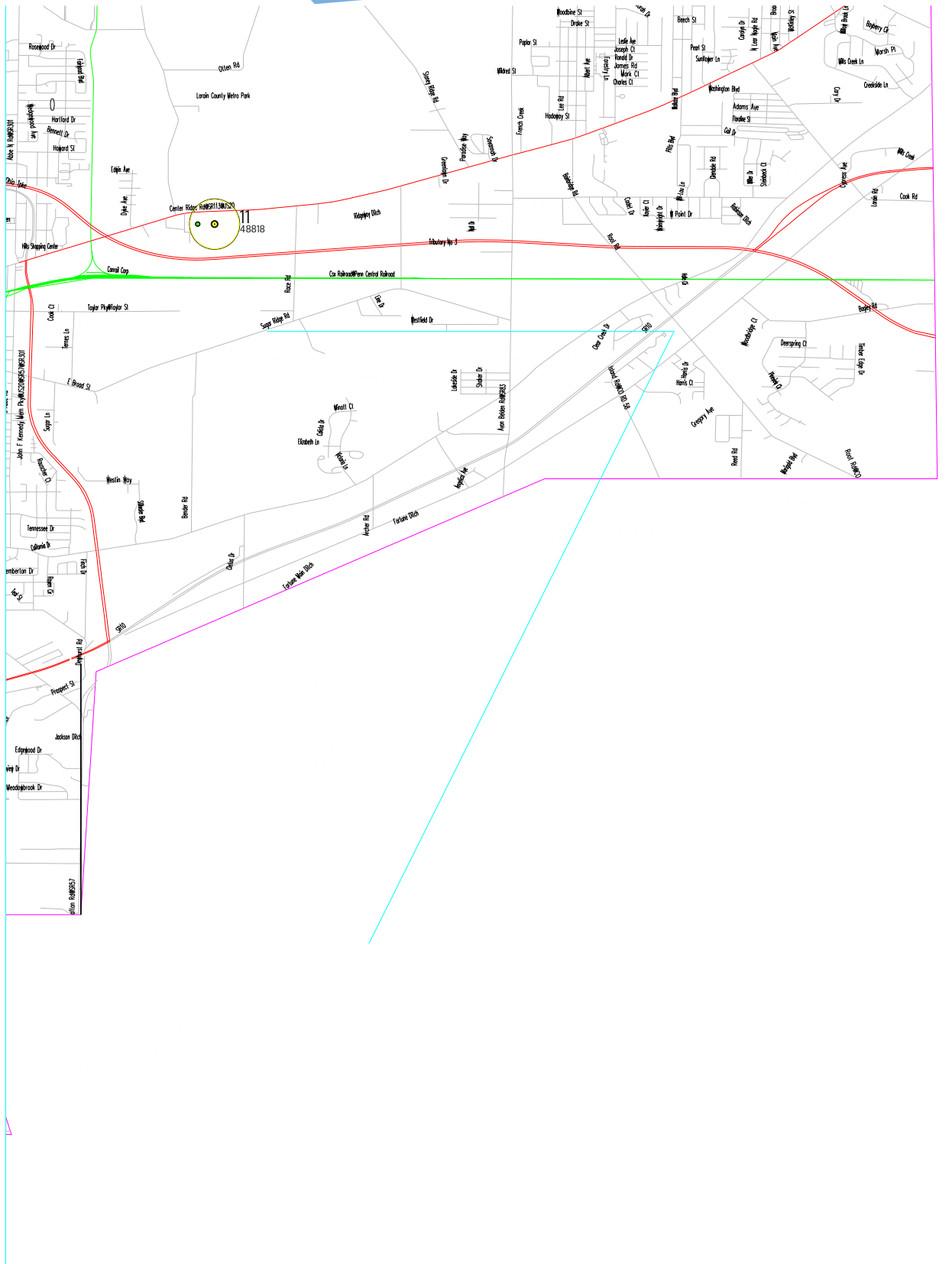
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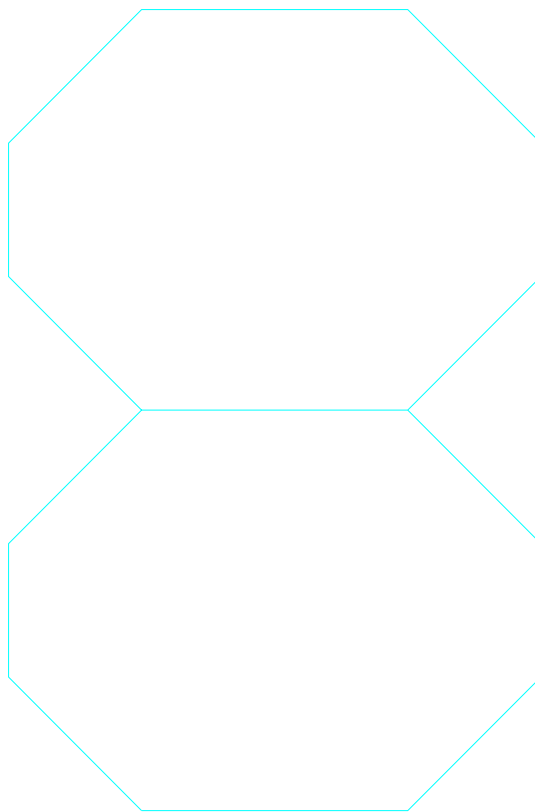
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