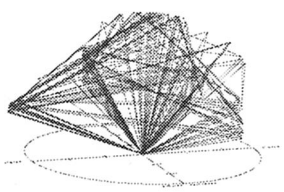
You Are Here: Information Drift

Laura Kurgan

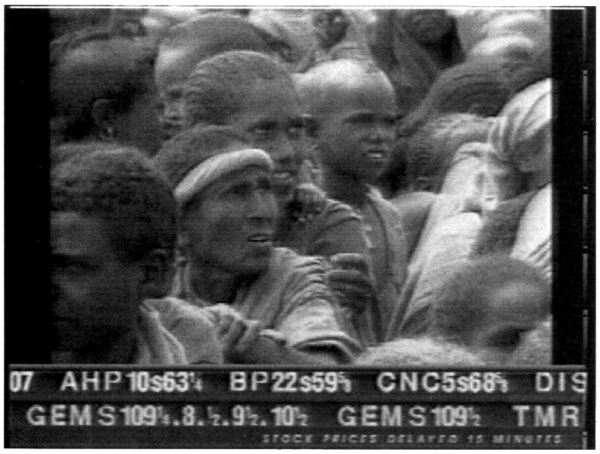


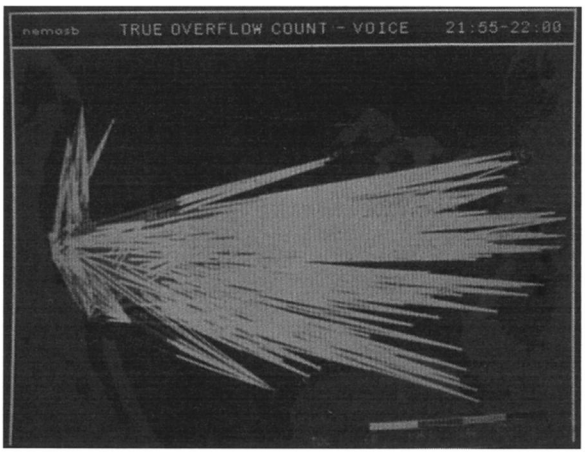
Global Positioning

These days, orienting yourself is becoming increasingly disorienting. Now, in order to answer that old question about where you are, it seems you have to leave the ground and travel into space, and more exactly into the cyberspace of a global satellite network. It is said that satellite positioning technology offers a definitive solution to this question, which some claim has troubled us from our origin: where am I?

Where we are, these days, seems less a matter of fixed locations and stable reference points, and more a matter of networks, which is to say, of displacements and transfers, of nodes defined only by their relative positions in a shifting field. Even standing still, we operate at once in a number of overlapping and incommensurable networks, and so in a number of places, at once. Orienting yourself in this open and ongoing interaction appears all the more imperative, and all the more impossible. "Where am I" in what? Where am I, where? In the global market, in the universe, in the family, in a corporate database, in some collective history, in the city or the desert, in the Internet, on the information superhighway?

With the Global Positioning System, it is said, a definite answer can finally be provided, with a precision verging on one centimeter. "Every square meter of the earth's surface [will] have a unique address," as one user's guide to GPS puts it, and "everyone will have the ability to know exactly where they are, all the time." But the space or the architecture of the information system that wants to locate and fix us in space has its own complexity, its own invisible relays and delays. The difficulty of charting the spaces that chart the spaces, of mapping the scaleless networks of the very system that promises to end our disorientation, demands redefining the points and lines and planes that build the map, and lingering in their strange spaces and times. "You Are Here: Information Drift" is an attempt to begin mapping this emerging space of information using its own technologies. These are drawings with satellites, produced not to pinpoint a location but to experience the drift and disorientation at work in any map or any architecture — especially the architecture of information.



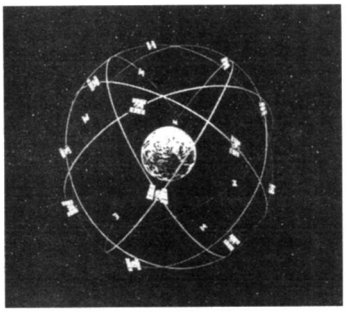


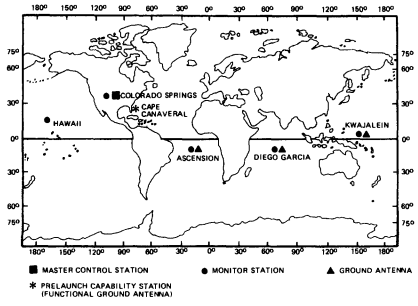
Point

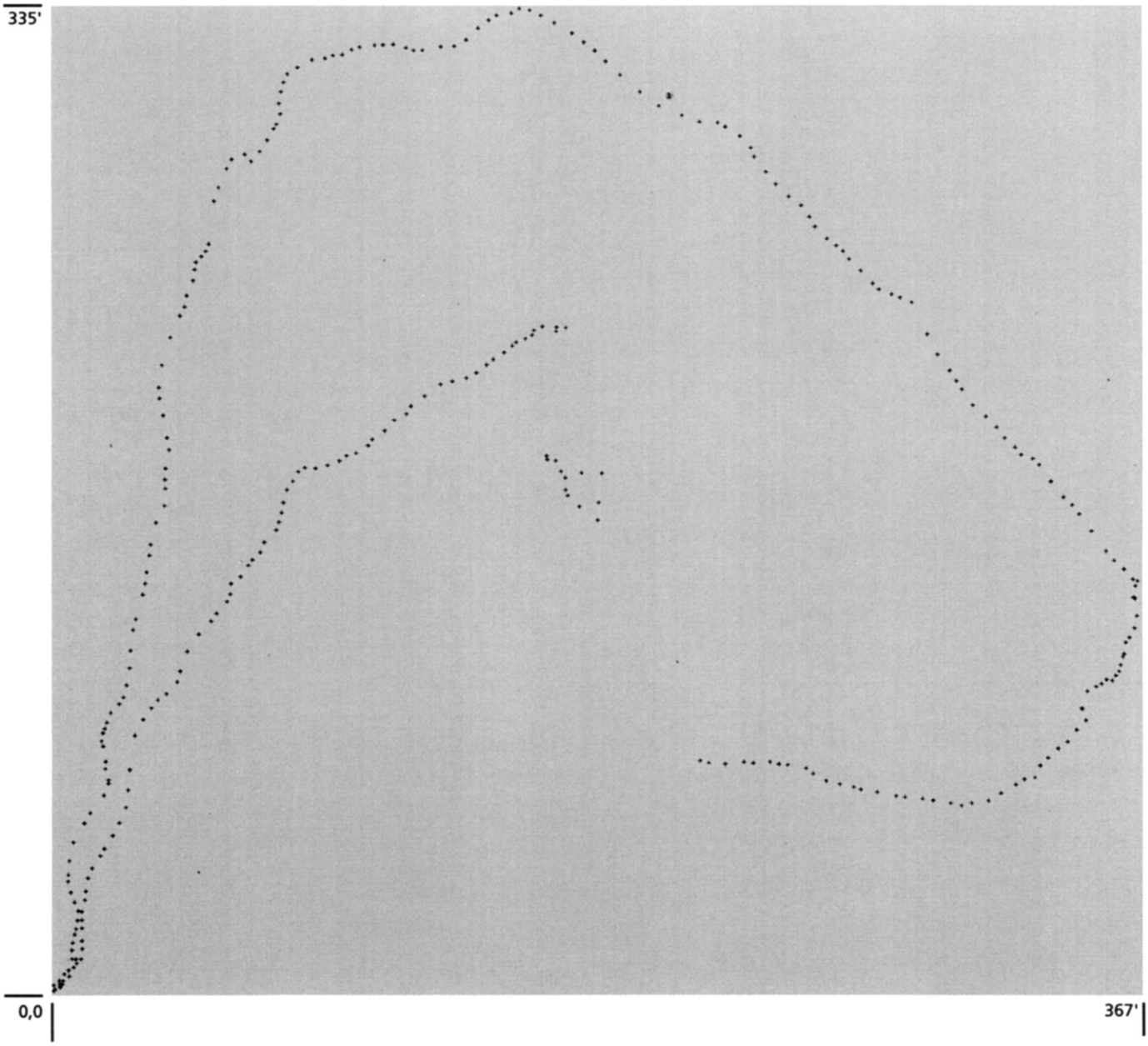
The Global Positioning System is a network of twenty-four satellites and five ground stations designed to provide anyone carrying a portable satellite receiver with a highly specific determination of his or her location, anywhere, anytime, and in any weather. It promises that people and their vehicles will never get lost; missiles and bombs, as well as airplanes, will land exactly where they ought to; and a world of stationary objects, from telephone poles to wetlands to private homes, will be fixed once and for all in their proper places.

The satellites, launched and operated by the U.S. military, are arranged in orbits that allow at least four of them to be "seen" at one time by a receiver anywhere on earth. They constantly emit signals specifying the time and their own positions. The GPS receiver measures the time the different signals take to reach it, and by comparing this with what it learns about where the satellites are, it can calculate its own position. Because the signals can become degraded in the atmosphere, and because the military purposely distorts them, these position readings are only accurate to within about a hundred meters. But if the receiver is connected to another receiver at a known location or "base station" within roughly three hundred miles (the area covered by one group of four satellites), the errors currently in effect can be measured very exactly and the readings corrected accordingly. This "differential correction" can ordinarily bring the accuracy of the readings to within two to five meters. With very advanced signal processing equipment and a real-time link to the base station, it is said, instant point locations accurate to about a centimeter can be obtained.

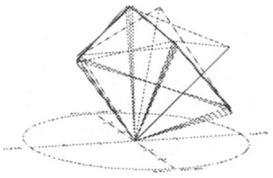
How to locate a point with GPS? Stand somewhere open to the sky, holding a GPS receiver for ten minutes, and collect a stream of position readings. Atmospheric interference, military scrambling, and the "multipathing" bounce of the signals in a built environment combine to represent this stationary position as a complex scattering of points (*Scatter*). Download the data to a computer from the receiver, then download from a local base station its (scattered) readings for the same time period (*Reference*). Correct your readings and reduce the drift (*Correction*), average the points, and learn where you were — within a few meters (*Average*). In the computer, the satellites draw the points for you; as the readings become more precise the points grow to fill the screen.



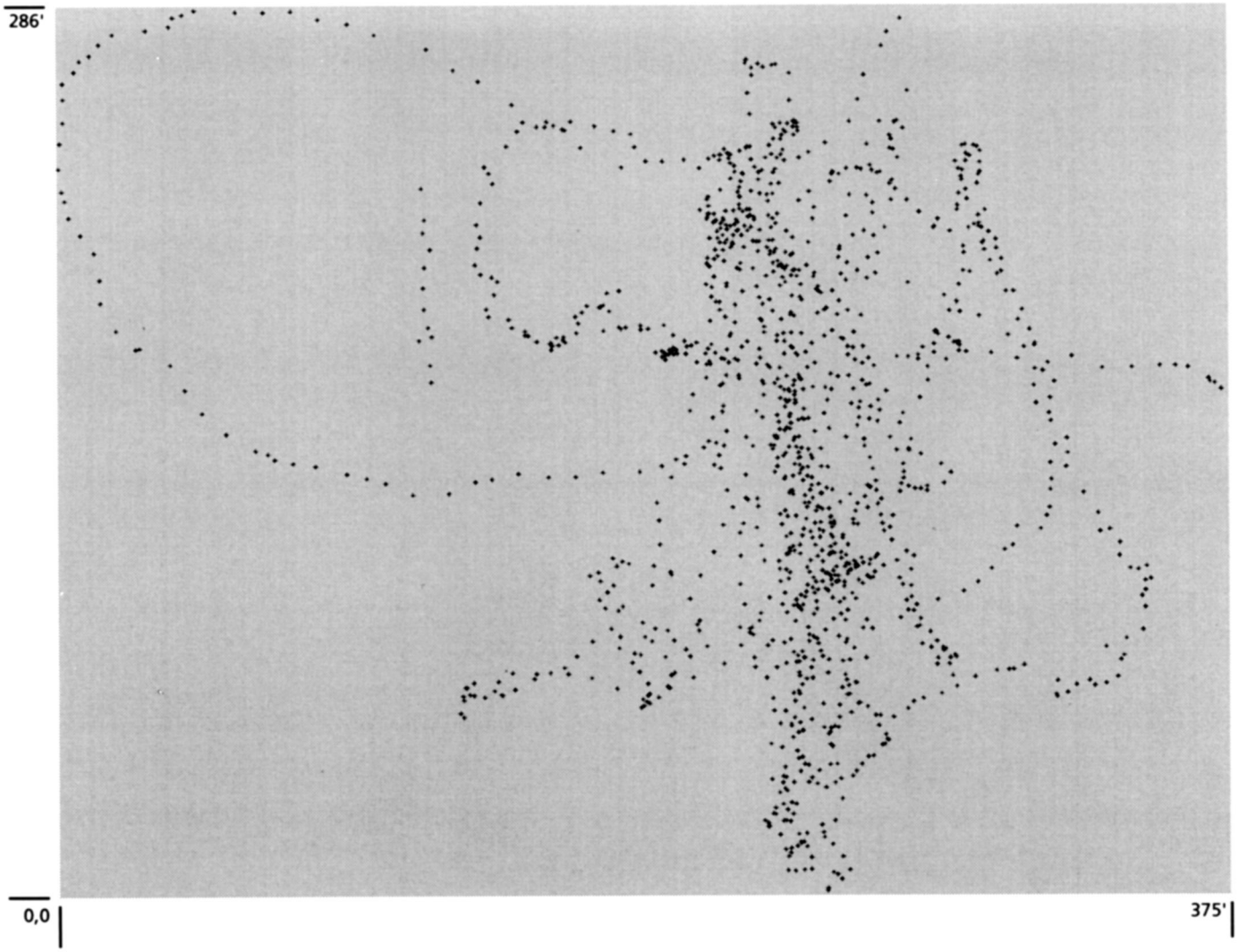


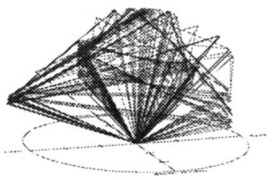


Scatter: 10 minutes, standing still (StoreFront)



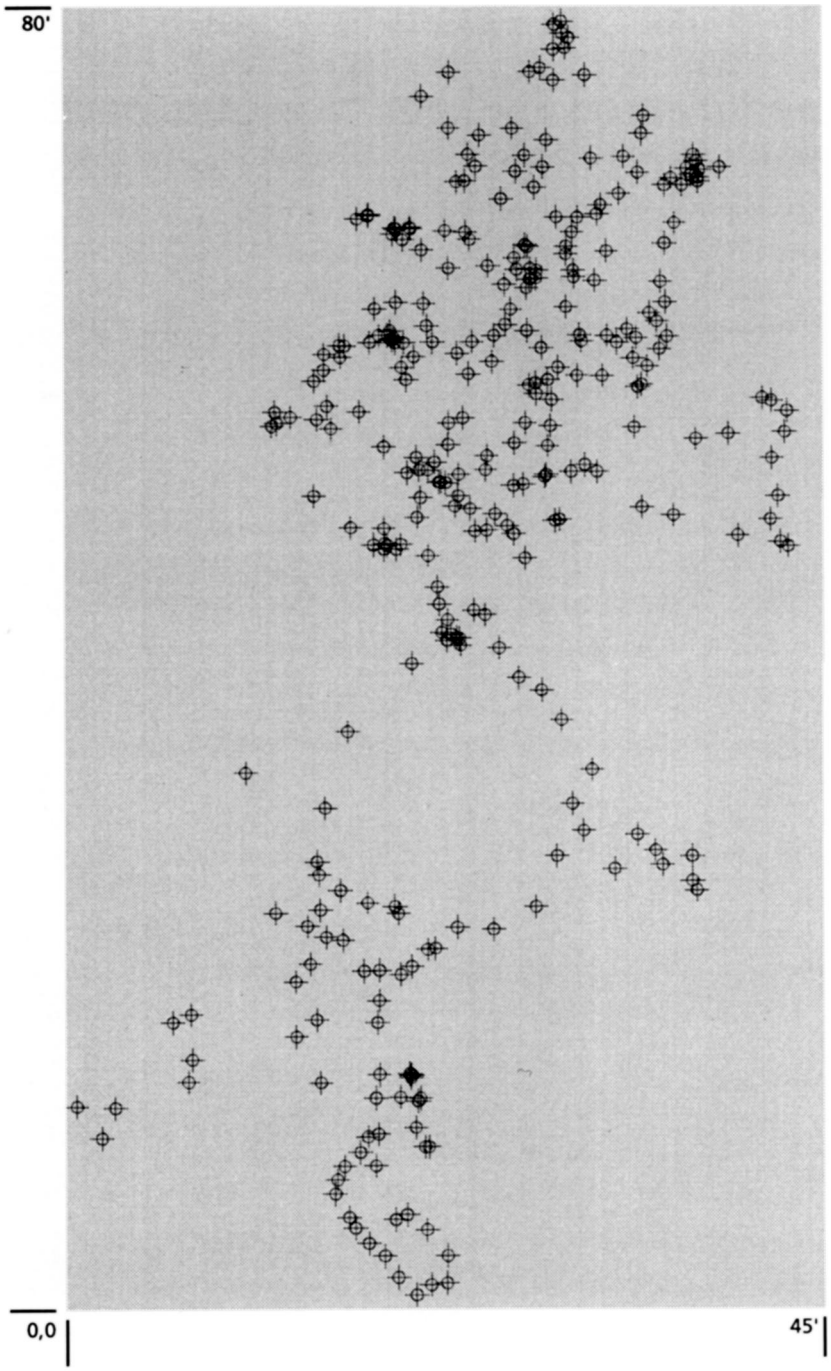
Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 21, 25, 01, 20, 23.
303 position records, acquired 25 Jan 1994, 16:56:13 – 17:05:53 (GPS time).





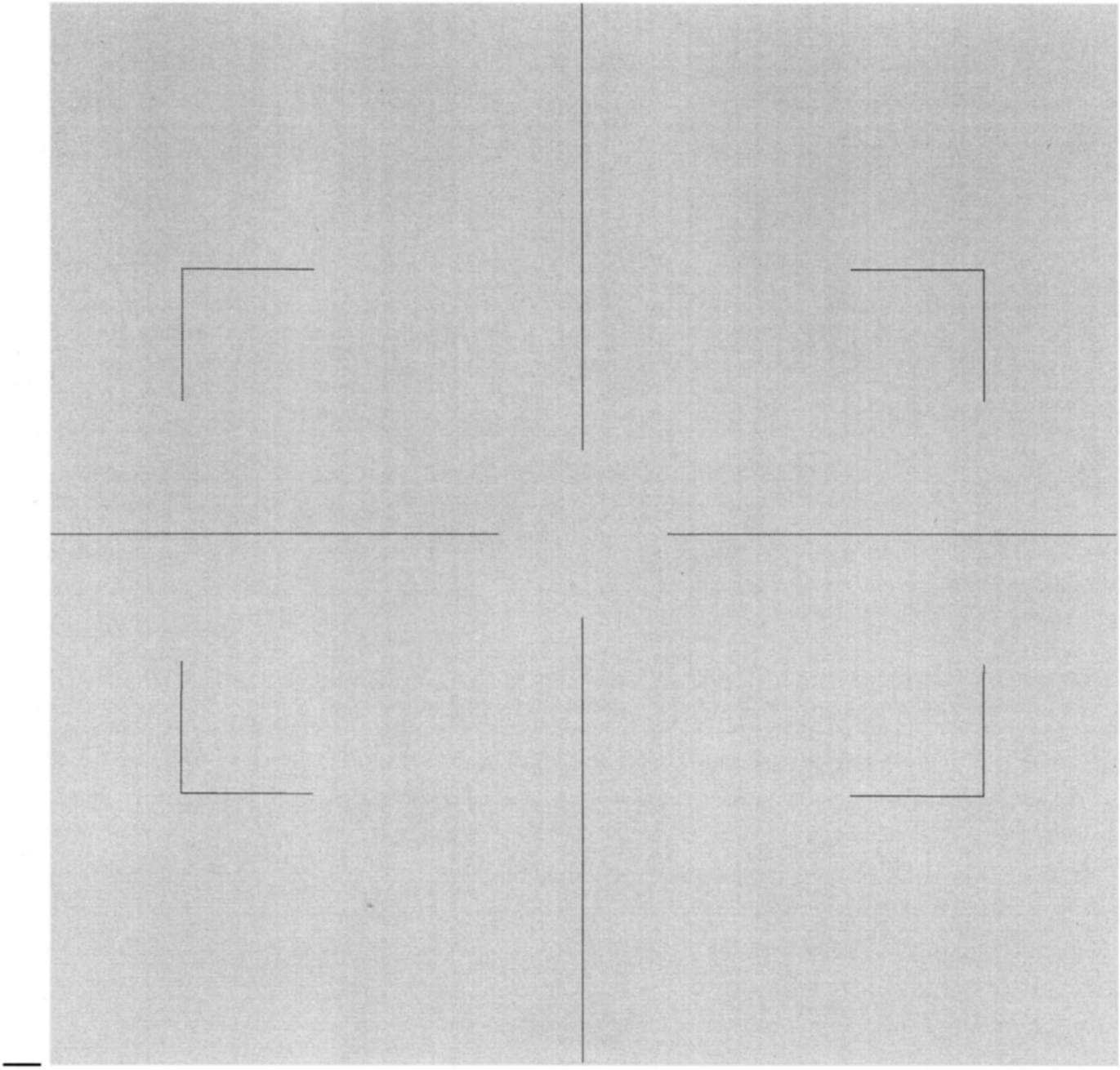
Reference: 2 hours, fixed position (Trenton)

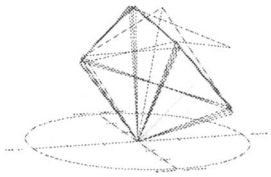
Receiver location: 40° 13' 14.014" N, 74° 45' 24.640" W (Trenton CBS).
NAVSTAR Satellite constellation: 01, 05 ,12 ,15, 20, 21, 23, 25.
1313 position records, acquired 25 Jan 1994, 16:00:18 – 18:00:09 (GPS time).



Correction: error (here) reduced by reference (there)

Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 21, 25, 01, 20, 23.
303 position records, acquired 25 Jan 1994, 16:56:13 – 17:05:53 (GPS time).





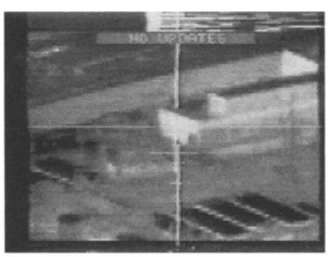
Average: best approximation of position (here)

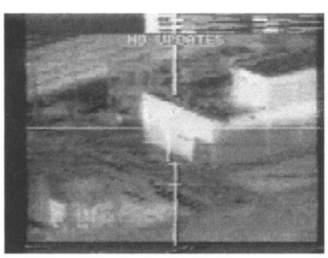
Receiver location: within 3 to 5 meters of 40° 17' 17.53" N, 73° 59' 49.18 W.
NAVSTAR Satellite constellation: 21, 25, 01, 20, 23.
303 position records, acquired 25 Jan 1994, 16:56:13 – 17:05:53 (GPS time).

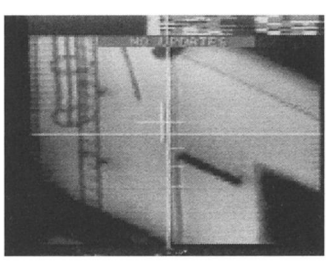
Spectrum

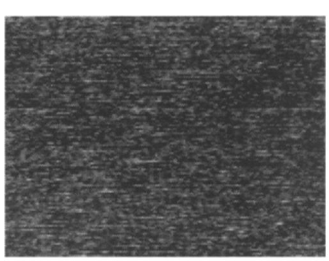
"Completely overexposed to different sources of intelligence, the electronic battlefield thus sees the traditional ballistic procedures of its various projectiles doubled by an immaterial electromagnetic ballistics, with data and information of all sorts circulating without delay in the ether: the precision guidance of the missile's trajectory [has] become more important than the explosive charge of the object. . . . The fatal geographic confusion of the local and the global tends then to result in the need for a kind of generalized feedback for the military in action: a global feedback, whose anticipatory model would be the American system activated during the Gulf War in order to locate precisely the vectors of the coalition's air and ground forces. Based on an American satellite network, the Global Positioning System, as it is called, allows a rigorous orchestration of operations, but above all a perfect and automatic adequation between the positioning and the localization of weapons and war materials engaged in a conflict whose worldwide scope necessitates guidance, a flawless inertial navigation, in order to avoid provoking a chain of catastrophes whose impact on public opinion would be politically insupportable."
Paul Virilio, L'*écran du désert* (*Desert Screen*)

"The Gulf War demonstrates what can be accomplished when we control the electromagnetic spectrum. But at the same time, it highlights our extreme dependence on the spectrum. The coalition was able to deny the enemy the ability to see the battlefield and the ability to effect C2 of its own dispersed forces, much of which was accomplished by the use, denial, and control of the frequency spectrum. . . . The Army of the 21st Century will be challenged to 'Win the Battlefield Information War.' In this regard, information warfare cannot be waged unless a military force can effectively and efficiently control the electromagnetic spectrum. . . . We cannot count on uncontested ownership of the electromagnetic spectrum in future conflicts. It is a valuable and finite resource. Military and civilian groups compete for its use. Interestingly, it will not be sufficient to develop the weapons and tools to ensure spectrum supremacy over the enemy. The proactive participation in national, international, and allied policy formulation is equally important. This will ensure the Warfighter uncontested access to the spectrum needed to carry out the National Strategy when the nation calls."
U.S. Army, Director of Information Systems for C^4, *The Army Enterprise Vision*





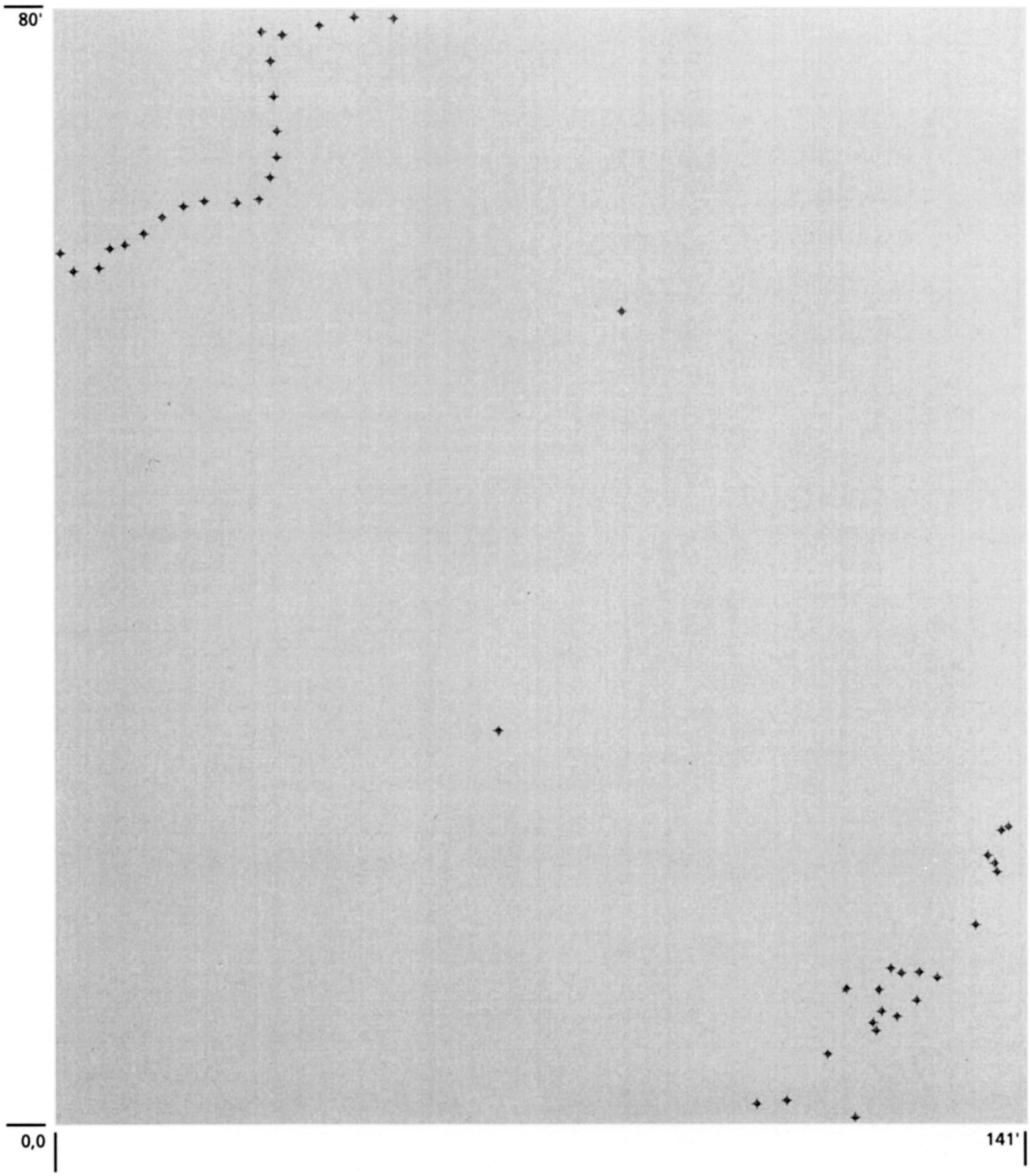




Line

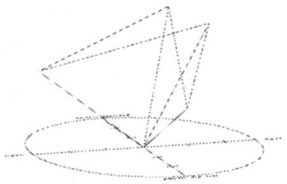
Take a walk, even a short one, with a GPS receiver. A minute and a half on the roof of the building leaves a faint collection of points (*Drift*), about one every two seconds, the oddly scattered remainder of a meeting with five satellites. Correct them differentially and a line emerges (*Correction*). Moving is collecting points, which is to say, drawing. With a real-time display, you can watch yourself walking, charting, wandering — on the roof? on the screen?

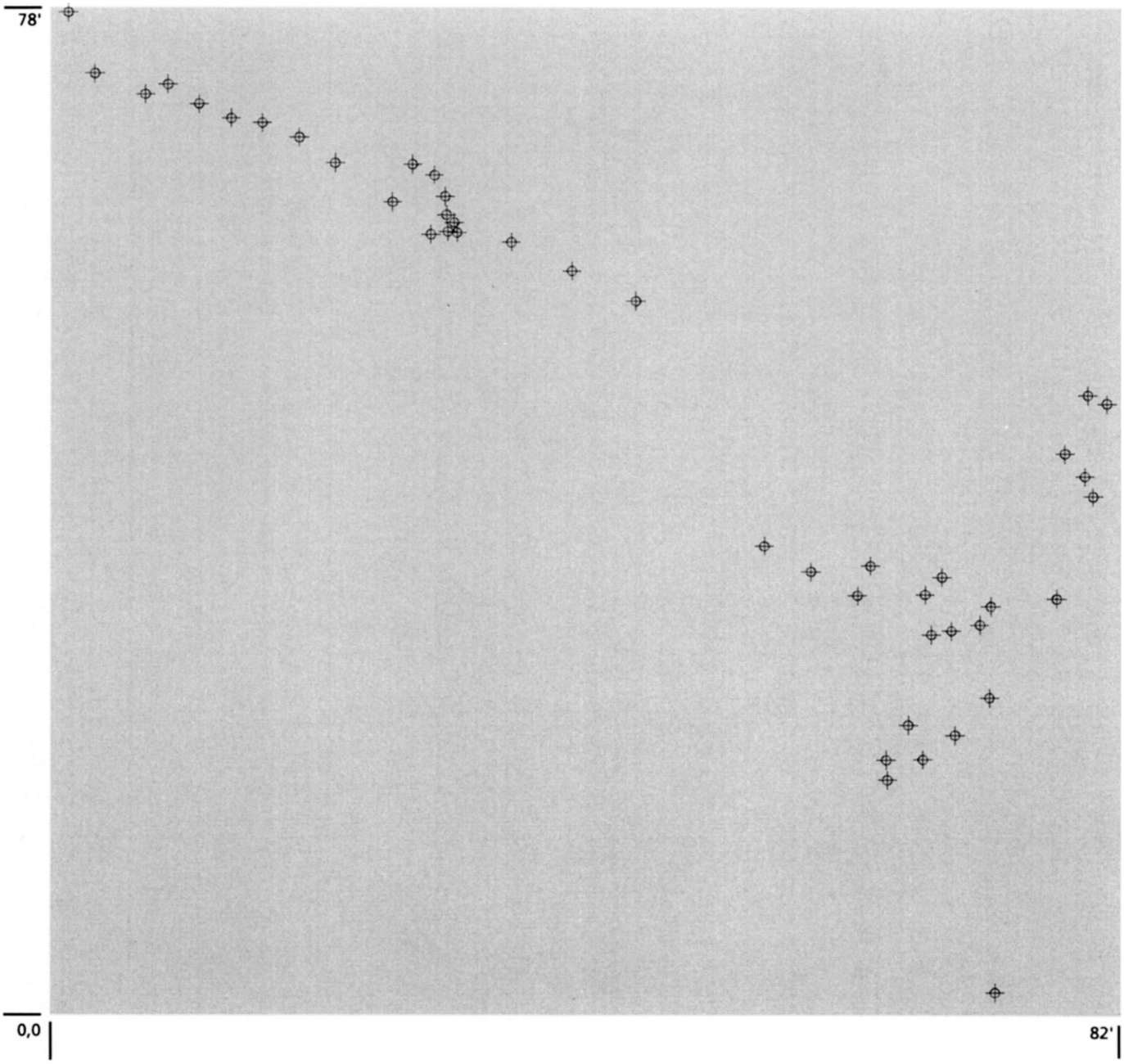
The network is a machine for leaving traces, and so we can draw with satellites. The record of the interaction appears at the foot of each display: the identifying numbers of the NAVSTAR satellites, the time spent in contact with them, the number of data points collected by the receiver. What remains of this correspondence is something like a line, a sequence of points that registers the movement of the receiver across some physical space. But the line that results (*Line*), what is left over not exactly from a relation between given places but rather from the transmission of data, charts more than one drifting pathway. Across the roof, across a representation, across the screen. And in the network. GPS location data, always a series of points, require that both movement (line) and stasis (point) be registered as drift in the zone of information, and so the map user operates in an oddly layered space, as if data and earth were at once utterly independent of and somehow transparent to one another. The ostensible elements of architecture — points, lines, and surfaces — all find themselves transformed and redefined in the interactions of this network. This scaleless information zone constitutes not simply the representation of a preexisting space — as if built or physical space had some priority — but another space altogether. The possibilities of disorientation, not in the street or on the roof but precisely in the database that promises orientation, are of an entirely different order, and GPS offers the chance to begin mapping some of these other highways as well: drift in the space of information.

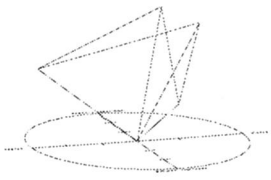


Drift: walking for 1.5 minutes (StoreFront)

Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 01, 09, 17, 21, 23.
44 position records, acquired 14 Jan 1994, 15:32:02 – 15:33:31 (GPS time).

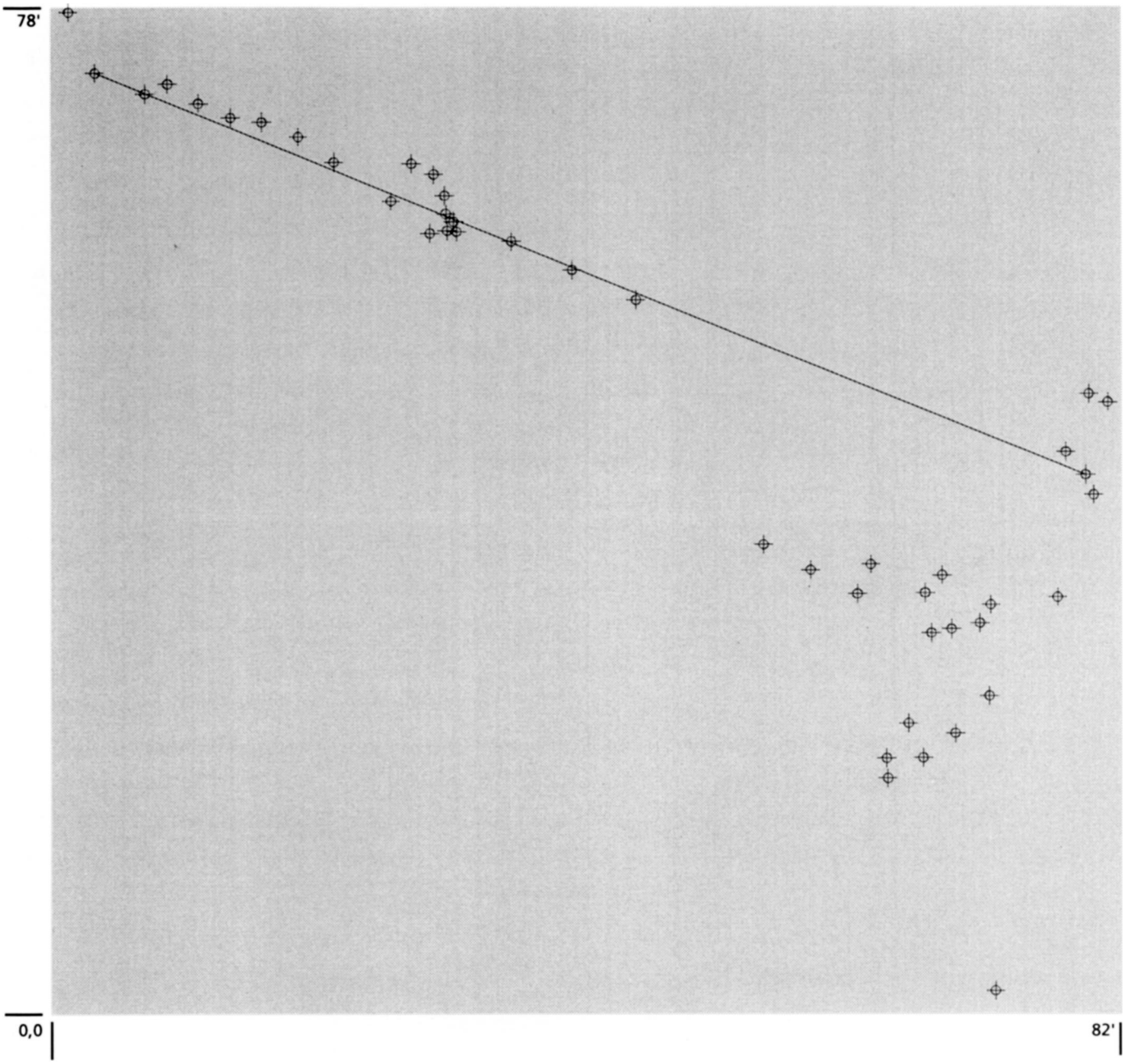




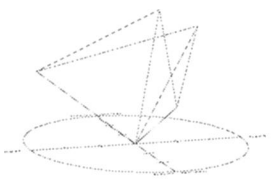


Correction: line error (here) reduced by point reference (there)

Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 01, 09, 17, 21, 23.
44 position records, acquired 14 Jan 1994, 15:32:02 – 15:33:31 (GPS time).



Line: best approximation of line (here)

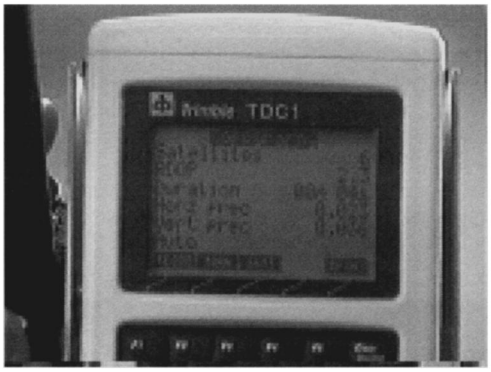


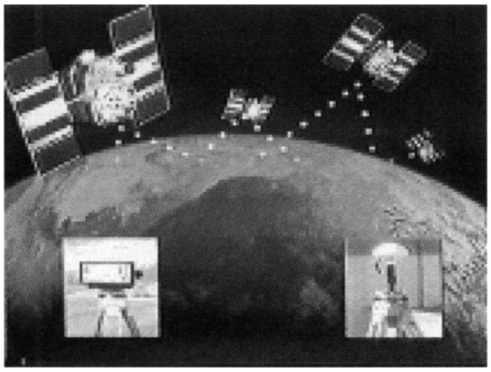
Receiver location: within 3 to 5 meters of startpoint: 40° 43' 17.58" N, 73° 59' 49.98" W,
endpoint: 40° 43' 17.26"N, 73° 59' 48.97"W.
NAVSTAR Satellite constellation: 01, 09, 17, 21, 23.
44 position records, acquired 14 Jan 1994, 15:32:02 – 15:33:31 (GPS time).

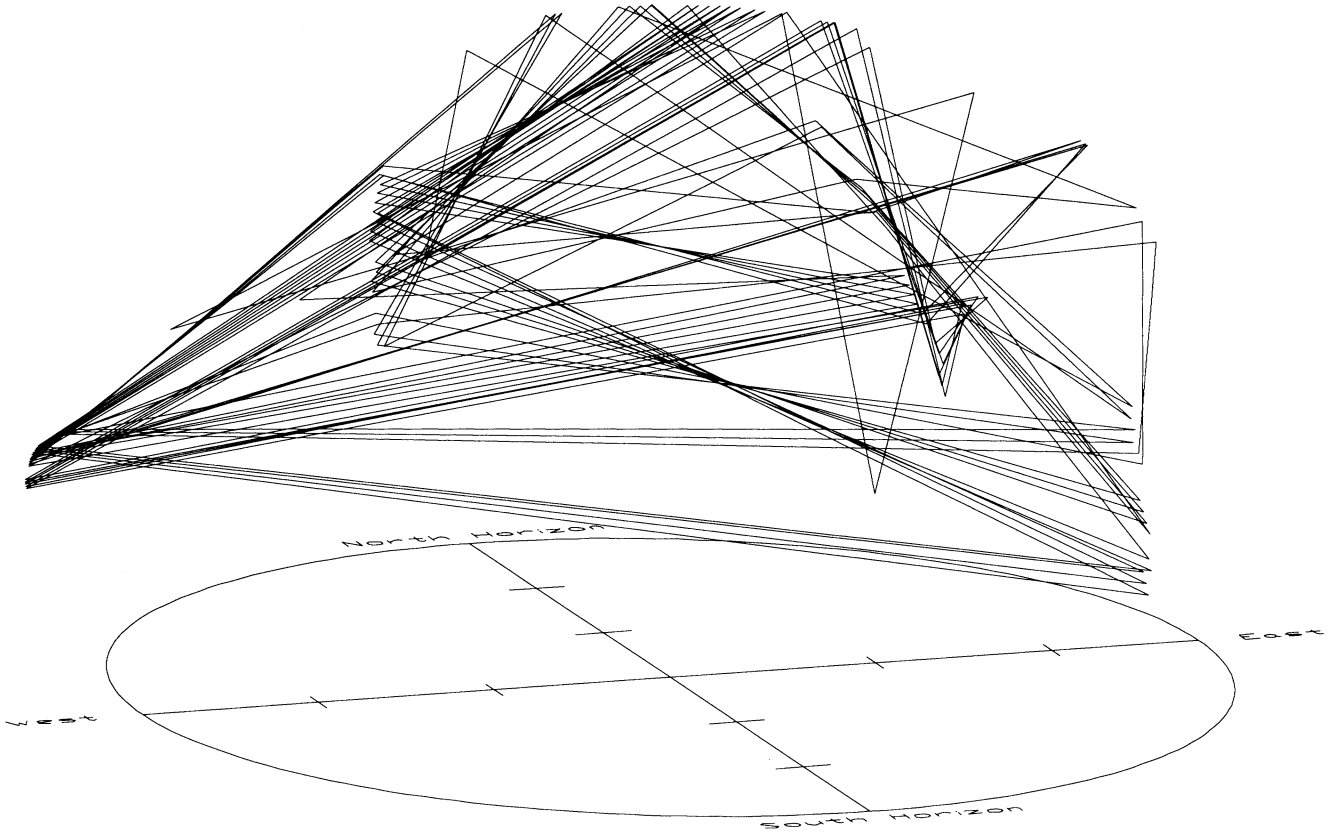
Implied Plane

Over our heads, less like a canopy or roof than a panoply, the twenty-one active satellites and the three spares of the NAVSTAR constellation construct a strange space, in space. Guided by five ground stations scattered around the globe, near the equator, their signals blanket the earth and their movements allow us to chart ours, at any time. Or rather, their incessant motion allows us to stabilize ours, because their motion is not only that of objects traveling in space but that of constant broadcast, transmission, flow in the electromagnetic spectrum.

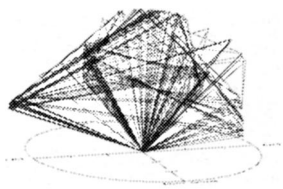
Any GPS position reading implies the interaction of at least three satellites (the addition of a fourth allows an altitude calculation) and thus inscribes the active interface with an information network. Frozen in the second that defines a point's registration, the satellites constitute or imply a network of planes: not the planes that enclose a volume or a shelter, but the planes of a transmission, of the relay or passage of information at the speed of light, and of information that amounts to nothing more than the record of their own positions (*Implied Planes*). They move in a fourth dimension: they transmit a "pseudo-random code" for timing purposes, based on data from on-board atomic clocks, along with a message about their exact orbital location and the status of the system, in a few hundredths of a second. Their orbital paths define the movements that link them as a network, a series of nodes defined only in relation to one another; but the pathways followed by their radio transmissions are as much temporal as spatial. Constant real-time transmission grants them a certain ubiquity: invisible in their motion, they render everything visible. Without watching or listening, without the eyes and ears with which we figure surveillance, they nevertheless lay a grid over the totality of the earth's surface, they define it as a totality and mark every position on that grid with a real-time address, a unique and singular geotemporal code. They make up an "information" or "orbital front," as Virilio has called it, which operates in a fourth dimension, an "exo-spheric" and strictly temporal dimension, "that of the real time of ubiquity and instantaneity, . . . less physical than microphysical." Twenty thousand kilometers and six one hundredths of a second overhead, they are transmitting — now.







Implied Planes: 51.5 minutes, 10 satellites (New York)

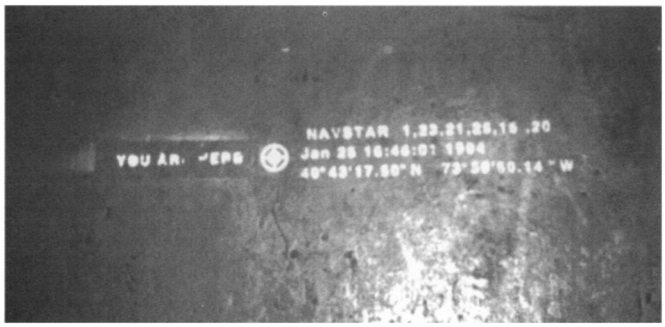


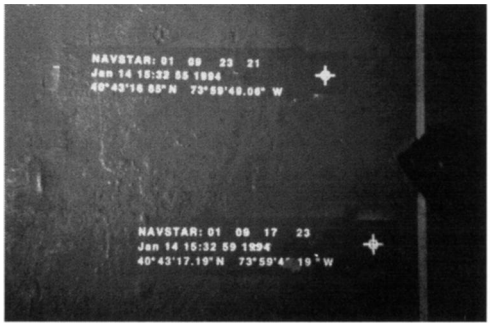
Reference location: Anywhere within a three-hundred-mile radius of New York, 40° 55' 00" N, 73° 55' 00" W.
NAVSTAR Satellite constellation: 01, 05, 09, 12, 15, 17, 20, 21, 23, 25.
Seen: 14 and 25 Jan 1994, 15:32:02 – 17:05:32 (GPS time). Movement increment of planes: 2 minutes. X,Y axis : azimuth — position of satellite away from north. Z axis: altitude — position of satellite above the horizon.

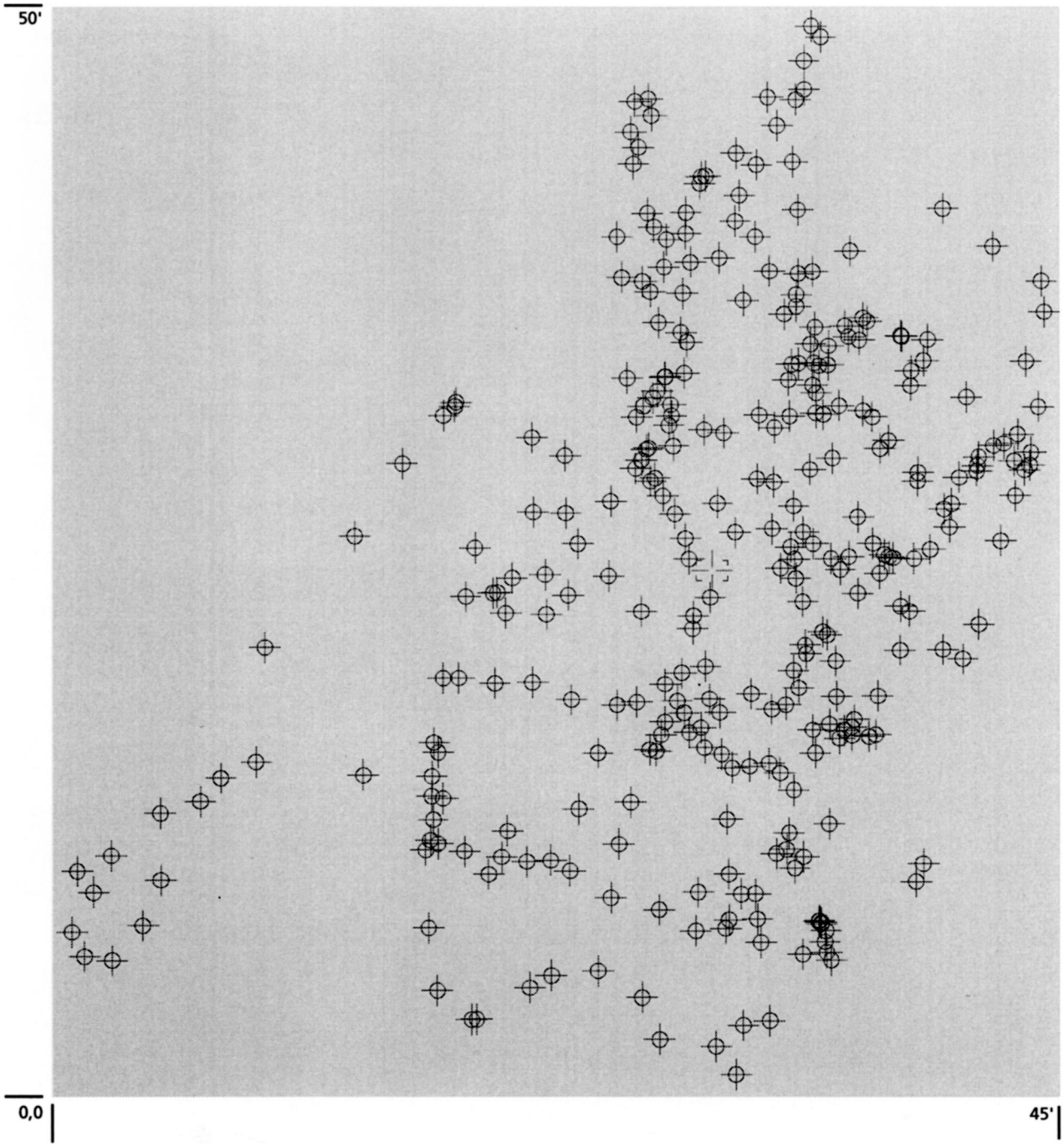
Map

How to compile a map with GPS? "You Are Here" maps the spaces of a building, the StoreFront for Art and Architecture in New York City, and then installs this map in and on the building itself: not in the name of self-reference but rather of superimposition, of the overlay of asymmetrical spaces. Build up a series of successive point and line measurements, ten minutes apiece for five points (*10 minutes* through *50 minutes*) and a short walk on the roof on two days in January (*51.5 minutes*). The data and drawings — on the wall, on the monitors, on the building, and on these pages — are the traces of an interaction with the satellite network, and the physical space is layered over and folded with the immaterial remnants of this encounter. The passage of data through the electromagnetic spectrum and cyberspace leaves its mark on the site of reception — not with the destructive force of an explosion, but with the silent insistence of images, light, and writing.

The composite map is a series of layers, corrected and averaged points traced over one another in the memory of a computer. The layered data are correlated by reference to a quasi-arbitrary point: the so-called 0/0 reference point enables the digitized data to be coordinated with the space of its reference. On the composite map (*You Are Here: Information Drift*) not all the points recorded by the GPS receiver — even the averaged points — fit into the space defined by the walls of the gallery. Even with the most accurate receiver available on the market, and the most precise corrections possible, the point is always divisible into a series of points somewhere in the zone of an expected point. The GPS information refers to but does not simply represent the space it maps: it exceeds, transforms, and reorganizes this space into another space. Not a representation of a space, but a space itself. Or rather, spacing itself, passage and inscription, light and motion, transmission and interface. GPS can locate a target to within a few meters, measure the movement of a mountain after an earthquake, keep an airplane on course, direct a 911 response team to one's doorstep. This active intervention obliges us to take these maps and readouts seriously, obliges us to think of these computerized maps as real spaces, at least as real as anything else (the building, for example). Perhaps there is more than one dominant definition of this, or any, space. The composite map, in its compilation and complication, charts a digital ground, a space of pixels — a space in which we think and act and move, every day.

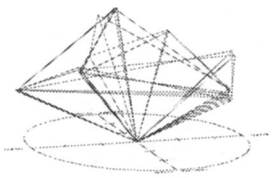


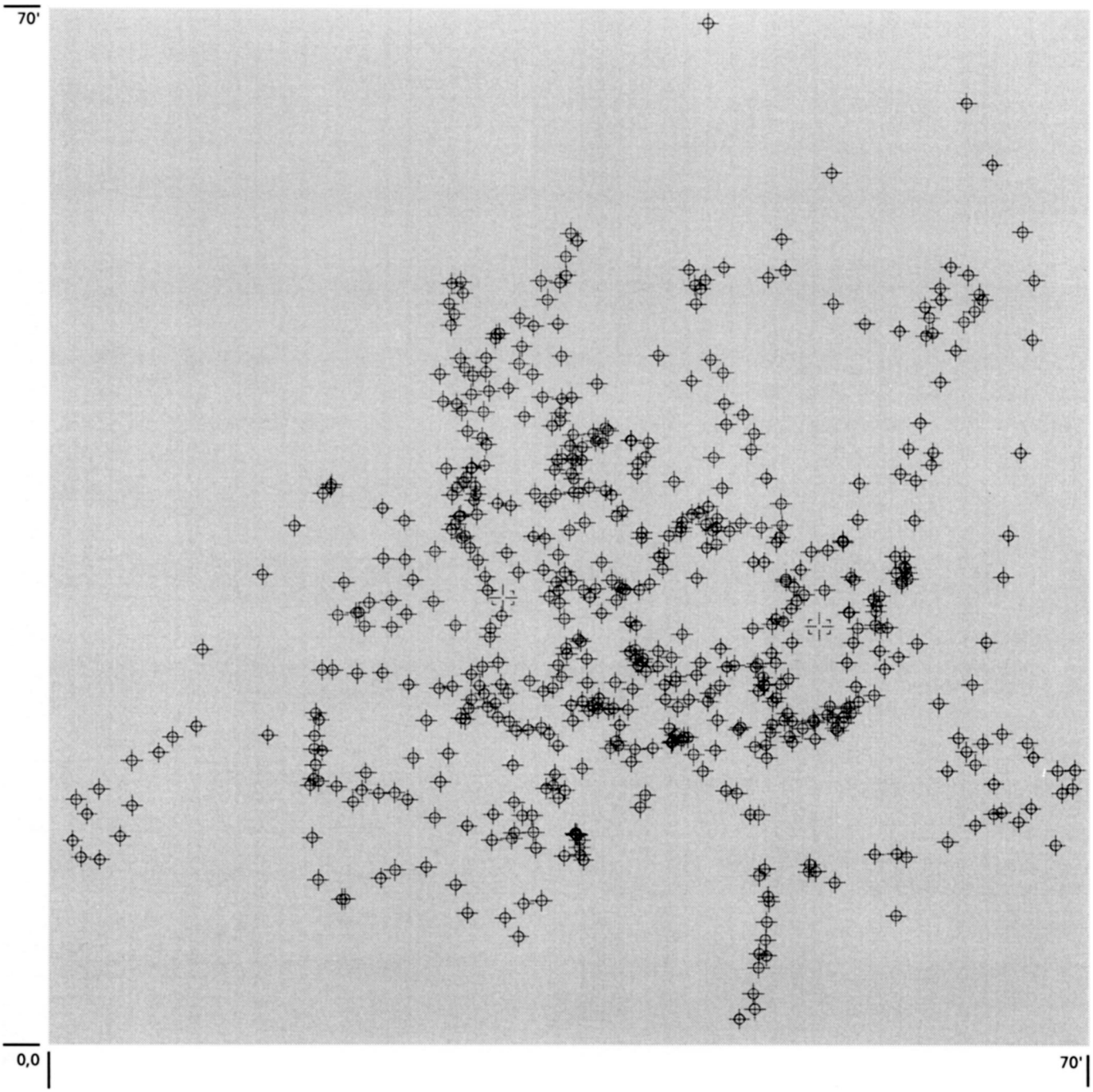


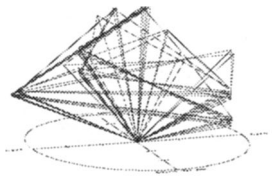


10 minutes, 1 point (StoreFront)

Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 01, 23, 21, 25, 15, 20.
311 position records, acquired 25 Jan 1994, 16:41:06 – 16:51:06 (GPS time).

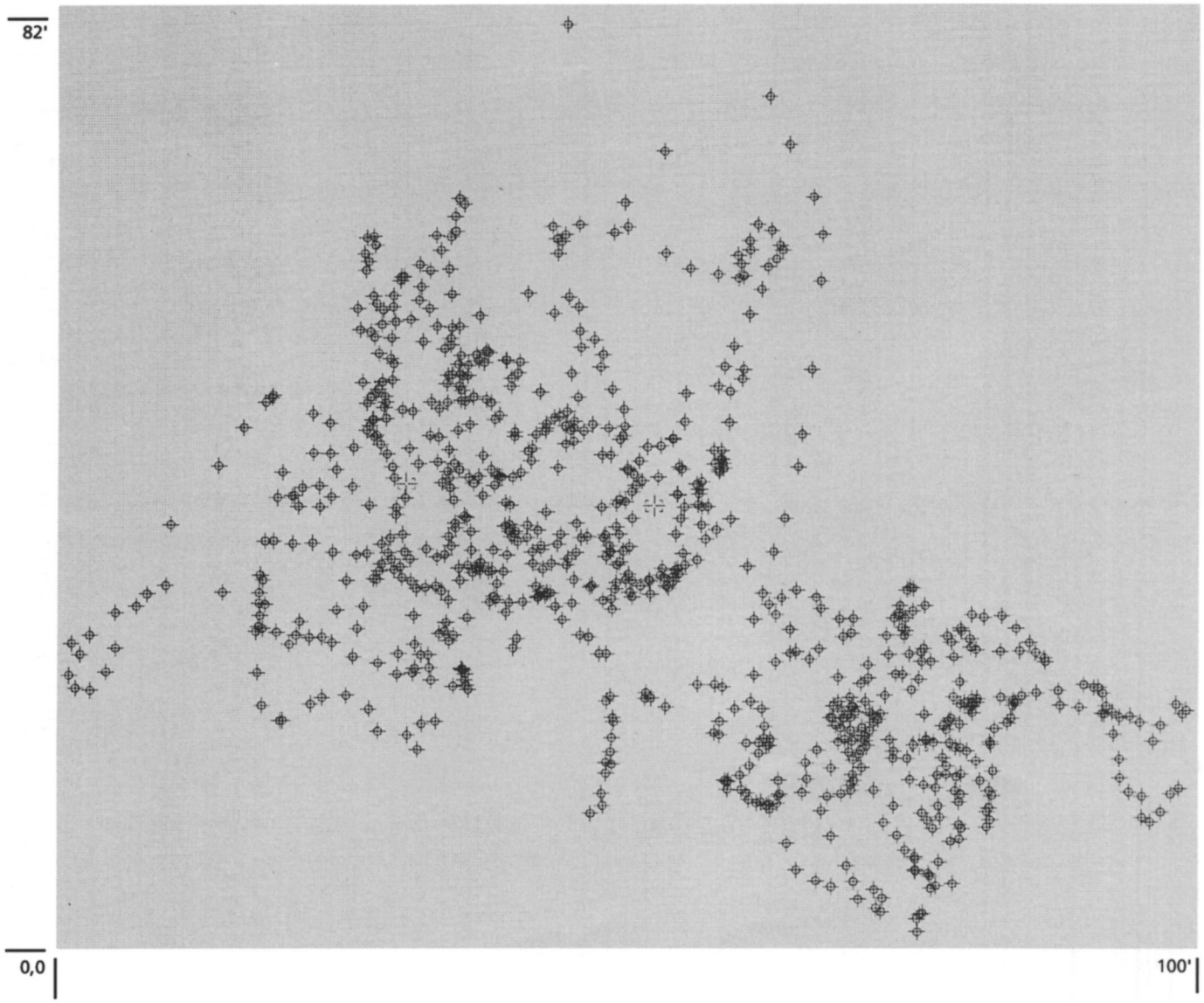




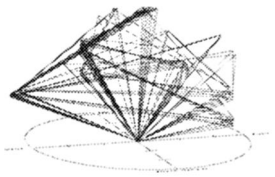


20 minutes, 2 points (StoreFront)

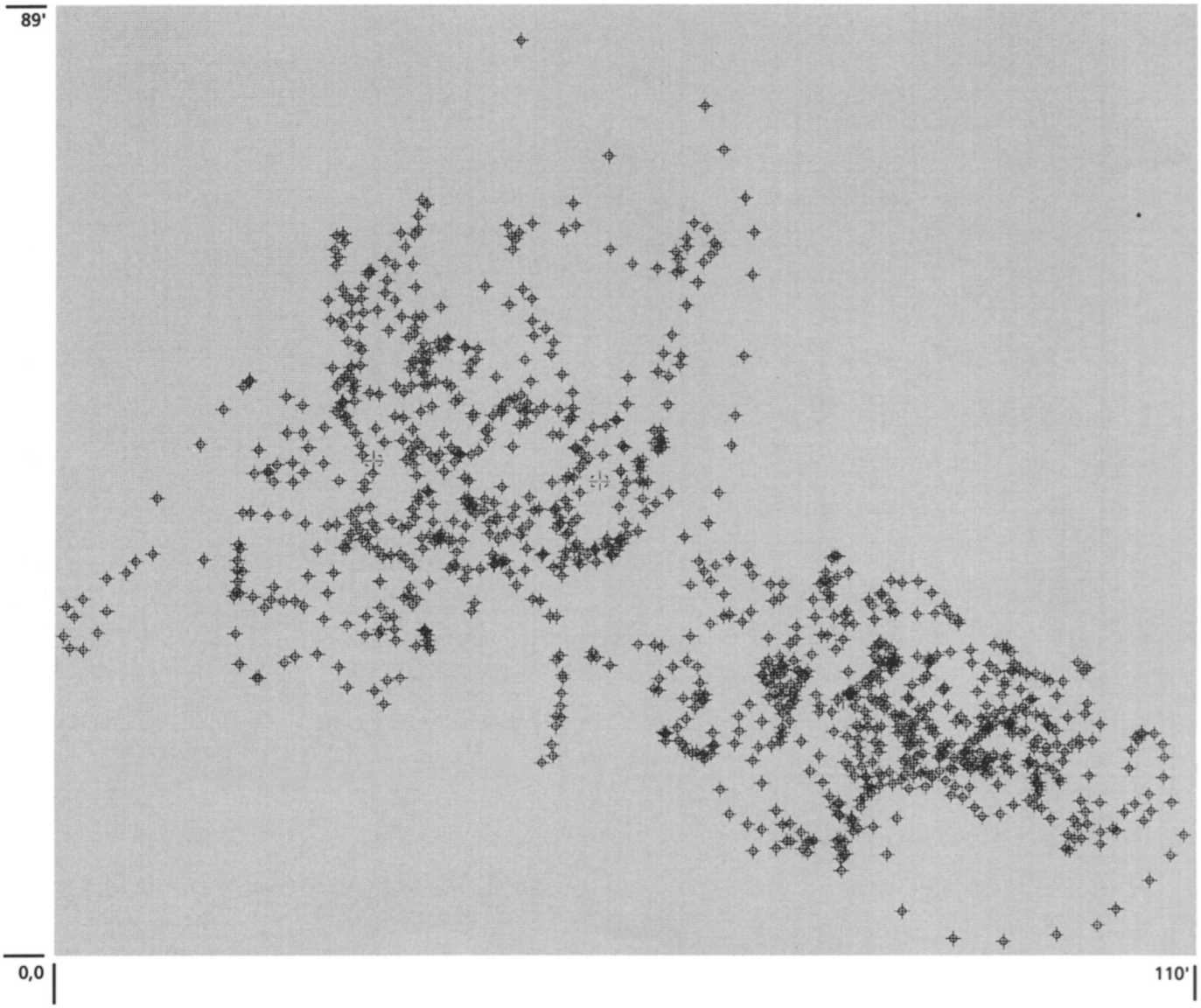
Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 21, 23, 25, 01, 15, 20.
562 position records, acquired 25 Jan 1994, 16:41:06 – 16:51:06, 17:08:21 – 17:17:59 (GPS time).

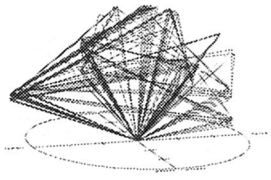


30 minutes, 3 points (StoreFront)



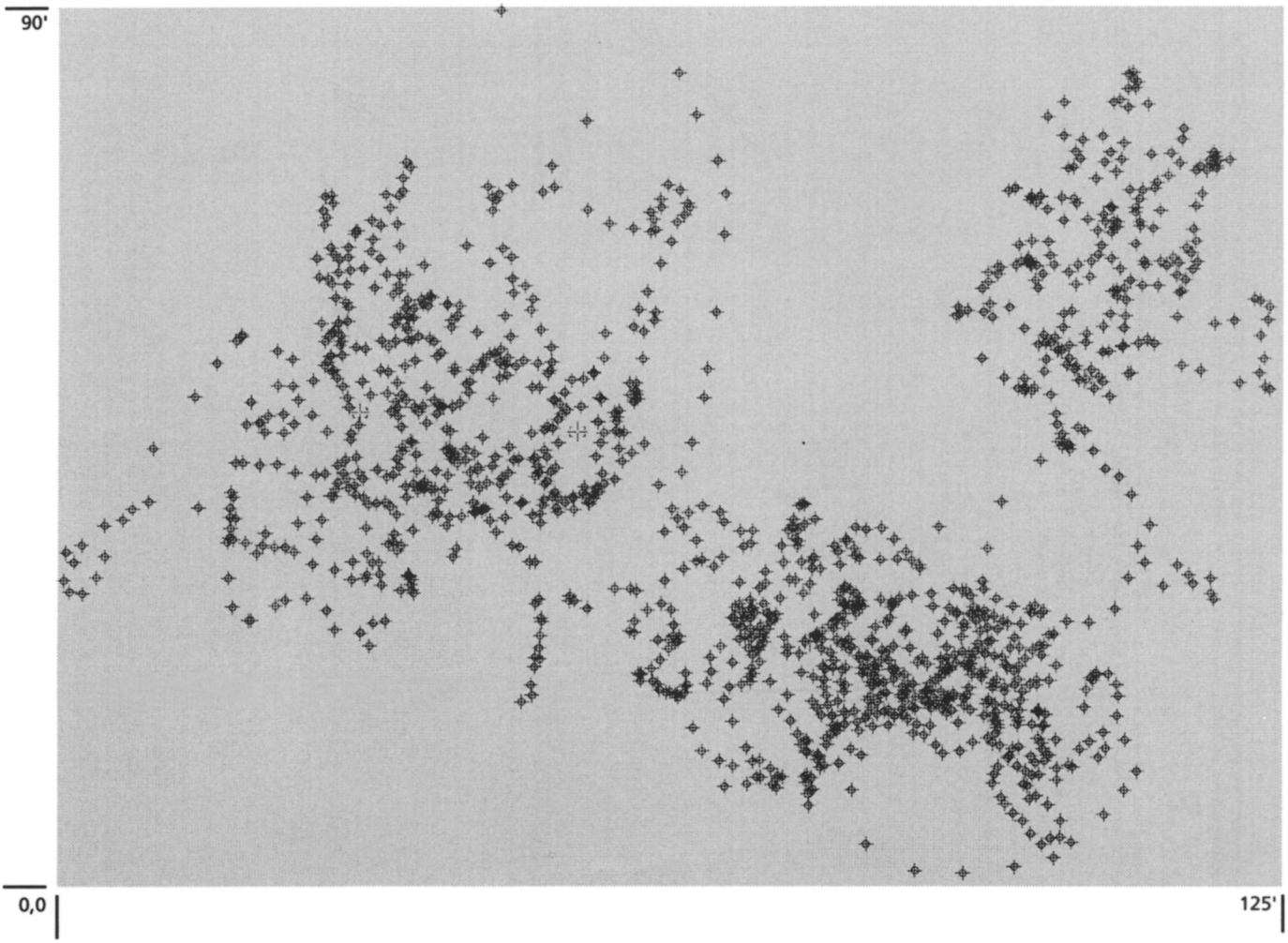
Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 01, 23, 21, 25, 15, 20.
817 position records, acquired 25 Jan 1994, 16:41:06 – 16:51:06, 17:08:21 – 17:17:59, 17:19:05 – 17:29:06 (GPS time).



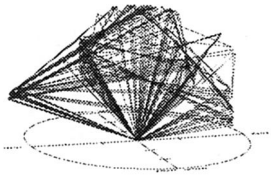


40 minutes, 4 points (StoreFront)

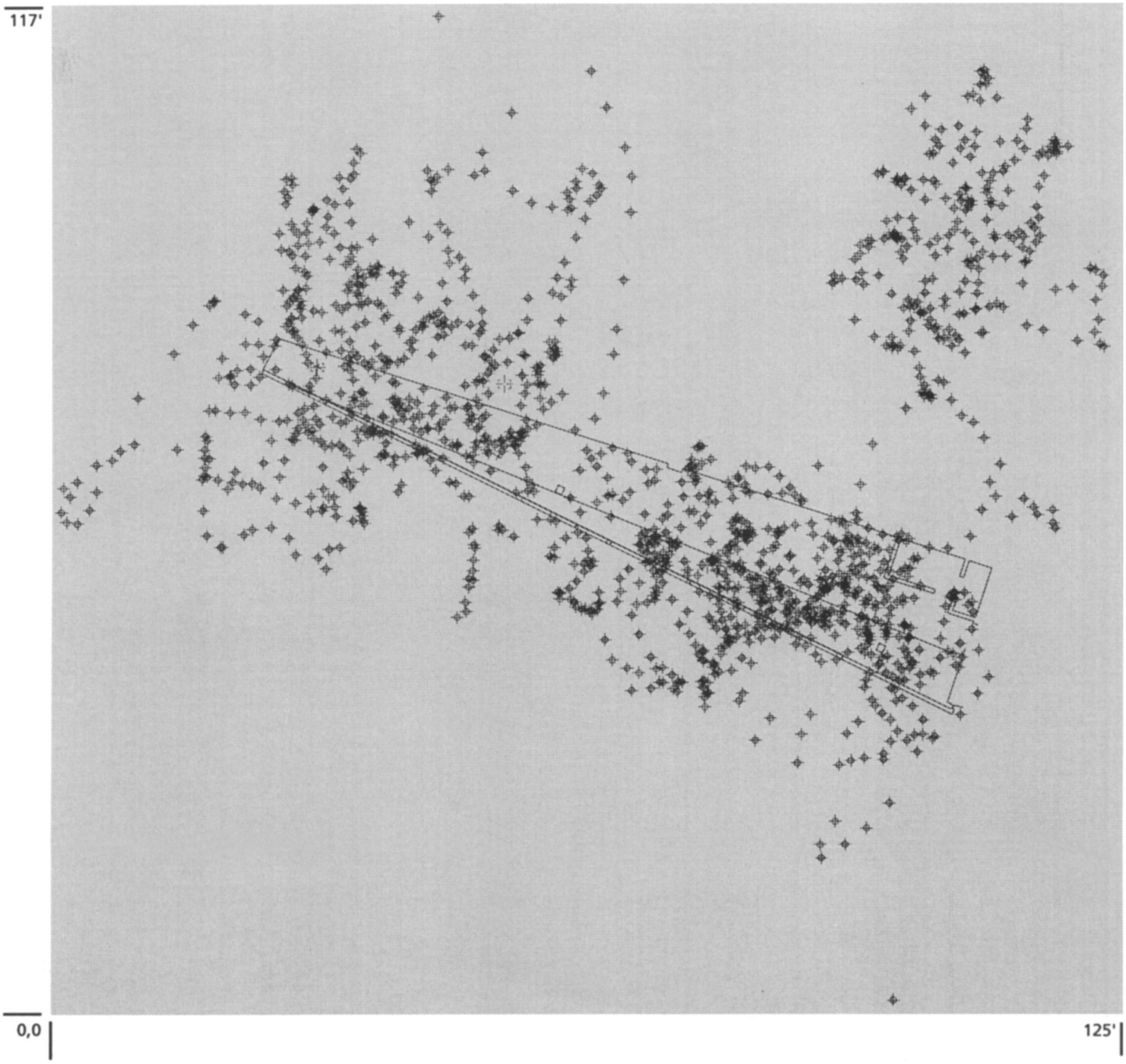
Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 01, 23, 21, 25, 15, 20.
1,046 position records, acquired 25 Jan 1994, 16:41:06 – 16:51:06, 17:08:21 – 17:17:59, 17:19:05 – 17:29:06, 17:31:28 – 17:41:28 (GPS time).

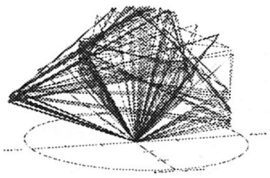


50 minutes, 5 points (StoreFront)



Receiver location: StoreFront for Art and Architecture.
NAVSTAR Satellite constellation: 01, 05, 12, 15, 20, 21, 23, 25.
1,349 position records, acquired 25 Jan 1994, 16:41:06 – 16:51:06, 17:08:21 – 17:17:59, 17:19:05 – 17:29:06, 17:31:28 – 17:41:28, 16:56:13 – 17:05:53 (GPS time).



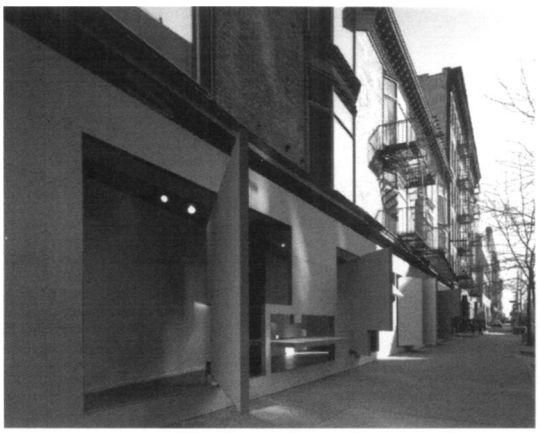


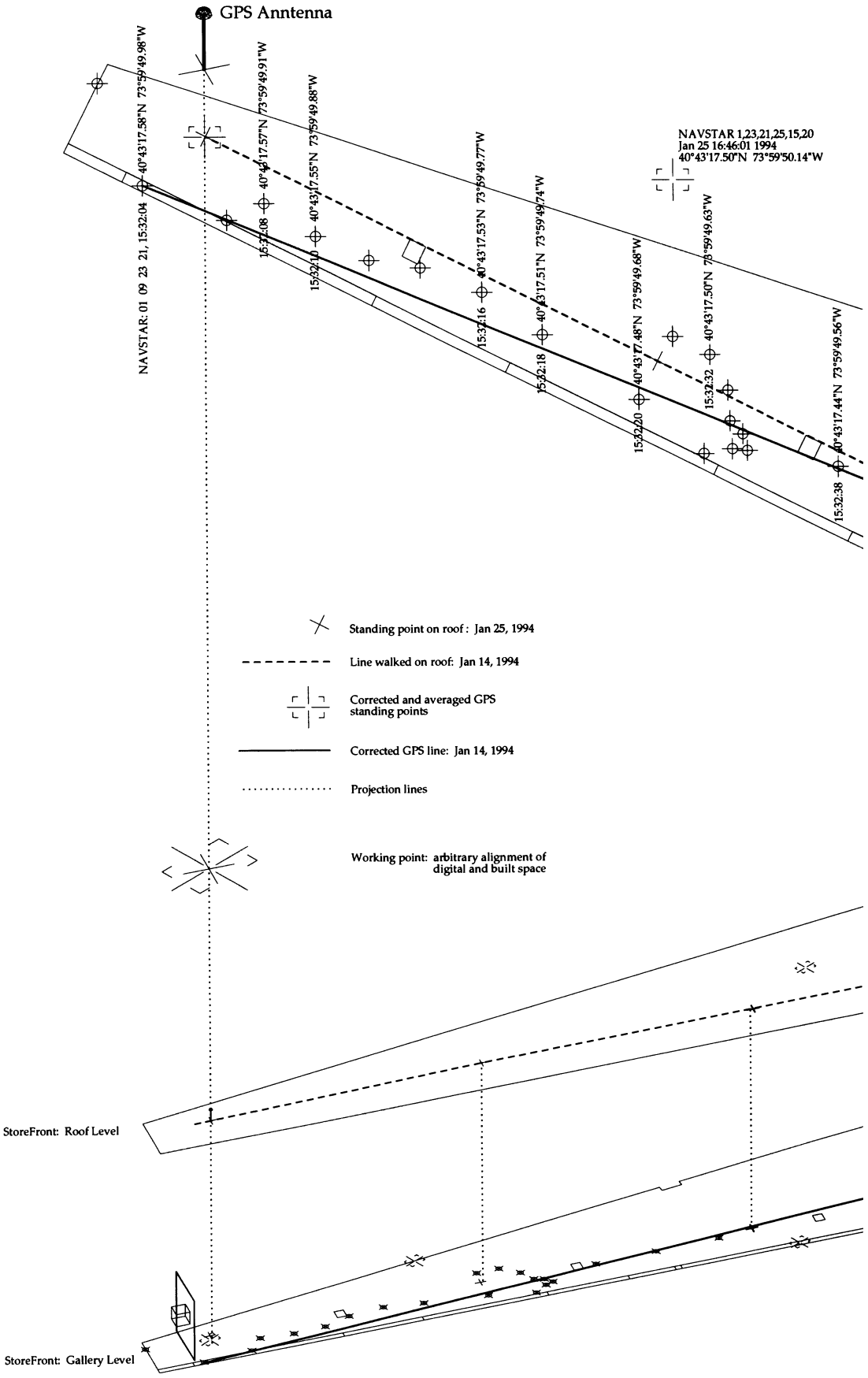
You Are Here: Information Drift

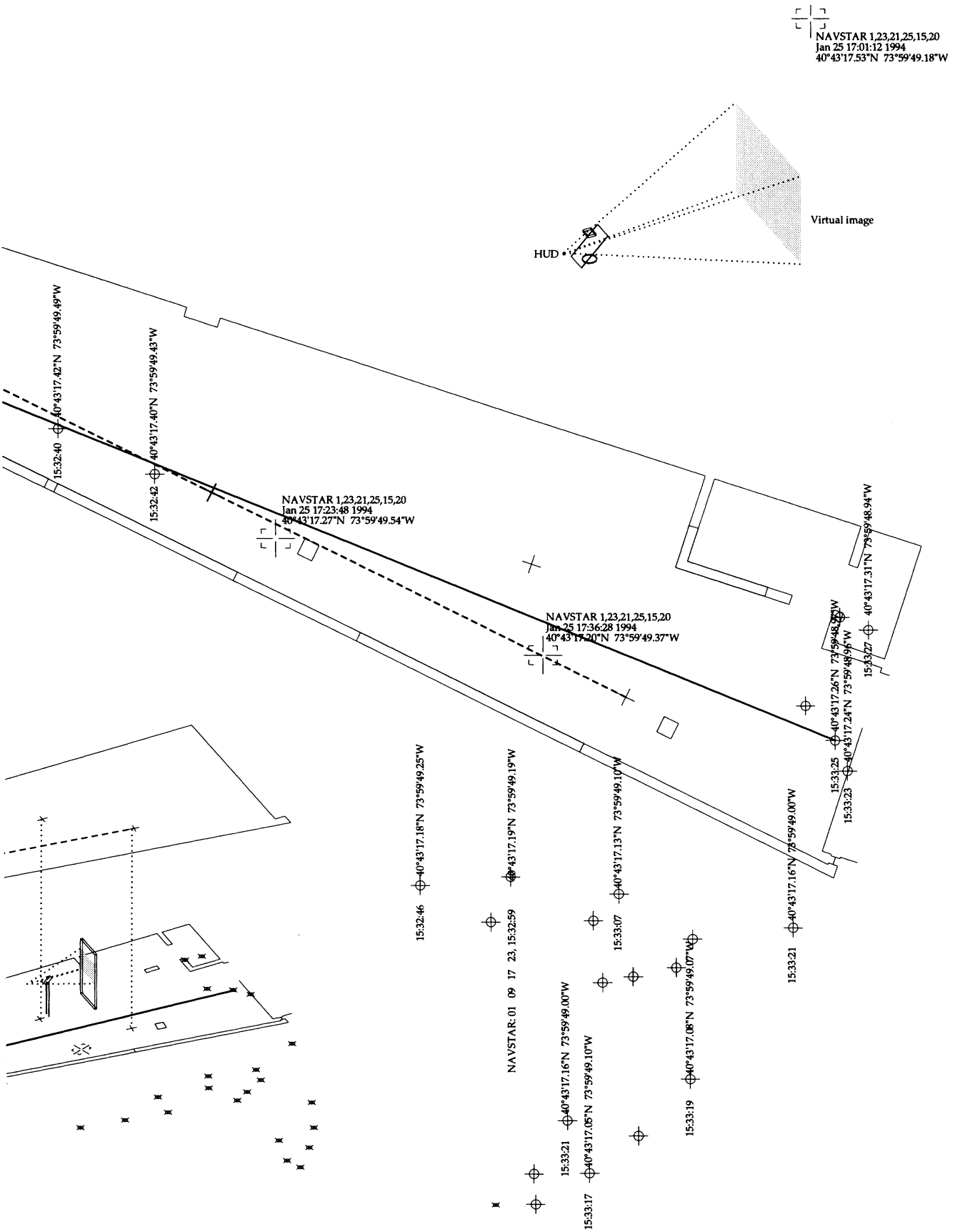
Storefront

The StoreFront for Art and Architecture has recently been given a new "front," a permeable membrane of pivoting doors aimed at blurring the distinction between the street and the gallery. The architect says that "this project has two extremes; totally closed, and totally open. . . . If it is closed, it is a wall with lines on it. When it is open, the outside is inside and the inside is outside." In its symmetry, this position leaves room for a very limited interpretation of both outside and inside. Like the opposition between open and closed, the distinction between inside and outside stays firmly in place — the wall with lines on it remains itself a line. But can we imagine an inside that remains pure, that resists the intrusion of everything else, secured by the frontier of a line? The barriers between public and private, outside and inside, always questionable, have long since been eroded and transformed by so many complications, of which digital networks are only one figure. StoreFront is a node, defined and redefined only by its changing position in different networks, and try as we might we could never be simply inside or outside the space. One cannot choose to open or close oneself to the outside, as one chooses to open a door or a wall. But without these reliable boundaries, at the StoreFront or anywhere, disorientation becomes less a problem to be solved than an irreducible condition of possibility for our movements in space and time.

In March and April 1994, "You Are Here: Information Drift" closed the doors of this new façade in order to open it onto and inscribe it into a usually invisible network, an orbital or digital front. Turned into a satellite receiver, the StoreFront became both the subject of and the surface on which to register and display the flow of digital mapping with GPS. The installation proposed three zones of activity: a real-time feed of GPS satellite positioning data, a head-up display (HUD) superimposing an animation of the satellites in motion on the final GPS map, and the inscription of the GPS data on the walls and floor of the gallery. These interfaces between the digital and built space are experienced as drift: the impossible alignment of the built space of the gallery with the electronic space engaged in mapping it.





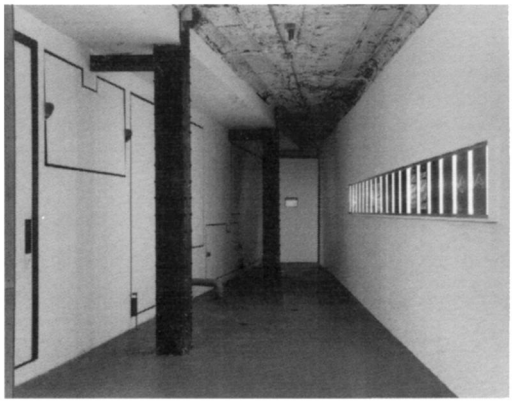


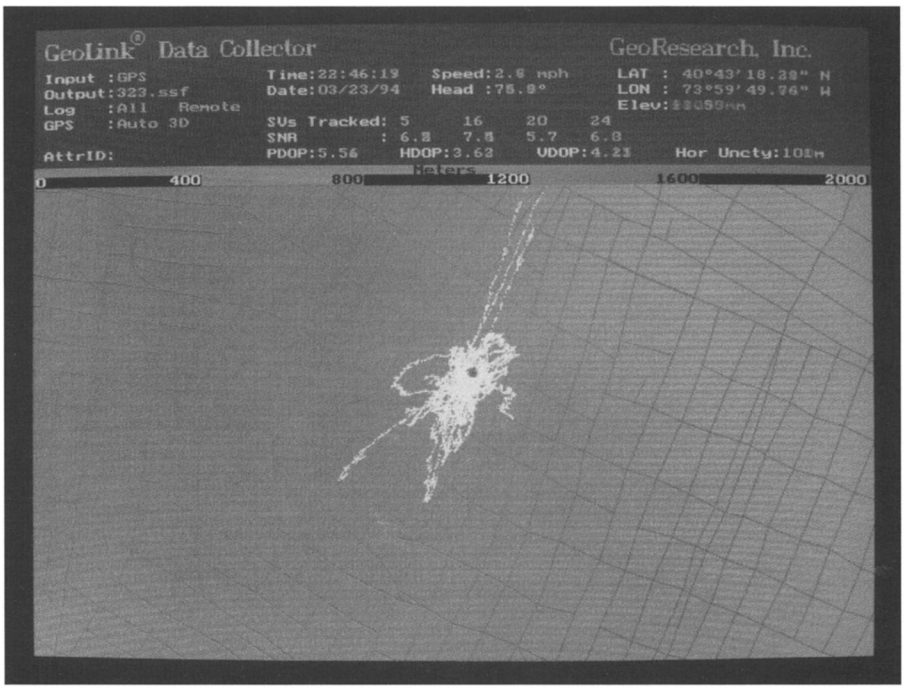
Installation

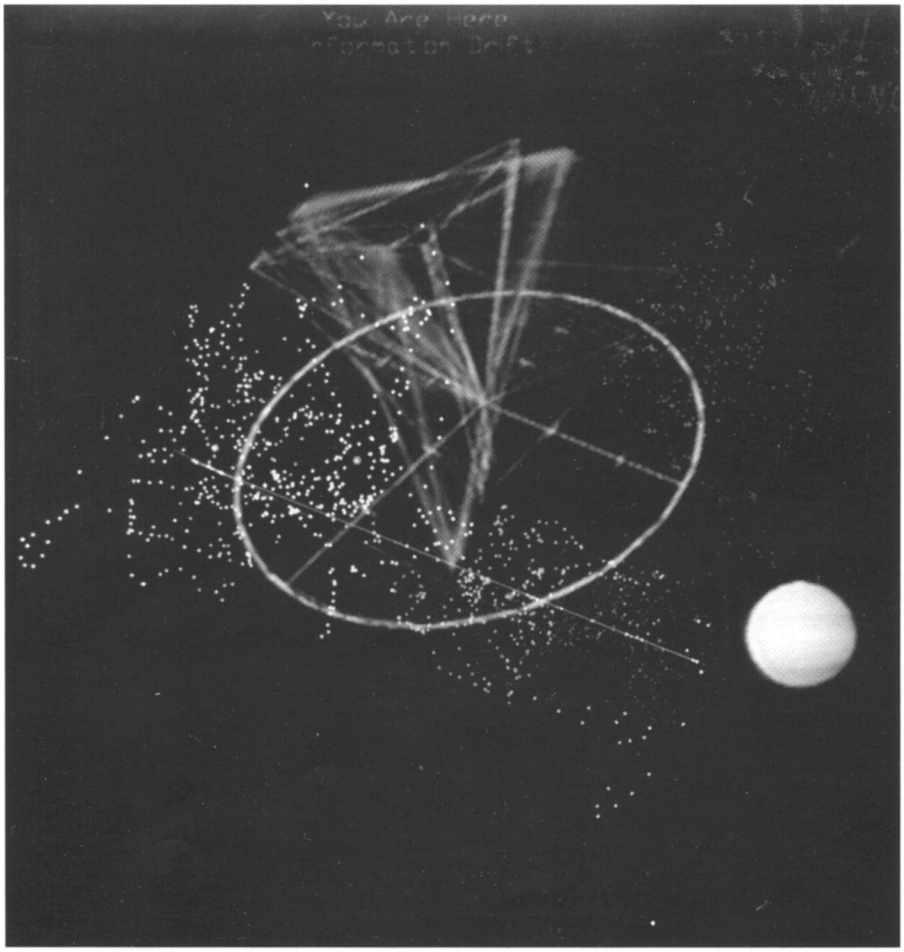
At one end of the gallery, a real-time feed of satellite positioning data floated across a monitor, a dot drawn on the computer screen every two seconds. Each dot, marking the location of the antenna on the roof of the building, was a small database, its characteristics listed at the top of the screen: longitude, latitude, time, and the constellation of satellites visible as it was being drawn. The stationary position scattered (the receiver sometimes thought that it was moving along the roof at a speeds of up to five miles an hour) and the dots drifted every day, as expected, within a hundred-mile zone inside and outside the StoreFront, against a background map of lower Manhattan — even though the doors remained shut.

Along the walls, drawings traced the movements of the earlier encounters with the satellites and built the final map of the space in cyberspace, displaying the record of movement on the roof of the building along a line parallel to and two feet behind — digitizing — the new façade of the StoreFront. The digital line was also traced along the floor, and some of the points marked out with position records on the floor.

At the gallery's other end, a head-up display unit overlaid an animation of the GPS satellite network in motion onto the composite map of the information it had provided. HUDs are normally found in military aircraft cockpits, where they serve as an orientation device, a system for navigating in the electronic field, in the shifting planes of transmission. The display is a transparent screen mounted in the window directly in front of the pilot, optically focused at infinity in the screen and overlaid on the view of the space outside the plane. Flight data can be read at all times in the HUD's lines, numbers, and symbols, without looking anywhere other than through the screen. The symbology projected there transforms the world viewed through it. The landscape is translated into codes of data, so that the pilot can see what the plane is looking at. What cannot simply be seen is first apprehended as data, and only thereby seen. The superimposition of a grid of information onto a landscape or target, makes possible its physical encounter — a strangely doubled perception, the transparency of vision overlaid with the cathodic light of information.



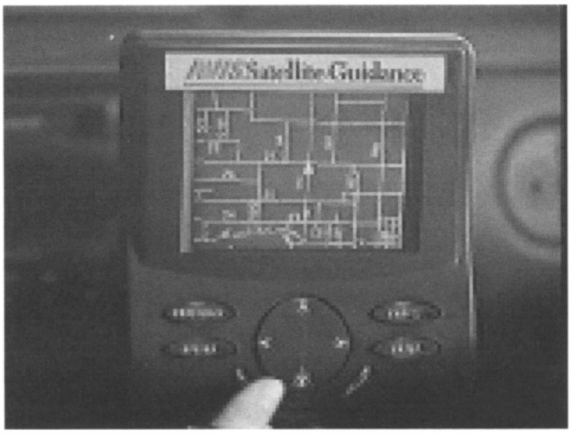




Pixels

"We need to know for certain where we are," says a man holding a map titled *Los Angeles Fires and Civil Unrest* in a brochure for real-time GPS mapping software. The open reference of the statement summarizes the promise and the dream of GPS: accurate positions instantaneously and continuously. One newspaper report on GPS in passenger cars was headlined, "In Japan, they may never ask for directions again." Not simply for pilots and engineers and ambulances, but for everyone, anyone, facing a location crisis. "With today's integrated circuit technology," suggests one manufacturer's handbook, "GPS receivers are fast becoming small enough and cheap enough to be carried by just about anyone. That means that everyone will have the ability to know exactly where they are, all the time. Finally, one of man's basic needs will be fulfilled. . . . Knowing where you are is so basic to life, GPS could become the next utility."

Another recent announcement for a GPS software package promises that it can finally deliver a reliable answer to the questions that continue to vex even the users of the most powerful maps: "'Which pixel am I standing on?' or worse, 'Where am I?'" Not "where am I" on the earth, but where on the map? At a time when these digital technologies seem to offer great leaps in our ability to locate ourselves, and when not only frightened urbanites but some of our most radical social critics are worried about failures in cognitive mapping, a critical analysis of new mapping technologies seems imperative. But perhaps the sense of what's "worse" conveyed by the GPS announcement needs to be rethought: the older and perennial question of "Where am I?," the question that gives rise both to panic and to new discoveries, has been replaced or displaced by a still stranger interrogative, "Which pixel am I standing on?" How to orient oneself in the cyberspace that promises orientation? What could it mean to stand on a pixel? Who or what stands in or on the data space of a pixel? The orbital front at once offers unprecedented mapping and positioning powers — and these capacities, for better and for worse, should not be underestimated — and opens new questions that challenge the most basic ways we think about space.



Project Credits

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Figure Credits

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Page 17, right. Courtesy of AT&T.

Page 18, page 42 right. NAVSTAR Global Positioning System, Joint Program Office, *GPS NAVSTAR User's Overview* (1991).

Page 23. Courtesy of the U.S. Department of Defense.

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All other photographs and drawings by Laura Kurgan.

Laura Kurgan is an architect in New York City.