



Fortin Xpressway

7:10PM

NEXT TRAIN

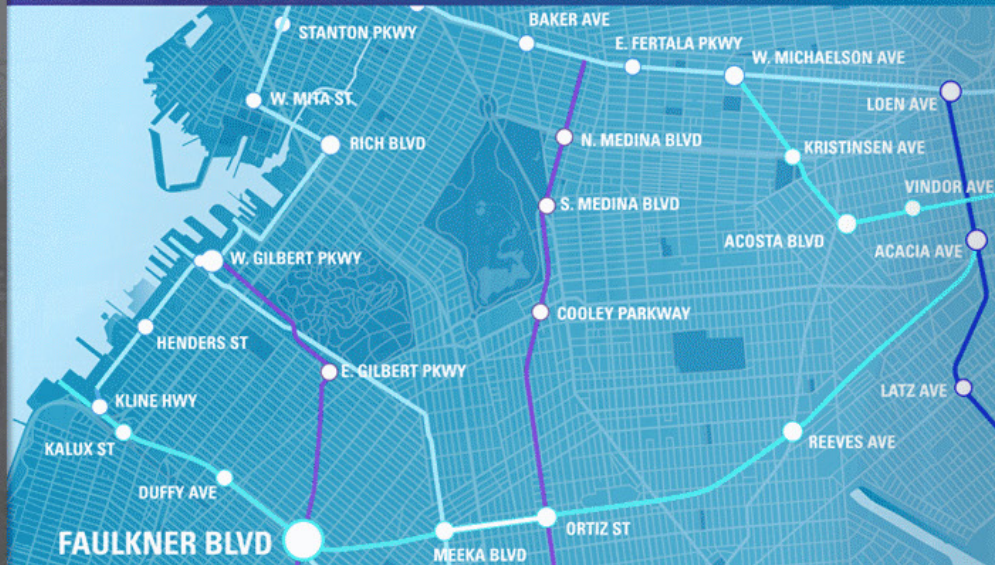
SCHEDULED STOPS

PLATFORM B
PURPLE LINE TRAIN ARRIVES IN

04

Minutes

Jenkins Blvd	7:22PM
Steem Ave	7:29PM
Brineway St	7:35PM
Shea Blvd	7:48PM
Riller Ave	7:57PM
Cherry Blvd	8:06PM
Tyron Ave	8:12PM
Davila Ave	8:16PM



White Paper:

Taking the Message Outdoors

How New Outdoor Display Tech Is Changing How
Businesses Communicate

SAMSUNG

TAKING THE MESSAGE OUTDOORS

The many barriers that limited how digital screens could be used outdoors and in direct sunlight have all come down, making it possible now to get high impact, dynamic messaging in front of consumers in almost any situation.

Rain, snow, heat and cold long conspired to make putting screens out in the elements – in a drive-thru lane or on a transit shelter wall – a costly, complicated and temperamental proposition. But no more.

Putting digital signage in shop and bank branch windows was usually a wasted effort, because direct sunlight overpowered the light from the displays. That's also changed.

Above all, LCD and LED display manufacturers and the specialty firms that do outdoor work are taking advantage of years of insights and experience, engineering advances and dropping costs to make the process of putting screens out in the elements, or in sun-bathed

windows, entirely possible and logical.

“I think we'll see the day, pretty quickly, where even Mom and Pop stores are replacing the printed posters with digital posters in their windows, because the prices and ease of doing it will reach that point,” says Nick Lee, Experimental Engineer with Yesco, a Las Vegas-based specialty display company that has, for years, been designing and building screens built to run and last outdoors.

It's possible now to have mouth-watering images and videos showing on pre-sell screens in the drive-thru lanes of snow-battered New England, interactive directories running on the sun-scorched sidewalks of Tucson, and stacked digital mannequins in the department store windows of big cities - visible, rich and attractive even on the sunniest afternoons.

That's a big change, even from five years ago.

The early days of outdoor and outdoor-facing digital signage displays were characterized by finding the right components and reliable suppliers, and then conquering the enormous engineering challenges of keeping displays running no matter what Mother Nature threw at them.

Many early adopters – media companies and restaurant operators – saw screens and systems fail because the components and engineering put together by inexperienced suppliers weren't up to the task of working in heat and blazing sun, high humidity or wild temperature swings from deep freezes to heat waves.

These days, reliability is largely assumed from major suppliers and solutions providers. The specialists in outdoor LCD displays solutions have their R&D efforts more focused now on adding and integrating new functionality that meets the expectations of the smartphone generation



THE DISPLAY'S THE THING

Outdoor digital signage products break down in two ways – displays that face outside, and those specifically engineered to live and work outside.

Semi-outdoor displays are used indoors, but in locations exposed to direct sunlight. They are all about nits – the measurement of brightness commonly used in the display panel business, representing candelas per square meter. With the exception of heavily shaded locations, regular commercial display panels built for indoor use will not be effective in communicating messages during daylight hours. Direct sunlight and glare will wash out and overpower the visuals.

Where 300-500 nits is typical for indoor display panels, outdoor and high brightness panels can generate more than 2,500 nits, and have both the brightness and color contrast properties to cut through even direct sunlight. A commonly used term for that is daylight readable. You'll see them

in storefront windows, individually or stacked in totems or grouped to make video walls.

Outdoor displays may look a lot like their semi-outdoor brethren, but are very different products. While they have similar brightness capabilities, outdoor displays reflect years of engineering designed to make running an LCD in harsh environments as crisp and reliable as running an LCD on the reception wall of a law office.

Outdoor displays are designed to work flawlessly, for years, despite extreme high and low temperatures, the added heat from full days of direct sunlight, rain, frost, dirt, dust and fumes, to unpredictable things like power spikes and vandalism.

“With semi-outdoor displays,” says Lee, “you’re really just worried about brightness. With outdoor, you’re engineering custom environments for these displays to operate in.”



CONQUERING THE CHALLENGES

Display specialists focused on providing solutions for companies that wanted their messages outdoors were challenged by a variety of issues during the early years of a still-emerging specialty.

The biggest obstacle was heat – from inside and from the sun. Direct sunlight and its amplified heat could alter the properties of LCD crystals – the display layer of screens – and discolor or cause black blotches. Inside,

the challenge was even greater, as heat build-up also affected the state of the LCD layer and shortened the operating lifespans of the electronics.

Specialists resorted to tearing apart LCD panels and re-engineering them with different lighting and electronics to amplify the brightness and better tolerate the heat. In most cases, notably those where high temperatures were an issue, they built air

conditioned, sealed enclosures designed to move air through and keep the electronics inside their heat tolerance ratings. They were, effectively, their own micro-environments.

All that engineering was reflected in the final cost to customers – meaning most outdoor installations were done as tests and trials, or only at signature or high volume locations of retail and media clients.

LED CHANGED EVERYTHING

The first and many following generations of LCD display panels were illuminated by fluorescent lighting tubes - skinny variations on the fluorescent lighting used for decades in everything from workplaces to backlit advertising posters. They had limited brightness capabilities, generated a lot of heat and were not particularly energy efficient.

But in the past five years, the commercial display industry (as has happened with TVs) has transitioned to back-lighting using light emitting diodes (LEDs). That has changed everything for outdoor digital signage.

Far less heat – even with super-bright LEDs – has meant that displays that previously needed intense, highly customized heating and cooling designs, with air conditioning and backup systems, could now be cooled

with lower cost fan solutions. Air flows and heat dissipates to keep the electronics in their acceptable operating ranges.

That's stripped out components, reduced capital and operating costs, and greatly extended the expected operating lives of units being deployed around the world.

"Reliability has increased dramatically," says Ralph Idems, COO of Vertigo Digital Displays in Toronto, Canada.

Idems has been designing and building outdoor displays for more than a decade, and has seen the industry scale a steep and sometimes painful learning curve. "But we're there now," he says. "Reliability is up, costs are down and the global logistics are in places to push out, manage and support very large deployments."

READY FOR EVERYTHING

Specialty display design engineers have to think not only about protecting LCD panels against the elements, they also have to factor in the risk from nefarious elements of the general public.

Just like subway cars, building walls and mailboxes, digital signage display enclosures are subject to abuse from vandals and graffiti taggers.

Specialty glass overlays are used to protect the fragile LCD layer of displays from being damaged by intent or accident. Transparent anti-vandal films provide another protective layer across the surface of enclosure glass, limiting scratching and making it possible to simply peel off and replace the film on-site in the event of it being spray-painted or damaged.

WHAT TO THINK ABOUT

Outdoor display technology is no different from most technologies – in that there's always a cheaper option somewhere. But it is one of those cases where the old saying about "getting what you pay for" is fully in play.

Here's what to think about when researching and sourcing outdoor and high brightness displays:

- Is it truly bright enough to be daylight readable?
- Will people wearing sunglasses see the visuals properly, because the displays handle polarization properly?
- What is the pedigree – the experience, history and size – of the supplier?
- How does the manufacturer or supplier validate the display's engineering? Do they have labs where things like thermal temperatures and sun-loading are tested?
- What's the warranty period and the life-cycle of the product?
- Are there spare part depots in the region, or at minimum, in the country?
- What's in place for vandalism protection, and for the security of the screens and particularly the media players inside enclosures?

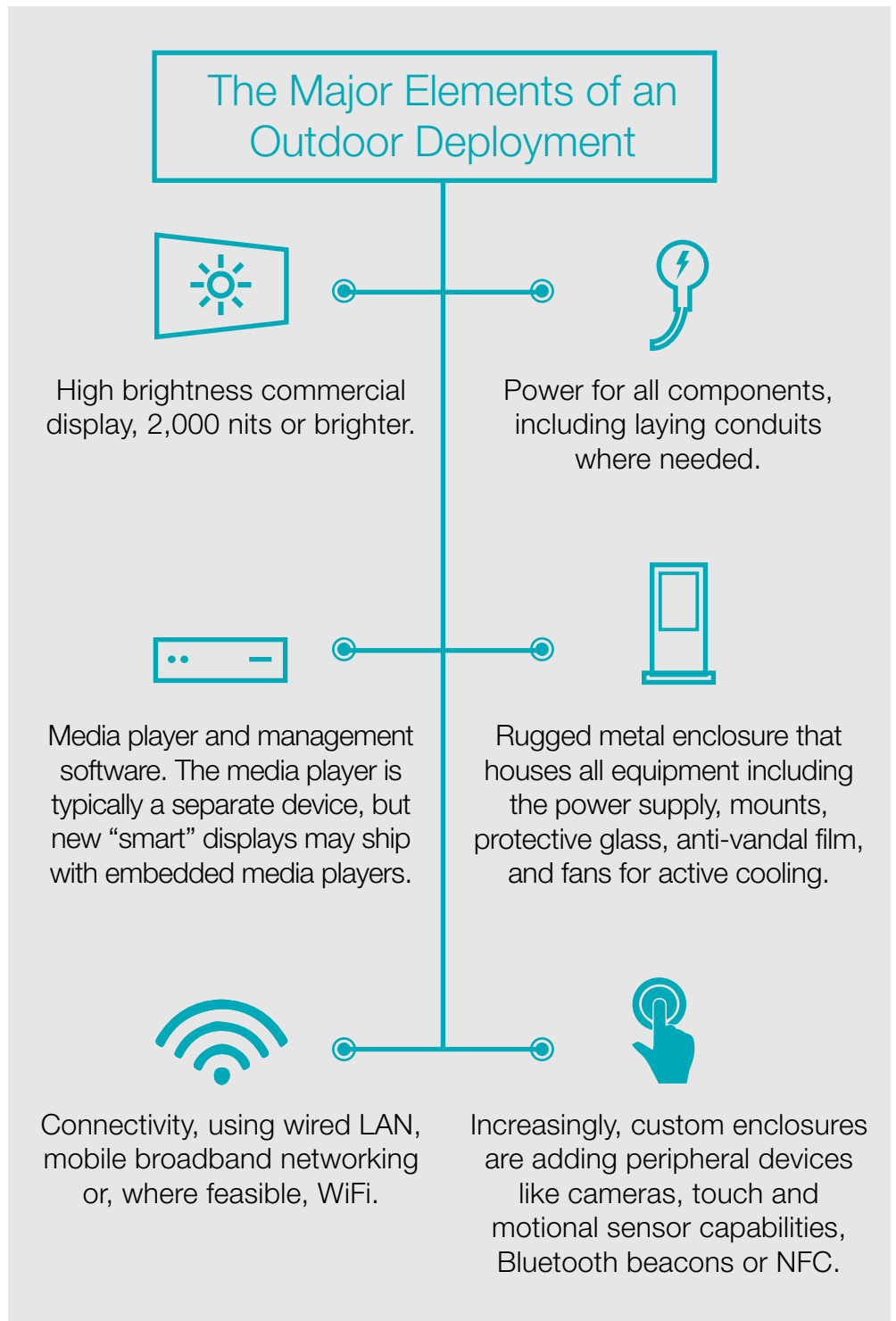
PUTTING IT TOGETHER FOR OUTDOOR SUCCESS

Putting a digital screen out in the elements is a major engineering challenge because of the obstacles that need to be cleared. It has always been much more than finding an LCD display bright enough to cut through sunlight. They've needed to live in their own custom-designed, weather-protected and climate controlled environments.

It's been specialized work best left to companies that have years of experience, extensive R&D capabilities and a broad set of skills. That's also, invariably, meant costs for outdoor displays have been many multiples of their indoor cousins.

The handful of companies that have specialized in outdoor displays have tried to keep costs down by developing standardized designs that could work for many projects. Unique designs that introduce new engineering, testing and tooling of parts can easily double costs.

Companies have found themselves working on outdoor advertising displays for transit shelters that had to operate in cold, damp Helsinki, and then do a different design for the super-bright, oven-like conditions of Phoenix.



48" Digital Indoor Signage Display

- \$1,000+ per unit
- 300-500 nits

VS

46" Digital Outdoor Signage Display

- \$4,000+ per unit
- 2500-3000 nits



WHY GO OUTDOOR: BENEFITS OF DIGITAL-OUT-OF-HOME

Outdoor digital displays really had their start with the billboard advertising industry, which has rapidly converted much of its stock over to digital. We're now seeing the conversion of print to digital on increasingly smaller display "faces" – not only in advertising, but in everything from retail marketing to information stations and directories at malls, campuses and large facilities.

The reasons and impacts are clear:

- Digital displays – with static or moving content – get noticed, and their messages recalled;
- Messages can be changed remotely, on demand, and scheduled by anything from time of day or week, to location;
- Digital introduces opportunities for engagement, though interactive touch or even gesture, and creates bridges to other technologies like smartphones, and payment and ordering systems;
- Compliance rates – a measure of the percentage of marketing material that appears where it should, when it should – skyrockets when campaigns are planned and executed by a central office, with no need to rely on local managers getting posters up and down on time and as directed;
- Digital introduces dynamics – leveraging Internet of Things data from databases, mobile devices and sensors to present content and messaging based on

conditions. In a drive-thru, for example, smart systems could enable a pre-sell display to dynamically suggest adding a pastry when a customer orders a coffee.

Idems says much of the outdoor activity to date has been with media companies converting posters to displays, but he sees a huge wave coming of Quick Service Restaurant operators converting their drive-thru posters to networked displays.

"They're going to convert because they've seen how converting menus inside their restaurants to digital paid off in sales lift on high margin items," says Idems, "and they expect the same will happen in the drive-thru lanes."

WINDOW DISPLAYS BUILT FOR EASY INTEGRATION

Understanding, from experience and advice, the many challenges of outdoor displays has limited the number of companies that have chosen to focus on this specialized integration work. There's now a short list of top tier integrators, like Yesco and Vertigo, delivering products and services around the globe.

Samsung's OM Series of high-brightness LCD displays includes models for outdoor-facing, called semi-outdoor,

and for fully outdoor. The semi-outdoor displays share many of the characteristics of conventional indoor displays, and have finished enclosures that can stand alone or be grouped or stacked for video walls. They come in a size range of 46, 55 and 75 inches, with a smaller 24-inch version on the way for early 2016.

The kit versions of the OM displays have unfinished edges that allow them to be mounted

inside cases and enclosures. The units are available in 46, 55 and 75 inches.

The kit form is used by solutions providers like Yesco, Vertigo and NuWay, who build them into enclosures that have the necessary thermal and protective environment the job requires, as well as whatever peripherals the job demands.

HOW SAMSUNG IS CHANGING THE OUTDOOR GAME

New, game-changing technology developed by Samsung is opening up specialty displays to a much broader range of integrators. Samsung's OH Series displays have all the engineering and design needed for ultra-bright, high-reliability, high durability displays built into completed, ready to install and use packages.

Michael O'Halloran, Samsung Business' Product Marketing Manager for Smart Signage, says in practical terms this delivers a turnkey solution that signmakers and metal fabricators can more efficiently build around. "These are designed in such a way that a wide range of companies can provide these solutions, without needing people on staff who understand things like thermal and fluid dynamics."

It's a huge business opportunity for small to medium businesses. Futuresource suggested in 2014 that just 1 percent of the potential market for outdoor displays had so far been tapped,

and pegged the potential market for them at 7.2 million units globally.

Samsung's OH Series displays come in 46-inch and 55-inch sizes, with a be 24-inch versions to be made available in 2016. The displays come ready to easily mount in your outdoor fixture, are IP56 waterproofed and have ballistic glass and anti-vandal films.

All of Samsung's outdoor-focused displays ship with the Smart Signage Platform (SSP), an embedded system-on-chip processor. That means media can be played out on the screens without the need for a separate PC or networked media player. However, separate media player inputs are also designed in for customers who choose to use them.

The displays also factor in another impact of sunshine – using circular polarizing technology that eliminates display blindness caused by polarized sunglasses.



THE IMPORTANCE OF PEDIGREE

Daylight-readable, weather-tolerant displays were largely a niche, almost novelty product a decade ago. The major brand manufacturers that consumers knew and trusted were not involved as makers or suppliers. So the specialty display business had to find its own sets of suppliers and do the legwork, testing and validation to come up with solutions they'd not only market, but sell with a warranty.

Both Idems and Lee have seen countless examples of small, unfamiliar manufacturers producing and selling solutions for outdoor projects that ended badly, because the expertise wasn't there, the engineering was flawed, and the support and after-care was limited or non-existent.

It's a big deal, they say, to have companies like Samsung now manufacturing product specifically for these kinds of projects. A major manufacturer like Samsung brings immense R&D resources and economies of scale, says Idems. But more than anything, it creates credibility and trust among buyers.

"For a long time, that was our single biggest obstacle to closing sales – questions about our suppliers," relates Idems. Describing suppliers as unknown manufacturers on the other side of the planet made buyers uneasy. "When I was able to say 'Samsung,' it all changed."

LOOKING AHEAD

Research shows that while it may seem like there are screens everywhere in our working and consumer lives, the actual market penetration remains relatively low.

That will change rapidly in the coming years – both indoors and outside.

The technical challenges have been resolved, so the focus has now turned to how screens outside get stitched into how we do things – from accessing information to making purchases.

In drive-thrus, for example, displays will be much more than digital versions of posters and meal beauty shots. Some major QSR companies are already testing ordering and payment using smartphones, with walk-up and drive-thru pickup windows.

Technology such as Bluetooth beacons and dedicated mobile apps will recognize customers as they enter zones, and both welcome them and upsell to them on screens, using dynamic data.

Cameras embedded with screens are generating analytics on lane speeds, demographic profiles and even sentiment.

Starbucks plans to add video displays to 2,400 drive-thrus across the United States, using them for promotion, order confirmation and to stream a live video image of the barista handling the motorists' orders.

One operator is even using one of the screens in its drive-thru to let customers know the state of traffic in the immediate area, potentially warning them off a planned route.

The possibilities are endless, but what's clear now is that consumers both welcome and expect screens as part of their interactions. The early days were rough, but the technology and expertise is now there to fully deliver on those expectations.



OMD-W SERIES

Storefront window solution delivering 2500 nits to communicate clearly on the sunniest days



OMD-K SERIES

A high-brightness display kit ready to install in your custom enclosure



OHD SERIES

Rugged, weather-proofed display solution with IP56 certification for outdoor installation

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