

# REPORT

**California custom home developer brings high-end buyers into the exciting new world of home automation networking and entertainment with a warranted Category 5e structured cabling system.**



## **TNT Development Builds High-Tech Homes Using Belden® HomeChoice™ Composite Cable**

While custom home developers nationwide are just beginning to join the race to design "Intelligent Homes," TNT Development in Southern California is clearly setting the pace. TNT's Walnut Country development of luxury homes was built specifically to propel home buyers into a high-tech future of home automation, home networking and advanced multimedia applications.

How did a small builder manage to master the learning curve of high-end residential communications technology so quickly? Pretty easily, actually, because TNT Development president Tom Chung is also the president of Tri-Net Technology, a long-time manufacturer and distributor of leading-edge structured cabling products for premise and commercial markets. Walnut Country is the realization of Chung's vision to integrate high-end technology seamlessly into custom-built homes.

"We are building not just for today, but for the future," says Chung. "We see the home network as the next opportunity where technology and the Internet converge to change the way we live. That's why we have pre-wired Walnut Country Homes for computer networking, distributed home entertainment, home audio systems, high-end home theatre, home automation, security systems and remote monitoring — with additional capacity built-in for future expansion."

### **Partnering With Belden**

The cabling infrastructure Tri-Net Technology selected to support Chung's vision is Belden's HomeChoice Composite Cable (#7878A), an innovative cabling design that is UL-verified to meet Category 5e performance. The 2x2x2 construction of HomeChoice #7878A conveniently "bundles" two RG-6 Duobond Plus® coaxial cables, two DataTwist® 350 Cat 5e 4-pair Bonded-Pair UTP cables, and two multimode 62.5 micron LANLite® fiber optic cables, under a single outer jacket. The composite cable meets the TIA/EIA-570-A standard for residential cabling and is designated by BICSI as a Grade Two configuration for residential applications.

Choosing Belden came naturally to TNT Development, a division of Tri-Net Technology. Since 1992, Tri-Net has built and marketed Belden twisted pair and fiber optic cable assemblies for commercial networks. According to Steven Haworth, Tri-Net Technology's communications director, "Tri-Net's long-standing relationship with Belden has been characterized by a high level of trust and confidence in Belden products. When TNT Development decided to enter the residential marketplace, HomeChoice was our first consideration in developing a product line." Today, each Walnut Country home has more than 1,000 feet of the composite cable installed.



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### The HomeChoice™ Advantage

Unlike other composite cables, Belden® HomeChoice cabling is verified to meet Cat 5e standards. One reason for this is the UTP cables' patented Bonded-Pair construction which results in a number of performance advantages over standard UTP cable, including the ability to operate at higher frequencies and improvements in attenuation, Power Sum NEXT, ACR headroom and Return Loss (RL).

Tri-Net's goal at Walnut Country Homes was to install an “industrial-strength” structured cabling system that would actually deliver Cat 5e performance when installed within an integrated home network. Haworth notes: “Belden's Bonded-Pair UTP technology is the key. Most Cat 5e cables from reputable vendors will test fine just off the reel. But we also sell homeowners our networking electronics and components — and we provide performance warranties on our products — so certification of Cat 5e performance *before and after completing the installation is essential.*”

Only Belden Bonded-Pair UTP cables deliver the Cat 5e performance standard Tri-Net Technology demands. The cables feature a unique design in which the individual insulated conductors are bonded along their longitudinal axes to maintain uniform conductor-to-conductor spacing. Since the conductors cannot loosen

or separate either during manufacture or while being installed, the cable maintains its Cat 5e electrical performance characteristics. Tests have shown that the performance of Cat 5e unbonded pair cables are seriously degraded when “bundled” into a composite cable construction or when subjected to the rigors of a typical installation. (See sidebar on page 4 for more information on Belden Bonded-Pair technology.)

“When it comes to installation, another advantage of the Belden HomeChoice composite cable is that it supports proper installation of each cable run,” adds Haworth. “With its larger diameter and inherent sturdiness, the cable maintains a proper bend radius, so even a novice installer can do it right the first time, with a minimum of instruction and without damaging the cable or affecting its performance.”

Tri-Net's stringent performance testing is conducted by its own test lab using a Hewlett-Packard 8753E Network Analyzer. Cable performance is tested and verified with Tri-Net electronic components both in the lab and on-site when the installation is complete. Haworth says this practice not only protects Tri-Net's warranty program, but also protects the builder (and ultimately the home buyer) by ensuring the promised performance level.

Tri-Net Technology selected Belden's HomeChoice Composite Cable to support their vision of building homes for the future.



Duobond Plus® coax also provides distinct installation advantages for Tri-Net. The shield effectiveness of Duobond Plus coax cable is better than Quad shield while using standard RG-6 connectors. Duobond Plus, a foil/braid/foil construction with a shorting fold in the outermost foil, provides exceptional protection against interference.

### Flexible Home Network Configuration

In each of the Walnut Country Homes, the HomeChoice™ cables are installed in a star topology in which the cables are home-run from a central distribution center in the master bedroom to each designated room. This configuration provides optimum flexibility, allowing the homeowners to change out individual cables to serve varying functions as family needs change. For example, the application of a nursery room's cable could be converted in minutes from use of a closed circuit video or an Internet camera to an office requiring data and

and broadband Internet connections; and two fiber optic cables, which are left dark, in reserve for future use. Even the master bathroom is included and the family room has two 4-port outlets to support a complete family entertainment center.

Haworth notes that, in installing the system, Tri-Net took a unique approach at the cable distribution box that allows pre-wiring to be completed without actually removing the outer composite jacket. "We found that this technique not only keeps the installation looking neater, but also protects the cable by keeping the bundles intact during installation of drywall, wall finishing and painting," he says.

Another unique feature of the Walnut Country cable system installation was the installation of innerduct within the walls, along two sides of each family room. While this type of conduit is commonly used in premise network installations, it is rare, but gaining in popularity in residential applications.

Haworth states: "This is another example of our determination to provide builders and end-users with an infrastructure capable of supporting whatever advanced multimedia applications they may desire, now or in the future. It's much more cost-effective to install cabling needed today, and capacity for growth during the construction phase, than to have to tear things apart and retrofit later."

Buyers of custom designed Walnut Country Homes will probably be more dazzled by the amenities in their new homes — amenities like 16,000 sq. ft. lots, marble baths, custom lighting and beautiful tile floors. As they settle into their new homes, however, they will also appreciate the state-of-the-art cabling and network management system that makes their high-tech dreams possible. Whether they want to equip a networked home office, high-end home theater, computer-controlled audio and video, automated heating and air-conditioning, security, irrigation and other home systems —

**HOME BUILDERS  
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media connections for networked computers. The structured cabling system brings telephone, video and network signals to a central media management center, which features an intuitive "resource to room destination," user-friendly design that makes it possible for changes to be made or new applications to be deployed as desired.

Each main room in the house has a 4-port multimedia outlet consisting of two coaxial cables for television transmission (antenna, CATV and satellite-based) and cable-based Internet hook-ups; two Cat 5e cables for phone



To ensure that the rigors of installation do not damage the cable's integrity, Tri-Net tests and verifies the cable performance both in the lab and on-site when the installation is complete.

**Belden® Bonded-Pair  
DataTwist® 350  
Cables Deliver  
Installable Performance™**

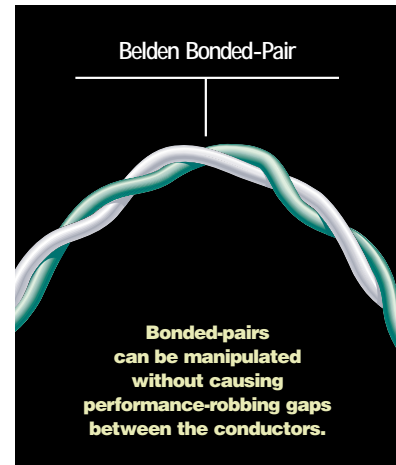
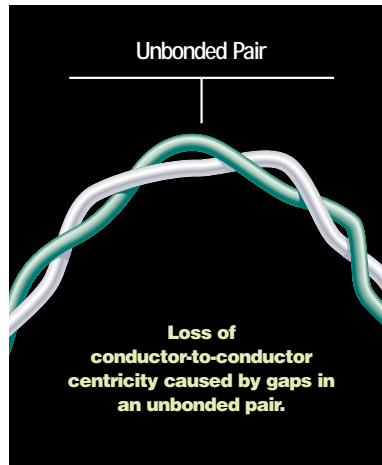
Belden DataTwist Bonded-Pair UTP cables derive their superior electrical performance characteristics from a unique, patented design innovation — Bonded-Pair technology. This construction feature ensures the structural and electrical stability of the cable both “on-the-reel” and after installation.

Belden’s Bonded-Pair UTP technology is a manufacturing process in which the individual insulated conductors are bonded along their longitudinal axes to ensure that the twisted pairs will not loosen or separate during manufacture or under the stresses of installation. The process also ensures uniform conductor-to-conductor spacing, consistent tension on the conductors within the pair, and a uniform twisting of the insulated conductors into pairs.

Unbonded twisted pairs are susceptible to conductor separation, leading to impedance mismatches, Return Loss (RL) and crosstalk problems. Unbonded pairs may test to the desired Cat 5e standard on the reel, but when cables are installed, they are pulled vigorously, bent around corners and may kink when coming off the reel. All of these factors can change the physical characteristics of the cables and, in turn, degrade their electrical performance.

In an Installation Stress Test performed on both unbonded pair and Bonded-Pair cabling, using TIA/EIA-568-B.1 installation guidelines, the unbonded pair cables’ performance degraded sharply after installation. Belden Bonded-Pair cables exhibited little change in RL performance and exhibited the same high degree of NEXT and PSNEXT performance whether just off the reel or installed in the wall.

Belden calls this unique after-installation performance capability Installable Performance.



**Installed/manipulated unbonded pairs (left) have a tendency to gap, varying the centricity of the two conductors; Bonded-Pairs do not gap so the physical integrity of the pair is maintained.**

any and all of these things are within reach. Standard offerings include front- and rear-door surveillance cameras, video modulators, high-speed Internet gateway, Ethernet hub, digital cable or satellite amplifier and hub, four-line telephone module, wall-mounted and hand-held remote lighting controls for automated lighting preinstalled in key areas of the home. Upgrades to these features and other optional electronics are offered by the builder, so home buyers can feel confident the installation and integration of their complete system will be hassle-free.

**Future Technology Installation:  
A Good Investment**

Belden offers several levels of HomeChoice™ residential cabling systems for “Intelligent Homes.” One lesson to learn from the commercial marketplace, however, is that designing communications networks to accommodate technological advances makes good business sense. Building in ample headroom for future applications not only protects the original investment, but more

importantly, helps the buyer avoid costly and time-consuming upgrades and retrofits down the road. That’s exactly what Tri-Net has succeeded in doing for TNT Development’s Walnut Country buyers. “Some might consider the HomeChoice 7878A composite cabling kind of high-powered for a home environment,” says Haworth. “But we see it as a good investment, with the long-term benefits far outweighing the initial cost. After all, it’s likely that, within months, consumers will be clamoring for Gigabit Ethernet networks to support their developing home technology systems.

“What home builders and integrators need to realize is that future-proofing is as critical to the residential market as it is to commercial development because home technology is expanding at an incredible pace,” Haworth concludes. “It’s nice to know that a network infrastructure like that is already in place in Walnut Country and is ready and waiting for the latest super-speed technologies — video-on-demand, HDTV, and who knows what else the future holds.”

**For More Information:**

**[www.belden.com](http://www.belden.com)**

Belden Electronics Division Technical Support **1-800-BELDEN-1** or **1-800-BELDEN-3**