



PEOPLE



PROCESS



SOLUTIONS

Reliable Custom **Connectivity**

Engineered Solutions for High Performance Systems



NAI Custom Cable Assemblies and Harnesses

NAI is an extremely agile designer and manufacturer of custom cable assemblies and harnesses for a diverse group of customers, industries and critical applications. We deliver end-to-end connectivity solutions that inspire confidence among our customers, and among their customers as well. This is the NAI story of our competencies and competitive advantages that will benefit your next project.

1) Custom Engineering & Manufacturing

Many of our customers have experienced significant cost savings by outsourcing to NAI. We add value with design engineering services and by obtaining cost savings through the use of alternative components. We are focused on diligent quality processes through our manufacturing operations to ensure the reliability of our product performance in a variety of critical applications and technologies.

2) The NAI Center of Excellence (CoE)

Many customers outsource the design and development of their fiber optic cable assemblies to NAI. Through expert engineering and specialized testing, our dedicated CoE facility ensures Design for Manufacturability (DFM), product performance, reliability, on-time delivery and achieves cost savings.

3) Global Sourcing

NAI specializes in obtaining high-value products and components required for the cable assemblies we manufacture. Internal manufacturing capabilities complement our global procurement to provide quality assurance and substantial cost savings. This unique NAI operation is flexible and nimble in response to customer needs, allowing NAI to ramp up rapidly for new projects.

4) Critical Applications

NAI produces assemblies and harnesses used in critical applications for life and communications in medical, telecommunications, data and industrial technologies.

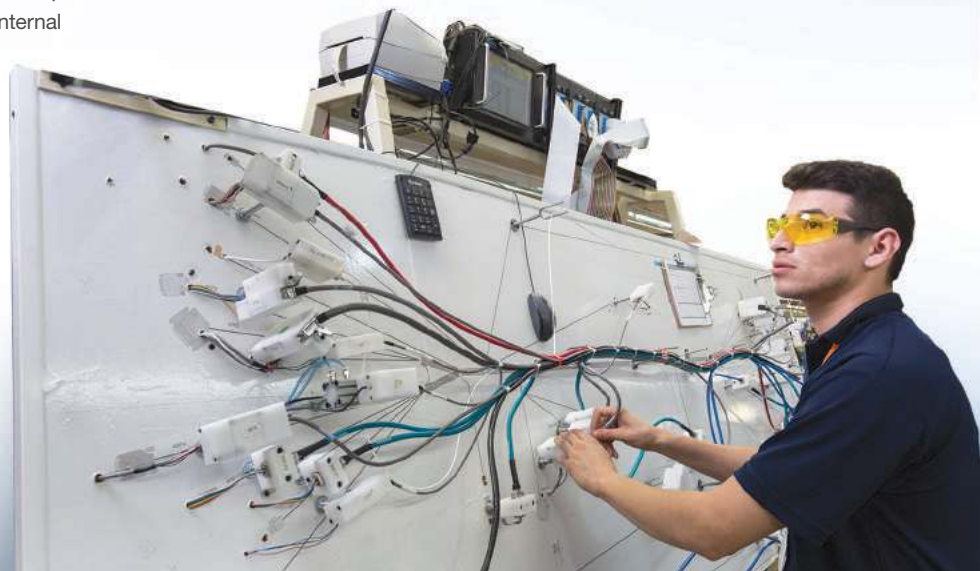
5) Relentless Quality

NAI employs the principles of Six Sigma and Lean Manufacturing in its operations. A dedicated Quality Control staff, use of testing protocols throughout manufacturing and a relentless passion for excellence, all combine to deliver reliable product performance.

6) Focused Assembly Experts

The people who work at NAI are well trained and committed to producing only the best quality products. Their “passion component” and agility set us apart from others.

Assemblies and harnesses are thoroughly tested on a “working board” for reliable electrical performance, as shown with this harness bundle for the semiconductor industry.



Custom Engineering & Manufacturing

Fast, Agile & Responsive

I found that NAI was able to approve and accommodate the capital investment required to set up operations for our project more quickly than others. Because NAI was so fast and nimble, our project was up and running within weeks!

Director of Supply Chain
Leading Telecommunications Company

Cable Assemblies

Fiber optic cable assemblies define the predominant output at NAI, followed by copper cable assemblies. We assemble to specifications and desired ruggedness, using ferrules, strain reliefs, connectors and other components as required.

Cable Harnesses

NAI rugged harnesses may include any combination of copper, fiber optic and power cables. Effective gaging tools and visual aids are used by operators during the manufacture of the assembly. Each part is thoroughly tested for electrical performance. Automated manufacturing equipment and test fixtures are employed to ensure signal integrity. Other capabilities include braiding, ultrasonic welding of bare copper and inline cable marking.

Preterm

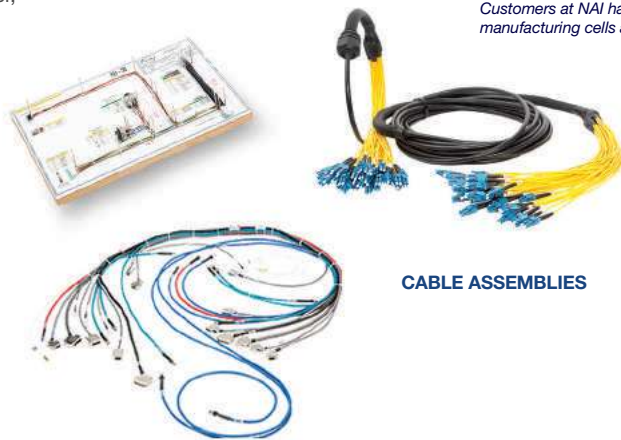
Customers often require pre-terminated fiber optic cable assemblies, ruggedized for easier and faster installation, saving valuable time for installers. The pre-terminated ends are protected for shipping and installation.

Customer Focus at NAI

As a customer, NAI provides one or more dedicated manufacturing cells to the assembly of your product. These cells are manned by a dedicated team as well, including engineers and quality control personnel.



Customers at NAI have dedicated manufacturing cells and teams.



CABLE ASSEMBLIES



PRETERM



CABLE HARNESSES

The NAI Center of Excellence (CoE)

Fiber Optic Design & Development



DESIGN & DEVELOPMENT

Design, Development, Prototypes & Testing

In 2016, NAI added a new dimension to its ability to provide custom design engineering and product development for fiber optic cable assemblies. This unique operation includes a dedicated team of engineers who design, analyze and qualify assemblies before they go into production.

The CoE is organized around three main principles.

- 1) The CoE mission is to design and develop fiber optic cable assemblies for customers who want to outsource their assemblies.
- 2) We achieve robust product performance and cost savings for customers by using alternative processes and components to reduce the purchase price variance.
- 3) The CoE supports the NAI manufacturing process by employing Design for Manufacturability (DFM) principles in the design stage.

The CoE utilizes CAD equipment and 3D printers to realize the appropriate design solution that will meet a customer's requirements. CAD software platforms include ACAD, SolidWorks and CorelDraw. FormLabs software is utilized for 3D printing to simulate prototype assemblies.

A wall of monitors provides CoE engineers with project dashboards, allowing them to control the design and testing process. Monitors display project status in real time, progress percentage and highlights, as well as live thermal test data.

Test operations include:

- Environmental test (thermal chambers)
- Immersion test according to IP67
- Cross-section analysis (connectors, cable assembly and transition areas)
- Tensile and connector tests based on connector specification or customer requirement
- End face and geometry, per standard spec IEC 61300 or customer requirement

The CoE utilizes CAD equipment and 3D printers to realize the appropriate design solution.



Once a prototype is made, the assembly is tested. An Environmental Chamber for temperature and humidity, along with tensile and immersion test devices, simulate demanding environmental conditions to ensure the product will perform under these stresses.

Parts & Materials

Global Procurement Expertise and Agility

We required cable assemblies for our industrial equipment from a clean room manufacturer supported with documented processes and testing, as well as the sourcing capability to incorporate unique components. NAI supported both our technical and commercial needs quite well.

Commodity Supply Manager
Semiconductor Manufacturer

NAI Materials & Components

NAI utilizes a large variety of cables and connectors, along with other products and components. Our global sourcing operations often procure alternative components that meet project specs and achieve overall cost savings. Here are just some of the components and materials used in typical assembly work:

Copper Cable

- | | | |
|----------------|---------------------|---------------------|
| - Hook-up Wire | - Cat. 3 – UTP, STP | - Cat. 5 – UTP, STP |
| - Coaxial | - Multi-conductor | - Power |

Fiber Optic Cable

- | | | |
|----------|---------------|-------------|
| - Ribbon | - Single Mode | - Multimode |
| - Hybrid | - Simplex | - Duplex |

Connectivity

- | | | |
|--------------|------------|------------|
| - Connectors | - Covers | - Housings |
| - Pins | - Contacts | |

Other Components

- | | | |
|--------------------------------|------------------|----------------------------|
| - Ferrules | - Strain Reliefs | - Shrink Tubing |
| - Terminal Blocks | - Enclosures | - Boots, Bushings and More |
| - Potting Material and Epoxies | | |



Sampling of NAI molded connectors.



Sampling of NAI molded components.

Molding Capabilities

NAI provides its own internal molding capabilities, when needed, for the production of specific custom components, ferrules, boots and more. We use 3D printers and have substantial automated molding equipment, which can produce components in a variety of shapes and sizes in Silicone, ABS, PC, PVC, POM, PP, TPU, PA, PMMA and more. Our silicone molding equipment produces prototypes which can often be turned around in 3 to 7 days.



NAI makes the capital investments needed for customer projects, such as for this line of 16 state-of-the-art over-molding machines.

TOP LEFT: Injection molding equipment provides capabilities to mold a broad variety of components.

LEFT: Over-mold equipment provides molding of strain reliefs, boots, etc.

Engineered Solutions for Critical Applications

No Project is Too Small or Too Large



Largest Variety for Critical Use

NAI's manufacturing operations are structured to handle an extremely broad variety of cable assemblies, harnesses and associated components, designed for use in applications found in specific industries – each critical to life and/or communication. While others may be able to manufacture a portion of what NAI produces, no one matches the breadth and depth of our quality product capabilities and processes. NAI has the capability you need!

NAI has manufactured single assemblies with over 430 terminations. There is no limit to the number of cable assemblies NAI can produce, nor to the number of terminations to be supplied.

The customer base for NAI is varied. We serve cable and connectivity manufacturers, OEMs and other contract manufacturers. Some of the technologies we support include:

- Cell Towers & DAS
- Enterprise networking
- Industrial & process control
- Lab equipment
- Medical imaging and other equipment
- Power supplies
- Telecom CO & OSP equipment
- Energy management
- Industrial networking
- Internet of Things (IoT)
- Medical instrumentation and devices
- Patient handling equipment
- Semiconductor
- Water treatment

Industrial Engineered Solutions

NAI has many years of experience in manufacturing ruggedized cable assemblies for the following applications. Many NAI assemblies have been engineered and manufactured in response to the growth in the sensor industry for IoT applications. Our capabilities include producing IP67 rated assemblies.

- Energy & power
- Measurement & control devices
- Network test devices
- Oil & gas test equipment
- Testing for pulp & paper manufacturing
- Water treatment test devices



NAI ruggedized cable assemblies are often used in industrial and process control applications.



NAI cable assemblies and harnesses are ruggedized to endure the tough environmental stresses typically encountered in industrial applications.

Assemblies for Precision Applications

Critical to Life & Communications

The cable assemblies for our medical devices required dedicated clean room manufacturing to prevent contaminants, all of which was provided by NAI. Their assembly process, testing and quality systems are second to none. Overall, NAI has delivered great value.

Design Engineer
Medical Device Manufacturer

Medical Devices & Equipment

Our plants feature medical clean rooms and are ISO 13485:2003 certified. NAI has produced precision cable assemblies for medical devices, such as coblation surgical assemblies, over molded pulse oximeter assemblies, surgical knife assemblies, ultrasound and laparoscopic surgical assemblies and disposable surgical wand assemblies.

In addition, NAI manufactures assemblies for medical equipment, such as MRI, PET and CAT Scan equipment, autoclave sterilization, DNA and chemical analysis hardware, patient handling equipment and other lab and test analysis equipment.

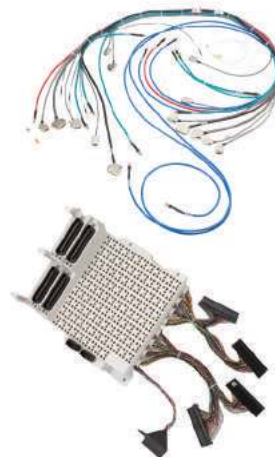


NAI cable assemblies and harnesses utilize "working boards" to guide the assembly and testing processes for products used in surgical instruments and other medical devices and equipment.

Telecom/Data

NAI outdoor and indoor products include cable assemblies and patch cords for:

- ADSL/VDSL
- Building Entrance Terminals
- Central Office assemblies
- Data centers and enterprise networks
- Full fiber optic jumper cable
- OSP and Central Office protector blocks and panels
- Upgrading cell towers for 4G LTE



NAI produces many telecom and data assemblies for legacy systems, as well as for new state-of-the-art equipment.

Quality Management Systems at NAI

An Exhaustive Process for Precision



Strict Quality Processes

At NAI, we integrate the principles and tools of Lean Manufacturing in our everyday operations. Statistical Process Control methods are employed throughout our planning, sourcing, incoming materials, manufacturing and outgoing processes to reduce variation in our end products. Quality is the focus of relentless pursuit at NAI.

Global Sourcing

The nimble global sourcing strategy at NAI is proactive and key to our ability to continue to serve our growing customer base. NAI utilizes an experienced Supply Chain Management Team to oversee the planning and implementation of this strategy. A Global Distribution Center in Nogales, AZ, incorporates kanban and vendor managed inventory services.

At NAI, there is a major focus on reducing cycle time and integrated material component planning.

NPI – NAI’s Unique *New Product Introduction* Process

The NPI operation occupies its own special space in the plant, and is managed by a dedicated team of specialized engineers and workers who are devoted to the development of new cable assemblies.

This group prepares the drawing of a completed assembly and its related “working board.” They also create a prototype and a production sample, along with a Bill of Materials. NAI can provide the First Article within two to four weeks.

The focused and agile NPI team is also tasked with preparing the visual aids and other tools needed for production. In addition, dedicated program managers utilize and oversee the Advanced Product Quality Planning (APQP) process, similar to the tool adopted by major auto manufacturers, for proactive quality planning in the design and manufacturing stages.



Detailed drawings of assemblies provide a visual aid to assembly personnel.



Working boards” are used to ensure the correct assembly of cables and components, as well as testing their electrical performance.



NAI provides a dedicated NPI team of engineers and quality personnel.

RELENTLESS QUALITY

Reliable Performance

Our customers' product applications are critical to supporting industrial control systems for manufacturing, thereby preventing costly downtime. NAI provides reliable and ruggedized products that give us the confidence in the performance of our products. Their quality systems are exemplary.

Quality Engineering Manager
Manufacturer of Industrial Control Systems

Fiber Optics: Inline Quality Control

State of the art equipment is employed for polishing, loss tests, laser cleavers, fiber fusion (splicing), cross section, thermo-chamber and immersion testing. All fiber optic cable assemblies are continuously tested throughout manufacturing for:

- Insertion Loss/Return Loss
- Attenuation
- Geometry, including concentricity and light continuity
- End face inspection after polishing

Air cleaning equipment removes contaminants at various stages of manufacturing.

If any part fails testing, the test unit automatically locks up. The operator is then required to have the Quality Dept. release the part from the test unit and fix the problem before continuing with assembly production.

Copper: Inline Quality Control

NAI produces copper cable assemblies and harnesses using leading edge test procedures and equipment to ensure optimal performance. All assemblies are 100% inspected. Electrical tests include continuity, high voltage (HiPot) and capacity. Some of the tests we perform include:

- Subassy electrical test
- Manufacturing visual inspection
- QA inspection
- Plug blade height
- Tensile, pressure and texture tests
- Insertion Loss/Return Loss

NAI Certifications

NAI maintains the following certifications:

- ISO 9001:2008 – for overall quality
- ISO 13485:2003 – for medical product quality
- TL9000 – for telecom product quality
- AS9100 – for aerospace product quality
- 2011 C-TPAT
- UL and C(UL) certifications

In addition, NAI has often been certified for many other specific quality or product protocols as required by certain industries and customers, such as UL, Intertek and NADCAP. Let us know your project requirements, and we will obtain the necessary certifications.

*Automated electrical testing
ensures product performance.*



NAI Quality is All-Encompassing

Covering Every Aspect of The Project



Other Control Measures

There are many procedures and processes NAI uses as part of its Quality Management System. Here are just a few examples:

- An Out of Box Audit (OBA) is conducted by a Supplier Quality Engineer on all incoming material to test for any defects, and determine if any CTQ tests (discussed at right) are needed. In working with our supply chain, we have achieved a very high level of acceptability, well beyond the 99 percentile.
 - Each product has its own Product Quality Planning Project Status Report that is updated continuously throughout manufacturing. Project tracking tools are used to monitor progress.
 - NAI utilizes the Advanced Product Quality Planning (APQP) process, similar to that used by major auto manufacturers, for the design and manufacturing of new products.
 - Every assembly produced at NAI is traceable back to the station and worker, in the event of a defect.
 - Fibers are kept clean throughout the manufacturing process.
 - Every completed harness is fitted to the working board for final testing.
- NAI also uses a Critical to Quality (CTQ) process, which adds another layer of testing to the testing done on the production line. The CTQ defines additional parameters, typically identified by customers, which need to be tested to ensure the final product meets their specifications.
 - Quality Management System engineers at NAI will service our rare customer complaints and utilize 3D problem solving disciplines for resolution.
 - Calibration technicians continuously monitor and maintain NAI's measurement equipment. A preventative maintenance team monitors the life of tools and equipment and makes changes as needed.
 - Kaizen events occur regularly at NAI, as the production teams strive to eliminate waste and improve processes.
 - As a customer of NAI, you have access to all of our extensive QC data associated with your project.

The Ultimate Packaging Protection

NAI will utilize both standard and custom packaging materials to ensure our customers' products are shipped safely and securely. A few examples include:

- Tubing used to protect terminations
- Styrofoam packing designs
- Custom reels



Custom reels, when needed, protect your assemblies at NAI.



NAI utilizes innovative protection and custom packaging during manufacturing, as well as for shipping.

The Extraordinary People at NAI

Well Trained, Committed and Essential

We visited one of the NAI plants, and we found the labor force to be well trained and committed to their work. NAI’s training program is outstanding, and, along with their capital strength, they were able to ramp up quickly for our project.

Business Unit Manager
Telecommunications Company

The Passion Component

As a product manufacturer with high labor content, the work force at NAI is critical to our success. Therefore, over the years, we have established unique systems to grow the expertise and professionalism of our personnel. As a result, we achieve levels of learning, commitment and teamwork that inspire passion and motivation.

An Organization Focused on Learning

To maintain a capable labor force in an ever-changing manufacturing environment, NAI has an entire team of expert trainers to work with new hires and establish specific training programs for each of them. Once the trainees move into production, the trainers continue to work with them, and efficiency and quality levels are tracked.

Responsive, Fast & Competitive

NAI aspires to continuously improve and reduce its overall cycle and response times. Whether for quoting, which is already considered to be very fast by our customers, or for manufacturing and delivery, NAI will continue to strive for improvement.

Leadership “U”

NAI operates the “NAI University,” a formalized educational system within the company, for two purposes:

- 1) To promote leadership among the labor force.
- 2) To shift the labor force from being committed to becoming highly motivated.

NAI promotes a list of 21 qualities to become a leader. The NAI “U” defines a model for leadership and provides the training and tools for the development of leadership skills.



NAI's Statement of Values.



A member of NAI's Training Team teaches new hires by using established training programs specific to the project.

Portrait of NAI

A Manufacturing Success Story

Since Production Began in 1993, NAI has had an Explosive History

Today, NAI operates five plants worldwide with over 530,000 sq. ft. of production capacity. Our current production levels are above 2.5 million assemblies, with over 25 million terminations per month and growing. While we employ over 3,200 personnel, hiring and training are ongoing at NAI.

In fact, one of the main advantages of working with NAI is our agility to ramp up quickly for any increase in demand – a learned capability from handling thousands of custom orders over many years.

We maintain a division of specialization at various plants and manufacturing cells to accommodate both High Mix/Low Volume orders, as well as High Volume/Low Mix orders. As a result, our ability to meet varying needs, along with our delivery performance, is second to none.



Manufacturing cells and teams are dedicated to customer projects.

NAI Global Operations

Regionalized for Value & Proximity



Hermosillo, Mexico

Beginning with one plant in 1993, NAI currently has 4 plants in Hermosillo, Mexico, with over 400,000 square feet of manufacturing space and over 2,500 employees. These state-of-the-art facilities house both cable and harness assembly operations.

The beautiful Hermosillo area provides NAI with qualified labor and students from 10 local universities, so NAI can react quickly to customer needs. We experience much lower turnover and absenteeism than our peer competitors or companies at the border.



Suzhou, China

Started in 2006, our Suzhou plant in China is a true state-of-the-art facility, significantly invested with automated equipment for various assembly and molding operations. With over 130,000 square feet and 800 employees, Suzhou provides the same cable assembly capabilities as Hermosillo. However, component molding is a capability exclusive to Suzhou. This plant will often save customers time and cost by internally molding needed components.



NAI Administrative Facility

7975 North Hayden Road
Suite D-105
Scottsdale, AZ 85258

Phone: 480-556-6066
Fax: 480-556-9477

Hermosillo, Mexico

Phone: 52-662-250-9882
From U.S., dial 011

Nogales, Arizona Distribution Center

Phone: (520) 281-0679

Suzhou, China

Phone: 86-512-88169622
From U.S., dial 011

nai-group.com