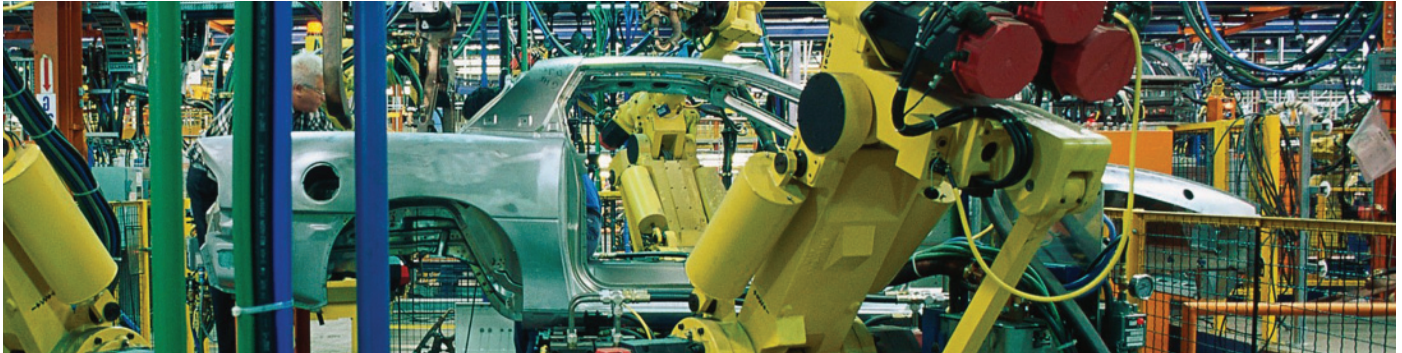




N-Tron Delivers Automotive Manufacturing Solution: Wireless Industrial Ethernet Drives Automatic Guided Vehicle Parts Delivery System

Key Facts

Customer

Major Asian Automaker

Installation Site

Vehicle Assembly Plant

N-TRON Solution

702-W Industrial Ethernet Wireless Radios

- Temperature tolerances from -40°C to 70°C
- Rugged industrial enclosure
- Range Performance:
 - Indoor (antenna dependent) greater than 300m
 - Outdoor (antenna dependent) greater than 60km
- Wireless Compliance: IEEE 802.11a/b/g/n
- Multiple In, Multiple Out (MIMO) technology increases throughput
- Station, Station/WDS, Access Point, Access Point/WDS Wireless Modes; Bridge and Router Network Modes
- >1 million hours MBTF



Since Henry Ford first introduced the use of assembly lines into his Detroit factory, process innovation has played a critical role in the success of the automotive industry. That tradition continues today in the form of advanced digital technology, high-tech robotics and cutting edge manufacturing systems. One technology that is rapidly gaining traction among automakers is the use of wireless communication in process control systems.

Its primary application is to provide full network communication with employees and/or equipment as each moves freely in the manufacturing environment. Wireless technology is also frequently used for remote monitoring purposes and data collection, eliminating the need for costly wiring installations and added infrastructure.

The growth of IEEE 802.11 wireless technology has increased sharply with security and bandwidth advancements improving performance. Also, the availability of new categories of wireless products, including process control equipment, IP security cameras, voice over IP, and RFID implements, has contributed to the acceptance of the technology.

Wireless communication offers many benefits in a factory setting:

- cabling cost savings
- ease of installation
- real time remote data access
- equipment mobility



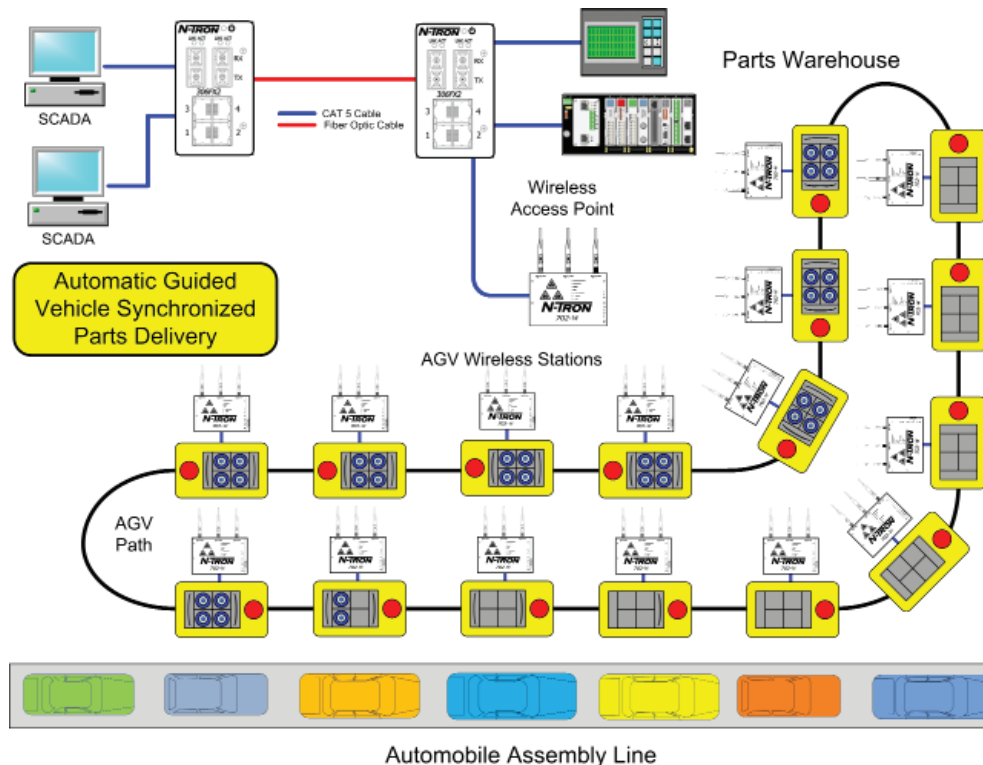


Figure 1

Wireless Drives Processes

A recent N-Tron installation showcases the use of industrial wireless technology. The company's 702-W Industrial Ethernet radios were selected by a major Asian automaker to provide the vital communication link in their factory's internal parts delivery system. The system relies on a highly-synchronized flow of activities between the scheduling division, parts warehouse and the assembly floor—all coordinated through the shared computer network. The centerpiece of the system is the fleet of automatic guided vehicles (AGVs) that transport the parts throughout the factory without human assistance.

N-Tron wireless radios manage all communications between the driverless vehicles and the master parts system as the AGVs quietly make their rounds through the plant, picking up parts from the warehouse, dropping them at the assembly line, and returning to the warehouse for more.

To produce the finished vehicle correctly, the scheduling department, parts warehouse and assembly group must perfectly synchronize communications to ensure that the appropriate parts, with selected options, arrive on time to match the appointed body type (see Figure 1). Any break in the process halts assembly, resulting in costly down time and unfinished vehicles. Because of their extreme reliability—more than 1 million hours MTBF—N-Tron's 702-W wireless Industrial Ethernet radios were selected to handle network communications between the various units, safeguarding mission-critical data flow.

Mobile Operation

As vehicles freely travel along a preassigned path through the facility, attached N-Tron radios encounter harsh factory conditions—high levels of electrical noise from manufacturing equipment, extreme vibration from motion and assembly processes, and a range of temperatures inside the factory.

These conditions are well beyond the capabilities of most wireless products currently available in the market. N-Tron models, however, are designed for optimal performance in tough environments. The combination of a rugged enclosure and outstanding industrial functionality allow the 702-W units to operate impeccably throughout the journey.

Outstanding Throughput

To effectively manage all incoming and outgoing data traffic, processing bandwidth was an evaluation consideration for the selection team. Unlike earlier generations of wireless products, the 702-W model provides outstanding throughput. N-Tron designed the device with Multiple-Input Multiple-Output (MIMO) operation, a smart antenna technology that allows the unit's multiple antennas to perform as both transmitter, and Spatial Division Multiplexing (SDM), an advanced processing technique, to boost throughput.

Why N-Tron

The N-Tron solution allowed the automaker to add greater mobility to the automation system without sacrificing real-time process control. Because of their tough industrial design, flexible capabilities and superior operation, the 702-W units were the ideal product for the job. N-Tron's 702-W radios are the key to the system, providing an extremely reliable information highway for process communication—without added infrastructure. The plug & play 306FX2 switches were chosen to provide a vital link in the system. Their compact size, fiber optic connections and easy setup made them a natural choice for integrators.

Note: The 702-W is a PoE-capable device. While the unit can be powered through traditional DC wiring, this feature enables the 702-W to receive power over a Cat5 cable instead. The PoE capability is a valuable and practical alternative in many applications. It allows the elimination of a power cable, streamlining costs and conserving space. While not used by the automaker for this application, the power sources for the 702-W radios could be quickly converted to PoE if future requirements deem this change necessary for any reason.

Available Antenna Options:

ANT-MD24-12.....	2.4GHz 12dBi Mini Directional Antenna
ANT-PAD24-16	2.4GHz 16dBi Directional Antenna
ANT-PAD58-19	5.8GHz 19dBi Directional Antenna
ANT-PD58-32	5.8 GHz Parabolic Dish 32dBi Directional Antenna

N-Tron Wireless Solution

- 702-W Industrial Ethernet Radios:
 - Individual radios are attached to each vehicle. An additional unit, used as an access point, connects to the network through N-Tron's 306FX2 Industrial Ethernet Switch.
 - > Fully managed compact radio
 - > Hardened device delivers maximum performance in harsh environments
 - > Wireless communication enables mobile operations
 - > Reliable functionality—greater than 1 million hours MTBF
 - > Class 1, Div 2 HazLoc certification
 - > Full IEEE 802.11a,b,g,n compliance guarantees seamless system compatibility
 - > Maximum bandwidth with three (3) antennas for 3x3 MIMO/SDM operation
 - > Secure communications
 - 802.11i with AES-CCM & TKIP Encryption
 - 802.1x, 64/128 bit WEP
 - > Wide transmission range
 - Indoor (antenna dependent) greater than 300m
 - Outdoor (antenna dependent) greater than 60km
 - > Web browser management eases programming and monitoring
 - > Four user-definable LEDs allows you to see signal quality at a glance
 - > Supports multiple radio frequencies and wireless modes for greater network flexibility
 - > Autosensing 10/100BaseTX, duplex, and MDIX
 - > One 10/100BaseTX RJ-45 port
- 306FX2 Industrial Ethernet Switches:
 - Two units are used to connect the scheduling division, parts warehouse and wireless access points to AGVs.
 - > Compact 6-port switch: 4 10/100BaseTX, 2 100BaseFX fiber uplink
 - > Plug & Play operation
 - > Class 1, Div 2 HazLoc certification
 - > Up to 1.2 Gb/s throughput
 - > Expanded environmental specifications
 - > Rugged industrial enclosure
 - > More than 1 million hours MTBF
- N-View OPC Monitoring Technology
 - > OPC server easily interfaces with industry-standard HMI software, enabling integration of real-time switch information
 - > Provides robust standalone web-based interface to monitor and configure device options, view network traffic, alarms and trend data





N-Tron 702-W

Industrial Ethernet Radio

Radio Output Power:

Up to 250mW US

802.11a	5GHz
DataRate	Avg TX ± 2 dB
1-24Mbps	24 dBm
36Mbps	22 dBm
48Mbps	20 dBm
54Mbps	19 dBm

802.11b/g	2.4GHz
DataRate	Avg TX ± 2 dB
1-24Mbps	24 dBm
36Mbps	22 dBm
48Mbps	20 dBm
54Mbps	19 dBm

802.11n	2.4GHz	5GHz
DataRate	Avg TX ± 2 dB	
MCS0	24dBm	24dBm
MCS1	24dBm	24dBm
MCS2	24dBm	24dBm
MCS3	22dBm	22dBm
MCS4	22dBm	22dBm
MCS5	22dBm	22dBm
MCS6	18dBm	18dBm
MCS7	15dBm	15dBm
MCS8	24dBm	24dBm
MCS9	24dBm	24dBm
MCS10	22dBm	22dBm
MCS11	20dBm	20dBm
MCS12	20dBm	20dBm
MCS13	17dBm	17dBm
MCS14	17dBm	17dBm
MCS15	15dBm	15dBm

Radio Receiver Sensitivity

802.11a	5GHz
DataRate	Sens. ± 3 dB
1-24Mbps	-96 dBm
36Mbps	-95 dBm
48Mbps	-94 dBm
54Mbps	-91 dBm

802.11b/g	2.4GHz
DataRate	Sens. ± 3 dB
1-24Mbps	-97 dBm
36Mbps	-90 dBm
48Mbps	-86 dBm
54Mbps	-84 dBm

802.11n	2.4GHz	5GHz
DataRate	Sens. ± 3 dB	
MCS0	-97dBm	-96dBm
MCS1	-96dBm	-95dBm
MCS2	-93dBm	-92dBm
MCS3	-91dBm	-90dBm
MCS4	-87dBm	-86dBm
MCS5	-84dBm	-83dBm
MCS6	-78dBm	-77dBm
MCS7	-75dBm	-74dBm
MCS8	-96dBm	-95dBm
MCS9	-94dBm	-93dBm
MCS10	-91dBm	-90dBm
MCS11	-88dBm	-87dBm
MCS12	-85dBm	-84dBm
MCS13	-80dBm	-79dBm
MCS14	-79dBm	-78dBm
MCS15	-76dBm	-75dBm

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