Redundant Wireless Data Communication Systems

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DATA-LINC Overview

- **GE Fanuc Accompany Partner**
- Manufacturer of communication solutions for industrial markets
- Broad line of solutions (private RF, dial-up/leased line, dedicated wire & fiber optics)
- Factory pre-configuration prior to shipping
- On-site GE PLCs for testing & support
Wireless Technology

Why consider wireless?

- Cable installation/maintenance is expensive (ROI)
- Cable installation is impossible
  - Moving/spinning platforms
  - Remote locations
- Phone company reliability is questionable
- RF back-up to a wired system
Wireless Technology

*Smart Spectrum™*

- Designed for industrial applications
- Spread spectrum (no FCC/DOC site license)
  - 902-928 MHz or 2.4 GHz band
- Advanced frequency hopping techniques
- Field proven predictable performance in high interference and harsh environments
- Range to 20 miles without repeaters
Wireless Technology

- Tolerant of multi-path reflections for indoor applications
- Supports 15 separate systems in the same location (ideal for redundancy)
- Provides automatic modem linking
  - Back-up modem connects without intervention
Wireless Technology

- Radio modems for SNP, CCM, Modbus ASCII/RTU (SRM6000) and Ethernet (SRM6200E)
- Non-deterministic by nature (10-30 msec latency-varies based on interference level)
- Ideal for 90-30 & 90-70 PLC SCADA, remote diagnostics/programming and control applications
Multi-point Wireless PLC Example

Range of 20 miles with line-of-sight antenna placement
Wireless as a Back-up

- Radio modems may be used to back-up a hard wired system
- Provides insurance in case of cable damage
Wireless Back-up of PLC Communications

Copper or Fiber Cable

GE 90-30/70 PLC
Slave PLC

Slave

DATA -LINC SRM6000 RADIO MODEM

Master

Slave PLC

Normal Operation

GE 90-30/70 PLC
Master PLC or PC
Wireless Back-up of PLC Communications

Back-up Mode Over RF Link

GE 90-30/70 PLC

Slave PLC

Copper or Fiber Cable

GE 90-30/70 PLC

Master PLC or PC

Master

Slave

Cable break

DATA -LINC SRM6000 RADIO MODEM

DATA -LINC SRM6000 RADIO MODEM
Radio Modem Redundancy

- Most common radio modem failures:
  - Lightning hit on/near antenna
  - Static electricity build-up on antenna
  - Surge from power source
  - Ground loop surges via interface cable

- Redundancy should take into account these causes
Common Causes of Communications Failure

1. Lightning Hit
2. Static Build-up
3. Power Surge
4. Ground Loop
5. DC Power Source
6. DATA Interface
7. RF
8. Lightning Arrestor
9. Earth Ground

Diagram:
- PLC
- Radio Modem
- Antenna
Radio Modem Redundancy

- Ideal radio modem redundancy
  - Separate primary/secondary radio modems
  - Separate antennas with masts at least 50 feet apart
  - Separate power sources
  - Optical isolation on data interfaces (especially on long cable runs)
Ideal Radio Modem Redundancy

- DC Power (Primary)
- Redundant GE PLC
- Primary
- Secondary
- Radio Modem (Primary)
- Optical isolation
- Radio Modem (Secondary)
- DC Power (Secondary)
- Lightning Arrestor
Radio Modem Redundancy

- Modem activation methods
  - PLC program controls modem power
  - Apply power to the appropriate modem
Redundant Slave with Power Switching

GE 90-30/70 PLC

Slave PLC

Power On

Redundant GE PLC

Primary

Secondary

Power Off

GE 90-30/70 PLC

Master PLC

or PC

Master

Primary Active

Primary

Secondary
PLC System with Redundant Slave

GE 90-30/70 PLC
Slave PLC

Redundant GE PLC
Primary
Secondary

Power Off

Primary

Secondary

Power On

Primary

Secondary

Slave

Master

GE 90-30/70 PLC
Master PLC or PC

Secondary Active
Radio Modem Redundancy

- Modem activation methods (continued)
  - All slave modems active
    - Master PLC/PC must poll appropriate slave PLC
    - Only one slave PLC may respond at a time
PLC System with Redundant Slaves

All Slaves Active
Radio Modem Redundancy

- Modem activation methods (continued)
  - Combination master & slave
    - Master selected by power
    - All slaves active
PLC System with Redundant Master & Slave

Primary Master Active

Power On

Power Off
PLC System with Redundant Master & Slave

Secondary Master Active
Summary

- RF may be an effective back-up to copper or fiber optic cable
- *Smart Spectrum* ideal for redundant PLC applications
  - Linking technique provides automatic modem synchronization
  - 15 separate systems may operate in same area
Summary

Future **DATA-LINC** Product Innovations

- The SRM6000 & SRM6200E are intelligent micro-processor controlled modems
- Modem features can be added via firmware program changes
- **What are your requirements?**
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