

NFPA 72 National Fire Alarm and Signaling Code and NFPA 1221 Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems both issue recommendations for the application, installation, location, performance, inspection, testing, and maintenance of fire alarm systems, supervising station alarm systems, public emergency alarm reporting systems, fire and carbon monoxide alarm reporting equipment and emergency communications systems (ECS), and their components. These recommendations are well-accepted and enforced by many AHJs (Authority Having Jurisdiction) throughout the United States.

In order for an Emergency Responder Radio Communication System (ERRCS) to be compliant with these codes, users should pay attention to the following requirements:

A) Component Approval and RF-emitting Devices:

- All RF-emitting devices shall have the certification of the radio licensing authority of that country and be suitable for public safety use prior to installation.
- All RF-emitting devices shall be compatible with both analog and digital communications, as required to be used by the radio licensing authority and the AHJ, simultaneously at the time of installation.

Fiplex Communications complies with these requirements. All Fiplex Signal Boosters/Repeaters and Fiber Optic DAS components that are designed for public safety communications are tested and certified by the Federal Communications Commission (FCC). They are specifically designed to work with all analog and digital communications simultaneously including P25 Phase I and Phase II, NXDN, DMR, TETRA, 4G LTE and Conventional Systems.

B) Component Enclosures:

- All repeater, transmitter, receiver, signal booster components, optical-to-RF and RF-to-optical converters, external filters, batteries, and battery system components shall be contained in a NEMA4 or NEMA4X type enclosure
- Batteries that require venting shall be stored in a NEMA3R type enclosure.

Fiplex Communications complies with this requirement. All Fiplex Signal Boosters/Repeaters and Fiber Optic DAS components that are designed for public safety communications are housed in a NEMA4 or NEMA4X enclosure. Fiplex Battery Backup system utilizes a main controller enclosure which is NEMA4 type and separate battery enclosure which is NEMA3R type.

C) Radio Coverage:

- Radio enhancement shall be designed to support two portable radios simultaneously transmitting on different talk paths or channels, where the AHJ has required the radio enhancement system to support more than one channel or talk path.
- The system shall adhere to the maximum acceptable propagation delay standard provided by the AHJ.

Fiplex Communications complies with these requirements in all our Digital Signal Boosters/Repeaters and Fiber-Optic DAS devices. Fiplex Signal Boosters and Fiber DAS are compliant with these requirements because they are Class A channelized devices which have automatic gain control (AGC) per channel and per timeslot in both DL & UL paths. This feature allows each channel to have its own independent AGC, which will only reduce the gain on the particular channel with a high input signal, leaving all other channels with full gain. This feature provides far-end preservation and mitigates the near-far effect allowing for multiple portable radios to communicate simultaneously throughout the coverage area with no change in performance and no change in coverage size. The AGC allows for consistent and stable coverage at all times. Furthermore, Fiplex devices have AGC per time slot for P25 Phase II TDMA communication systems. The AGC is fast enough to provide each time TDMA time slot with its own independent AGC which allows for multiple P25 Phase II portable radios to communicate simultaneously throughout the coverage area with no change in performance and no change in coverage size.

Note: Class A signal boosters and fiber DAS without AGC per channel and per time slot, as well as Class B signals booster and fiber DAS do not comply with this requirement as these devices are constantly changing the uplink coverage according to radio usage, providing inconsistent, unreliable communications that will fail during a critical response when multiple radios are transmitting simultaneously.

Fiplex Digital Signal Boosters and Fiber DAS also comply with the delay requirements for all analog and digital communication technologies including P25 Phase I and Phase II, NXDN, DMR, TETRA, 4G LTE and Conventional Systems. Each Fiplex digital signal booster and fiber DAS device have several digital filter bandwidth options, allowing the user to choose the correct delay vs. rejection performance. This allows the device to meet any delay requirement set forth by the AHJ.

D) ERRCS Alarms Annunciation and Monitoring:

- The system shall include automatic supervisory signals for malfunction of the two-way radio communications enhancement system that are annunciated by the fire alarm system.
- Monitoring for the integrity of the system shall comply with Chapter 10 of NFPA 72.
- System supervisory signals shall include the following:
 - Donor Antenna Malfunction
 - Active RF-emitting device failure
 - Low-battery indication when 70 percent of the 12-hour operating capacity has been depleted
 - Active system component failure
 - Loss of normal AC power
 - Failure of battery charger

Fiplex Communications complies with these requirements in all of our Signal Boosters/Repeaters, Fiber-Optic DAS components and Battery Backup Systems that are designed for public safety communications.

Fiplex Signal Booster Dry Contact Supervisory Alarms (See figure 1):

- Dry contact supervisory signal (alarm) for Signal Booster Failure
 - Active RF-emitting Device Failure
 - Active System Component Failure
- Dry contact supervisory signal (alarm) for Donor Antenna Malfunction

Fiplex Fiber-Optic DAS Dry Contact Supervisory Alarms:

- Dry contact supervisory signal (alarm) for Master Signal Booster Failure
- Dry contact supervisory signal (alarm) for Master Donor Antenna Malfunction
- Dry contact supervisory signal (alarm) for Remote Signal Booster Failure
- Dry contact supervisory signal (alarm) for Remote VSWR Alarm

Fiplex Battery Backup Dry Contact Supervisory Alarms:

- Dry contact supervisory signal (alarm) for Loss of Normal AC Power
- Dry contact supervisory signal (alarm) for Failure of Battery Charger
- Dry contact supervisory signal (alarm) for Low-battery Alarm

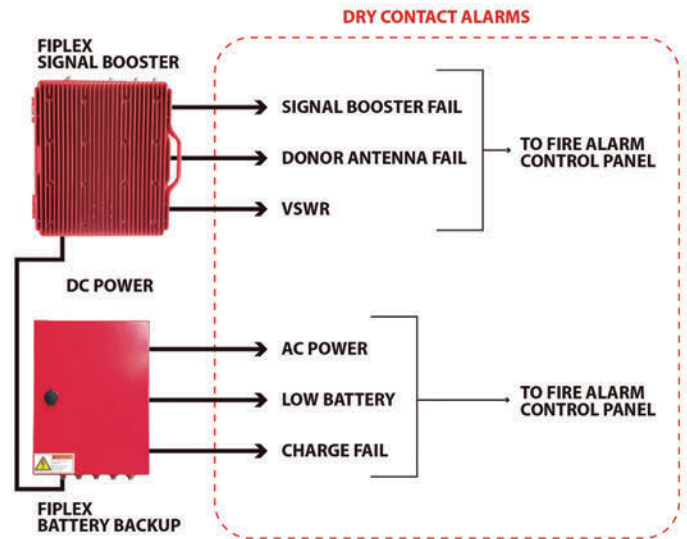


Figure 1 Fiplex Signal Booster & Battery Backup Dry Contact Supervisory Alarm Diagram

FIPLEX FIBER-OPTIC DAS SYSTEM

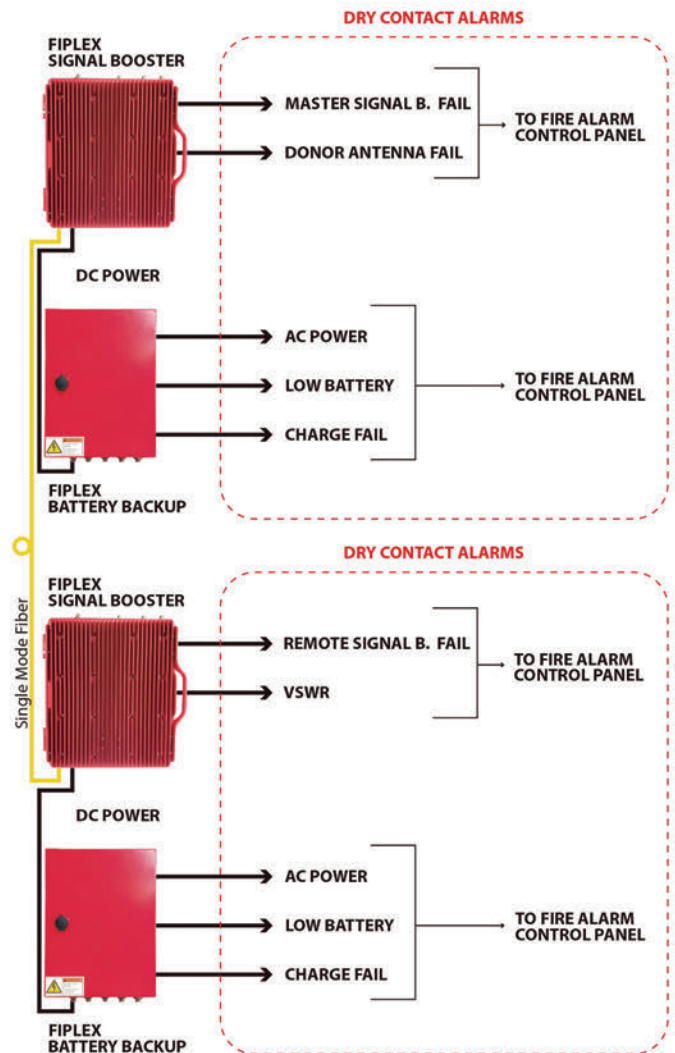


Figure 2 Fiplex Fiber-Optic DAS & Battery Backup Dry Contact Supervisory Alarm Diagram. All Supervisory Alarm signals are generated by the DAS Master Unit and the DAS Remote Units

E) Dedicated Annunciation:

- A dedicated annunciator shall be provided within the fire command center to annunciate the status of all RF-emitting devices and active system component locations. This device shall provide visual and labeled indications of the following for each system component and RF-emitting device:
 - Normal AC Power
 - Loss of Normal AC Power
 - Battery Charger Failure
 - Low-battery Capacity (i.e. to 70 percent depletion)
 - Donor Antenna Malfunction
 - Active RF-emitting Device Malfunction
 - Active System Component Malfunction

Fiplex Communications complies with these requirements in all of Battery Backup Systems that are designed for public safety communications. Each Battery Backup System has an option to include an annunciator with all recommended visual and labeled status indications.

Fiplex Annunciator Status Indicators:

- *AC Power Normal*
- *AC Power Fail*
- *Charger Failure*
- *Battery Low / Fail*
- *Antenna Fail*
- *Signal Booster Fail*
 - *Active RF-emitting Device Malfunction*
 - *Active System Component Malfunction*



Figure 5.3 Fiplex ERRCS Annunciator Panel

In addition to the NFPA 72 and NFPA 1221 recommendations, Fiplex has implemented the following characteristics on all of our Signal Boosters, to meet additional requirements of the North American market:

- *Enclosures are painted Fire RED.*
- *Dry contact supervisory signal (alarm) for Service antenna failure (VSWR).*
- *Signal Booster and Fiber-Optic DAS Alarms and Dry Contact Relays are reconfigurable to meet any AHJ special requirements.*